

The impact of mobile phone based health promotion services on maternal, neonatal and infant healthcare behaviour in resource-limited countries: lessons from a case study in Bangladesh

By

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Declaration

I declare that, except for contributions to multi-author papers incorporated in the thesis where my contributions are specified in this Statement of Contribution, the research presented in this thesis is my original work that I carried out during my candidature at the National Centre for Epidemiology and Population Health, Research School of Population Health, College of Health and Medicine, the Australian National University and has not been submitted to any other University or Institution.

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This thesis by compilation contains three chapters (6,000-8,000 words each), three published papers (6,000-13,000 words each) and one submitted paper (8,000 words). The fourth (submitted) paper was published while the thesis was being reviewed by the examiners. The details of the papers are outlined below.

Paper 1 (Presented in Chapter3)

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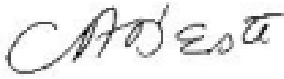
Contribution: MA, CD, CB and KL conceived this paper. MA reviewed the literature on the impact of mobile phone based health services in resource limited settings. MA was involved with the survey that occurred before inception of her PhD study. MA analysed the data during her PhD tenure,

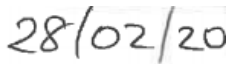
drafted the manuscript, coordinated co-author input, and executed revisions to the manuscript as required. All authors contributed to and approved the final version.

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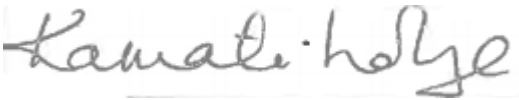
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the data. MA drafted the manuscript, coordinated co-author input, and executed revisions to the manuscript as required. All authors contributed to and approved the final version.

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Glossary

A2I: Access to Information

ANC: Antenatal care

ANU: Australian National University

AIDS: Acquired Immune Deficiency Syndrome

BBS: Bangladesh Bureau of Statistics

BDT: Bangladeshi Taka

BTA: Bangladesh Telemedicine Association

BTRC: Bangladesh Telecommunication Regulatory Commission

CRM: Customer Relationship Management

CONSORT: Consolidated Standards of Reporting Trials

DGHS: Directorate General of Health Services

DGFP: Directorate General of Family Planning

EmOC: Emergency Obstetric Care

GP: Grameen Phone

GP: General Physician

HIV: Human Immunodeficiency virus

ICDDR, B: International Centre for Diarrheal Disease Research, Bangladesh

ICT: Information Communication Technology

IMR: Infant Mortality Rate

IVR: Interactive Voice Responses

ITU: International Telecommunication Union

LBW: Low Birth Weight

MAMA: Mobile Alliance for Maternal Action

MDG: Millennium Development Goal

mERA: mHealth Evidence Reporting and Assessment

MMR: Maternal Mortality Ratio

MMS: Multimedia Messaging Service

MNCH: Maternal Neonatal Child Health

MOHFW: Ministry of Health and Family Welfare

MOTECH: Mobile Technology for Community Health

MTCT: Mother- To- Child Transmission

MTERG: mHealth Technical Evidence Review Group

NGO: Non-Government Organization

NMR: Neonatal Mortality Rate

OSRP: Open Smart Register Platform

PNC: Postnatal care

SBA: Skilled Birth Attendant

SDG: Sustainable Development Goals

SDNP: Sustainable Development Network Programme

SMS: Short Messaging Service

TRCL: Telemedicine Reference Centre Ltd

TT: Tetanus Toxoid

USAID: United States Agency of International Development

USD: United States Dollar

UTAUT: United Theory of Acceptance and Use of Technology

WHO: World Health Organization

Abstract

As mobile phone technology has improved, health services provided via mobile phones (mHealth), have spread around the world including hard-to-reach areas. mHealth services have been popularized in developing countries to reduce maternal and under-5 child mortality. Although there is evidence that text messages make a significant improvement to maternal and new-born health indicators, the effect of voice messages is under-researched.

In this thesis I have investigated Bangladesh's first national mHealth service called 'Aponjon' that provides two messages (voice or text) per week to pregnant women and mothers of 0-11 month old babies. Bangladesh in South Asia has made praiseworthy improvements in maternal and child health indicators. However, the maternal mortality ratio stalled before reaching its millennium development goal. Furthermore, neonatal mortality which makes up two-thirds of under-5 child mortality did not drop significantly. The overall aim of my thesis is to evaluate the effectiveness of the Aponjon messaging and consultation service for Bangladeshi women around pregnancy, delivery, new-born and infant healthcare.

My analysis of a retrospective cross-sectional study of 476 new mothers who were enrolled in the Aponjon service before (n=210) or after childbirth (n=276) suggested that unidirectional messages during pregnancy had no or limited association with delivery by skilled birth attendants, initiation of breastfeeding right after birth, delayed bathing of new-born baby and postnatal healthcare visits within 42 days of delivery. Facility based delivery was an independent factor for delayed bathing and post natal care visits.

We conducted a mixed methods study to investigate the usability of Aponjon's 24*7 consultation service. Call log data analysis and interviews of 16 (8 women, 8 husbands) callers and 11 doctors suggested that the service was accessed almost equally by female subscribers and their husbands for enquiries and advice. The doctors graded patient symptoms according to the patient's description and advised treatment and referral as appropriate. Most emergency calls were reported between 8 p.m. to 8 a.m. when visit to local health facilities or a doctor was not possible. Doctors encouraged people to use medicines responsibly and often spelled the names of the medicine to local drugstore salesmen during purchase. The service lacked a referral service linked with local health facilities.

A follow-up qualitative study with mothers (n=33) identified socio-cultural and technological barriers to adopting mHealth messages. Although women appreciated receiving information on new-born and infant healthcare from the Aponjon service and followed advice, women's delivery decisions were guided by their socio-economic background, cultural influence, involvement of family members, fear of C-sections, trust in local birth attendants and previous history of miscarriages or complicated delivery.

Finally, I analysed a retrospective cross-sectional study of pregnant women (n=459) enrolled in the Aponjon service for association between access to messages and satisfaction with the service. I found that women's singular access to messages was positively associated with their satisfaction with the service and better health practices compared to women who shared phone access with family members.

Overall, my thesis shows that a mHealth service for maternal, neonatal and infant healthcare has been widely embraced by Bangladeshi women and their husbands. However, mHealth implementers should also address the socio-cultural barriers identified in this thesis that reduce adoption of

mHealth services among low income households. This thesis makes recommendations about how mHealth could be enhanced while emphasising that this should occur in the context of broader improvements to existing services to collectively increase the quality of life for mother and children in resource limited settings like Bangladesh.

Organization of Thesis

The thesis follows a by compilation format and consists of seven chapters. There are four published papers, each of which constitutes a chapter.

Chapter 1 sets the context of the thesis, discusses the scope of mHealth in resource limited settings like Bangladesh and provides the aims, research questions and objectives of my PhD.

Chapter 2 presents the conceptual framework that I have followed throughout my thesis. This chapter also discusses research methodology and ethical considerations of the thesis.

Chapter 3 to *Chapter 6* discusses the results of the study. In *Chapter 3* results of investigation of research question-1 and objective -1 is described as a published paper (paper-1). The effect of non-interactive mobile messages during pregnancy on delivery and postpartum healthcare is discussed in paper-1.

Chapter 4 discusses the results of investigation of research question-2 and objective-2 in the form of published paper-2. In this paper perception and experience of doctors and subscribers who used the consultation service is presented along with the efficiency of the call centre.

Chapter 5 presents findings from a qualitative study (paper-3) exploring research question-3 and objective-3. This chapter details the socio-economic factors and barriers to adoption of mHealth services for maternal, neonatal and infant healthcare in resource limited settings.

Chapter 6 elaborates findings from investigation of the effect of women's differential access to messages on their pregnancy behaviour and experience about the service. How women access

messages is a critical factor (research question-3, objective-4) and effect of this disparity in mHealth service is discussed in paper-4.

Chapter-7 synthesises findings from Chapters 3-6. The findings are discussed in the context of present literature. This chapter provides policy implications for establishment of mHealth services for maternal and child health in resource limited settings and provides guidelines for future interventions and research.

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CHAPTER 1. Introduction

My thesis broadly evaluates the effect of mobile phone based health educational services on maternal, neonatal and infant healthcare outcomes in a resource limited setting. I have chosen a particular intervention (Aponjon service) in Bangladesh, a country in South Asia; once known for its high maternal and child mortality. In this chapter I will introduce readers to the core concepts of my study; the emergence and extent of a mobile phone based health educational service for maternal, neonatal and infant healthcare, the study location-Bangladesh, the Aponjon service- why it is relevant for my study, and the research aims, questions and objectives of this study. In the following chapter I will discuss theoretical perspectives and research methodology.

1. mHealth: mobile phones for healthcare

If the nineteenth century is marked as the era of first telephone use in the history of telecommunication then the millennium should be remembered as the era of basic mobile phone use; within a century scientific interventions have gradually transformed the giant, wired, costly telephones into portable, affordable and long-lasting mobile phone sets. Now, people can communicate with each other through their mobile phone sets in a microsecond in any part of the world. Mobile phones first introduced in high-income countries gradually progressed into low- and middle-income countries as the telemarketing companies made cheaper but sustainable mobile phones available (1). The International Telecommunication Union (ITU) estimated that 90% of the world population had reached mobile phone coverage by 2010 with developing countries reaching a

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saturation level around 73% in 2010 from 53% in 2005 (2). As mobile phones added new features like Wi-Fi, web-browsing, video conferencing, photo capturing apps and more internal data storage this technology was no longer limited to talking or sending Short Messaging Service (SMS) and voice messages (1, 3). Policy makers and implementers in developing countries welcomed mobile phone based health services or “mHealth” to explore possibilities to address challenges in resource-constrained health markets in terms of availability, quality and financing of health care (1). The World Health Organization (WHO) identified mHealth as a component of eHealth (1); while eHealth includes a spectrum of information communication technologies (ICT) such as computers, telephones and wireless communication in health services, mHealth is considered a subset that operates through mobile phones (1, 4). The Global eHealth observatory of WHO defined mHealth or mobile health as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”(1).

Labrique et al. identified (5) mHealth as a health system strengthening tool with 12 common applications around the world such as a tool for client education and behaviour change communication (BCC), sensor and point-of-care diagnostics, registries/vital event tracking, data collection and reporting, electronic health records, electronic decision support, provider to provider communication, provider work planning and scheduling, provider training and education, human resource management, supply chain management and financial transactions and initiatives. mHealth interventions in high-income countries made use of advanced technology (such as mobile phone apps in smartphones) in personalized health care for chronic disease management (6-11), self-monitoring of physical wellbeing and exercises (12, 13), smoking and addiction cessation (14, 15), medication adherence (11, 16-18), emotional self-awareness and management of mental health problems (11) and screening and diagnosis of chronic diseases (19-21). On the other hand,

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implementers in low- and lower middle-income countries have utilized basic mobile phone technology (text or voice messages, call centres, video tutorials) innovatively for treatment adherence for communicable (22-25) and non-communicable diseases (26, 27), following up patients (28) and setting appointment reminders (29), awareness and prevention campaigns (30-32), case detection and management of disease (33-36), performing diagnostic tests (37-39), improved communication between community health workers and physicians in remote areas (40), capacity building of local providers (41), childhood immunization campaign (42), reducing workload of community health workers by replacing travels (43) and paper based data collection process (44-46), promotion of contraception use (47), surveillance (48, 49), stock management for medicines (46) and tracking counterfeit drugs (50).

mHealth is a promising tool to respond to the unequal distribution of health workforce in urban and rural areas and inequity in access to Maternal Neonatal and Child healthcare (MNCH) services by rich and poor in low-income countries (51-53). Low-income countries account for almost all maternal and neonatal deaths in the world as marked disparities exist across regions and countries, rich and poor and urban and rural areas (51, 54). Almost 94% of maternal deaths occur in low and low-income countries mostly in rural areas amongst disadvantaged communities (55). The lifetime risk of maternal mortality was reported as 1 in 4,900 in developed countries compared to 1 in 36 in Sub-Saharan Africa in 2015. Sub-Saharan Africa accounted for approximately 66% (201,000) of all global maternal deaths followed by South Asia (66,000) (56). A baby born in Sub-Saharan Africa or in South Asia is nine times more likely to die in the first month of their lives than a baby born in a high-income country (54). Neonatal mortality rate (NMR) receives special attention as the decline has been significantly slower than other under-5 age groups (1-59 months) and contributed to half of share to the burden of 5.3 million under-5 child mortality across the world in 2018 (57, 58). It is a fact that most neonatal deaths occur within the first week after birth (58). An estimation in six low-

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and lower middle-income countries (Bangladesh, Ghana, India, Pakistan, United Republic of Tanzania and Zambia) suggested that approximately 46.3% of all neonatal deaths (14.1 per 1000 live births) occurred within the first 24 hours while neonatal mortality in the first 6 hours was recorded at 31.9% (8.3 per 1000 live births) (59). Preterm birth complications (35%), complications during labour and delivery (24%) and sepsis (15%) are the main causes of neonatal deaths all of which can be avoided with simple, cost-effective and high-impact interventions addressing continuum of care for mother and new-born baby with an emphasis on care around the time of birth (58, 60, 61). The majority of direct causes of maternal death such as haemorrhage, infection, hypertension and obstructed labour can also be prevented and managed during pregnancy by regular antenatal care visits and early interventions (55). Pre- and postnatal check-ups, birth preparedness and arrangement of delivery by skilled birth attendants (SBA) are some of the major recommendations by the World Health Organization (WHO) to ensure safe delivery and survival of mother and new-born baby (62-64). mHealth interventions for Maternal Neonatal Health (MNH) services in low-income countries address the underlying causes of maternal and neonatal death and adopt strategies that best support the needs of the community. Most of the mHealth interventions are deployed on an ad-hoc basis beside the standard MNH services to help pregnant women and new-born babies reach health facilities without delay for obstetric and neonatal complications (65, 66). Other interventions focused on pregnancy and birth outcome registrations (67), increasing rates of pre- and postnatal care visits (68-70), delivery by skilled birth attendants (71), exclusive breastfeeding (72), decreasing perinatal mortality (73), postpartum contraception usage (72, 74), infant HIV testing (70) and supporting community health workers by mobile supported job-aids (75, 76).

2. Bangladesh and mHealth

mhealth, as in many other countries, is a plausible solution to improve health communication and mitigate the need of rural people in remote areas, especially for maternal and child health care services in Bangladesh. The following paragraphs set out the reasons for selecting Bangladesh as my study location.

2.1 Country profile

Bangladesh is the eighth most densely populated country in the world, with a population of more than 155 million people on a land mass of 147,570 km² (77, 78). Situated at the top of the Bay of Bengal, it is a country in South Asia, surrounded by India in north, west and east and Myanmar in south-west (77). Historically Bangladesh was part of British-India before the split in 1947 and a part of Pakistan until being liberated in 1971 (79, 80). Citizens of Bangladesh are known as Bangladeshi and the state language is Bangla (also known as “Bengali” to foreign speakers) (80). About 90% of the population are Muslims, 9% Hindus and the rest 1% consist of other remaining religions (Buddhists, Christians etc.) (79).

Currently, the ratio of male and female is almost equal at 1.02:1.00 (78). A third of the population is below 15 years of age while more than half of the population belongs to the age group 15-49 years indicating an expansive population pyramid with high birth rate and low life expectancy; which is expected to change with availability of modern treatment and an increased proportion of population reaching 65 years of age or above by 2025 (78, 81, 82). In the 2014 demographic household survey, life expectancy at birth was recorded as 69 years for females and 71 years for males (79). Total fertility rate was reported at 2.05 (rural 2.37, urban 1.68) births per woman aged 15-49 years and crude birth rate at 18.5 live births per 1,000 population in 2018 (78).

2.2 Gradual transformation of a country

Economy: Over the past few decades, Bangladesh has emerged as a reformed and dynamic country from its initial war-torn, desperately poor, overpopulated and famine-struck image in the 1970s (83). Bangladesh is one of the few countries to have achieved the millennium development goals by the United Nations (UN) well ahead of time (83, 84). With continued public-private investment and strategies to overcome the barriers, Bangladesh has made significant progress in reducing poverty in the last couple of decades. The rate of poverty (calculated as 1.9 USD per person per day) has significantly reduced from 44.2% in 1991 to 14.8% in 2016/17 (85). Globally extreme poverty in developing countries has dropped down from 47% in 1990 to 14% in 2015 (84). Gross domestic product (GDP) growth has been significant at a rate of 6% for the last one decade and reached to 7.9% in 2017/18 which led Bangladesh to achieve the lower middle-income country status in 2015. With this continued growth rate the country aspires to graduate to a “middle-income country” by its 50th birthday (85). The garment industry, export business, agriculture and revenue from Bangladeshi overseas workers contribute a major portion to the thriving economy (86). Social transformation in patriarchal society, such as women’s empowerment through income-generating work outside home has influenced economic progression as well as adoption of modern contraception, expenditure on child welfare and demand for girl’s education (83). It is noteworthy that the micro-credit programmes, the rural non-farm sectors (such as Non-Government Organizations) and the garment industry have catalysed roles in women’s employment and consequently their empowerment (83). The ready-made garment industry alone employed 1.5 million workers, mostly women with some formal education, and contributed to relocation of women from rural areas (83, 87). Due to the increase in urban-centric industrialization and employment sectors the country is experiencing rapid urbanization although 75% of the population still resides in rural areas (77, 81). According to an

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estimate by the World Bank in 2007, the population of the capital city of Dhaka almost doubled in ten years from 5.8 million in 1990 to 10.2 million by 2000 (81). As a result of the unplanned migration, there is a lack of adequate housing, security, and access to essential services including health, sanitation and potable water for the growing urban population (81).

Education: Bangladesh has made significant improvement in ensuring education for all and narrowing the gender gap in primary education enrolment. Enrolment for primary education observed a rapid increase from 60.5% (girls 50.8% vs. boys 69.4%) in 1990 to 97.7% (girls 98.8% vs. boys 96.6%) in 2014 (84). The rate of children leaving primary education has also decreased. Grade 5 survival rate was reported at 81% in 2014 after a significant improvement from 43% in 1991 and more girls (84.45%) reached grade 5 than boys (77.65%) in 2014 (84). Adult literacy was estimated to be 65.1% for males and 56.9% for females in a 2015 report (84). Based on the ability to write a letter, Bangladesh literacy survey 2010 reported literacy rate at 59.82% for the population 15+ age group (84). School absenteeism and drop-out is correlated with poverty. Situation analysis of the global scenario suggests that children from poorest households are four times more likely to leave primary school early than children from the richest households (84). The improvement in school enrolment and gender parity in Bangladesh has largely been driven by the demand side financing strategies adopted by the Government to reduce inequality in accessing formal education. Since the 1990s, the ‘food for education’ programme to reduce drop-out of primary school children from poor households and special universal stipend programme for female students attending secondary schools were some of the commendable initiatives (83).

Millennium targets on health: Reduction of under-5 child mortality and maternal mortality ratio received special attention in the Millennium Development Goals (MDG). The Millennium Development goals (MDG) was a set of measurable goals and indicators declared by the Secretary General of the United Nations in 2001, to assess economic, education, health, equity and

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sustainable development progression among 189 member states between the period of 1990-2015 (58, 88). MDG4 targeted a reduction of under-5 child mortality by two-thirds between 1990-2015 by lowering under-5 and infant mortality rate and improving coverage of measles vaccination among infants (84, 88). MDG5A targeted to reduce maternal mortality ratio by three quarters by improving proportions of delivery attended by a skilled birth attendant and MDG5B aimed at ensuring universal coverage for reproductive health by improving contraceptive prevalence rate, the adoption of family planning methods, antenatal care coverage and reducing the adolescent birth rate (84, 88). The achievement of Bangladesh in meeting MDG4 by reducing under-5 child mortality rate (U5MR) has been impressive. Public-private aggressive campaigns on oral hydration solutions (ORS) to prevent child-diarrhoea and Expanded Immunization Programmes (EPI) for coverage of six vaccines have contributed to reducing the rate significantly (65%) from 133 per 1000 live births in 1989-1993 to 46 per 1000 live births in 2000-2014 (79). There have been significant improvements in new-born care practices in Bangladesh. For example, use of boiled instruments to cut cords during home deliveries had increased from 62% in 2007 to 83% in 2014, the recommendation to put nothing on the umbilicus was followed in 52% home deliveries in 2014 (only 4% increase since 2007), national recommendation of drying the new-born baby within five minutes after birth had increased from 51% in 2011 to 67% in 2014, delaying bathing of new-born baby for up to three days (another recommendation by the Government of Bangladesh) had improved from 28% in 2011 to 34% in 2014 and immediate breastfeeding increased from 50% in 2011 to 57% in 2014 (79).

Facility-based delivery and the number of C-sections are increasing in Bangladesh. The Bangladesh maternal mortality and health survey indicates that assisted deliveries by medically trained birth attendants had almost doubled in six years from 27% in 2010 to 50% in 2016 and that the increase was due to a sharp increase in facility-based deliveries from 23% in 2010 to 47% in 2016 (89). Before, the rate of utilization of medically trained birth attendant during delivery took ten years to

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double from 12% in 2001 to 27% in 2010 (89). Increase in delivery at public facilities may be due to the introduction of a demand side financing strategy or maternal voucher scheme in 55 districts since 2007 that offers free maternal healthcare services (ante- and postnatal care, delivery and C-sections, obstetric complications, transport cost and laboratory tests), conditional cash-incentives and food-voucher to marginalized women (78).

Since 1976, continued public-private intervention has significantly lowered the total fertility rate in Bangladesh from 5 in 1990 to 2.3 in 2014 (77, 79). Multiple campaign strategies used in the past three decades such as arrangement of satellite clinics in communities targeting males, home visits by Family Welfare Assistants (FWA) and Non-Government Organization (NGO) health workers, awareness programmes on television, posters and billboards were effective in raising awareness of unplanned births (90).

2.3 Scope for improving maternal, neonatal and infant health

Although Bangladesh's achievement in socio-economic and health reforms is praiseworthy, momentum is required to meet some indicators, especially for maternal and child health. For example, decline in neonatal (NMR) and infant mortality rate (IMR) has observed a slower pace compared to under-5 child mortality rate; neonatal deaths remain alarming in Bangladesh as NMR accounts for 71% of all infant deaths and 61% of all under-5 deaths in 2010-2014 (79, 84). NMR declined 46% from 52 per 1,000 live births in 1989-1993 to 28 per 1,000 live births in 2010-2014 while IMR dropped 56% from 87 per 1,000 live births in 1989-1993 to 38 per 1,000 live births in 2010-2014 (79). In South Asia region, U5MR per 1000 live births was reportedly lower in Bangladesh (41.1) than India (52.7) and Pakistan (85.5) but was higher than Sri Lanka (9.6), Maldives (9.9), Afghanistan (23.8), Bhutan (36.2) and Nepal (39.7) in 2013 (84). Similar trend was observed for IMR except Afghanistan; Afghanistan reportedly had the highest IMR in the South Asian Region (84).

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Similarly maternal deaths, after a desired decline of 40% from 322 in 2011 to 194 per 100,000 live births in 2010 have stalled and pregnancy related mortality ratio (PRMR) increased among adolescent women (15-19 years) from 75 per 100,000 live births in 2010 to 144 per 100,000 live births in 2016 (89). Maternal deaths account for almost 13% of all adult female deaths according to a national survey in 2016 (89). Ante- and postpartum haemorrhage is the most common (31%) cause of maternal deaths in Bangladesh followed by eclampsia and pre-eclampsia (24%), indirect causes (20%), abortion-related complications (7%), obstructed or prolonged labour (3%) and other direct or undefined causes (15%) (89). Bangladesh's progress in reducing MMR has been commendable but less so when compared to the global estimate of MMR which has declined from 330 per 100,000 live births in 2000 to 210 in 2013 (58, 84). Bangladesh also falls behind other South Asian countries such as Sri Lanka and the Maldives. In South Asia, Sri Lanka had the lowest MMR in 2013 at 29 per 100,000 live births followed by Maldives at 31 per 100,000 live births while Afghanistan reportedly had the highest MMR in the region at 400 per 100,000 live births (84).

Although important preventive measures to avoid untimely maternal and neonatal deaths such as awareness about birth preparedness, delivery by skilled birth attendants or facility-based delivery and pre- and postnatal check-ups from medically trained providers have improved, there are still a significant number of births (43%) conducted in house by untrained birth attendants (locally known as *Dai*) and relatives (79). Delivery by untrained personnel has contributed to dangerous practices for pregnant women and their unborn children. For example, *Dais* or traditional (unskilled) birth attendants have been known to kick around the pregnant woman's waist, shake her belly or apply pressure on the belly, or make her perform stand ups and sit downs repeatedly, apply ingredients to her vagina for easy passage of baby, put materials (such as garlic, mustard oil, kerosene, birth attendant's hand, mother-in-law's hair) inside her mouth to make her vomit and have placed unwashed hand inside her vagina to observe the birth progress (91-95). Hygiene is threatened in

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some households where delivery is arranged on the floor of an ill-ventilated dark room where the domestic animals are kept (91). Often cord-cutting instruments are put on bamboo leaves or dirty rags and pregnant women are asked to put on dirty clothes because the process of delivery itself is considered unclean (91, 96, 97). The concept of cleaning hands with soap before delivery and for postnatal care of the new-born baby is often not maintained or understood (95-97). In some scenarios the new-born is kept unattended (sometimes on the floor) until the placenta is excreted (91, 95, 98). Sometimes the placenta is pulled out manually by the *Dai* and abdominal massages are applied on the pregnant woman's belly to bring out the clotted blood from the uterus (91, 92, 96, 97). Sometimes pregnant women cut their umbilical cord themselves as there is additional charge for cutting the cord by the *Dai* (95). Women with obstructed deliveries are not taken to hospital in time resulting in maternal and new-born fatalities (95, 99, 100).

Research suggests birth preparedness and antenatal care (ANC) visits significantly increases the chances of care seeking for preterm babies from qualified providers (101). WHO recommends at least 4 ANC visits for pregnant women for uncomplicated pregnancies (79). According to the Bangladesh demographic health survey in 2014, 21.4% women did not receive any ANC visits, 17.9% women received at least one ANC visit while only 31.2% women received four or more ANC visits during their last pregnancy (79). Approximately 64% pregnant women received ANC visits from medically trained providers (79). Urban women are more likely to have the recommended number of ANC visits than rural women (46% versus 26%) (79). Although the coverage of four or more antenatal care visits had increased from 17% in 2004 to 31% in 2014 in Bangladesh, the target set by MDG to reach 50% by 2015 was unattainable (79, 84). On the contrary, other South Asian countries such as Sri Lanka (92.5% in 2007), Maldives (85% in 2005) and Nepal (59.5% in 2014) had reached the MDG target for 4 ANC visits coverage well before 2015 (84).

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There is also a lack of awareness of post-delivery care. The immediate few hours and the first two days after delivery are crucial for the survival of mothers and new-born babies (79). During this period complications may arise and if proper care and referral is not provided fatality may follow severe symptoms (102). It is recommended that mothers and new-born babies receive the first postnatal care (PNC) visit by a medically trained provider within the first 24 hours after birth (in case of a home-based delivery) or within an hour after birth (in case of a facility-based delivery) (63, 103). Typically a mother is required to stay in a hospital after delivery for at least 24 hours before getting discharged. WHO recommends an additional three PNC visits at least at 2-3 days, 7-14 days, and at 6 weeks (103). Extra visits are recommended for babies born with low birth weight (LBW) and mothers with known complications (102). Sadly, maternity care coverage decreases with childbirth in Bangladesh. In 2014 almost 61% women and 64% new-born babies did not receive any PNC visits from medical or non-medical providers whereas only 36% women did not receive ANC visits during pregnancy (79). The concept of hypothermia is not recognised in non-institutional deliveries where most new-born babies are bathed on the same day of delivery (91). Approximately 32% of baths occurred within the first 6 hours after birth and 39% within the first 24 hours in 2014 (79).

Despite public-private efforts to increase awareness of maternal and child health dangers and prevention programmes, there is marked disparity in utilization of maternal and child health care facilities and services as women from low-income households, with low literacy and from rural areas tend to have less access to MNCH facilities and rely more on traditional practices (79, 91). The health system of Bangladesh is pluralistic (82). Four key players such as the Government, the private sector, non-government organizations (NGO) and donors make up the mixed agencies in the existing system (82). The Ministry of Health and Family Welfare (MOHFW) is the leading agency in regulating both the public and private sector health services; with its' two wings- namely the Directorate General of Health Services (DGHS) and the Directorate General of the Family Planning (DGFP), the

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MOHFW covers primary to tertiary care (except urban primary care) from the central level to the grassroots and among the rural and urban population (82). Urban primary care falls under the responsibility of the local Government institutions (such as city corporations and municipalities) which are overseen by the Ministry of Local Government, Rural Development and Cooperatives (82). The Government of Bangladesh is committed to provide free or subsidized curative, preventive, promotional and rehabilitative services to all citizens through a robust framework operated by the Ministry of Health and Family Welfare (MOHFW) (82). The job is challenging with a shortage of health workers to reach a population of whom 75% remain in rural areas (77, 81).

Although substantial investments over the decades have increased primary health facilities and skilled workforce, they have not been enough. There is only 1 bed per 1,699 people in Bangladesh (82). The rural-centric public primary health facilities are poorly equipped with basic instruments and lack funds to maintain minimum functionality (82). Also, the secondary and tertiary level care is urban-centric (82). The sophisticated private facilities equipped with modern technology and specialists remain out of reach of the poor. They either have to accept long delays in reaching suitable care or seek care from local, inexpensive informal health care providers (such as traditional healers, quacks, unqualified allopaths, homeopaths) (82, 104). There is inequality in the distribution of formal health care providers as qualified doctors are urban-centric and rural positions have staff-absenteeism, delay in filling vacancies and transfers (82, 104). There are 0.3 doctors and 0.3 nurses per 1,000 population and cumulatively there are less than 23 doctors, nurses and midwives per 10,000 population in Bangladesh (82). Whereas WHO suggests a minimum of 23 health workforce per 10,000 population (or 2.28 per 1,000 population) to achieve the targeted 80% coverage rate for skilled birth attendance and child immunization (105). Lack of female doctors, proper equipment, qualified staff and specialist services in rural areas contributes to the existing inequality in utilization of maternal and child health care services between urban and rural areas (82, 104). The pluralistic

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health system relies on the NGOs to respond to the need of the underserved rural-based population. Usually the Government has a good working relationship with the local NGOs who provide basic preventive care during pregnancy and after childbirth through their large cadre of community health workers and satellite clinics (82, 106). However, the traditional community approach may not be adequate to respond to the health needs of a large population which is undergoing a health transition. In recent years the ratio for accessing facilities for delivery among poor and rich has reduced to less than 1 to 4, however, the absolute difference in facility-based deliveries among these two groups is very large at 54% (22% in poorest versus 76% in richest households) (89). Also, inequality was observed in the quality of maternal healthcare, for example, women who completed secondary education and were from higher wealth quintiles had received more antenatal care services than women with no education and from a lower wealth quintile (79), meaning the current health system requires equitable measures to cover the gap.

The nutritional status of pregnant women is extremely important for healthy progeny as malnourished mothers are likely to give birth to premature babies with low birth weight who are at risk of dying within the first week of birth (79, 107). Malnourished children are susceptible to infectious diseases, early death, growth and cognitive retardation (79). Bangladeshi children and young women of reproductive age are especially vulnerable to nutritional deficits. One-third of 6-59 months old children and half of pregnant and lactating women are reportedly anaemic in Bangladesh due to inadequate macro- and micronutrients in their diet (107). Rural children are more likely to be stunted, wasted (too thin) and underweight than urban children (79). Cultural practices around new-born and infant feeding present lack of awareness of exclusive breastfeeding and initiation of supplementary food at the age of six months (91). Often breastfeeding is delayed right after birth and instead honey, mustard oil or palm sugar water (ingredients considered by elderly family members to keep baby healthy) is fed; in some households cow's or goat's milk is introduced

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after 40 days of birth. Palm sugar water (*misri pani*) is considered beneficial for preterm babies or small sized neonates and often fed along with breast milk (91, 96, 97). Some mothers are not aware of the harmful effects of water-borne diseases and introduce untreated water to infants from 1-3 months of age (91, 96). And also there is an increasing malnutrition, and the problem of a double burden (high proportion of underweight under-5 children and overweight women) which means there is a lack of awareness about healthy diet, exercises and change in lifestyle (107).

After reviewing the literature on the current situation for maternal and under-5 child health in Bangladesh, it appears that the Bangladesh Government has come a long way towards improving the major health indicators and is on target to reduce inequality accessing MNCH services. However, current efforts are not enough to meet the post-MDG Sustainable Development Goals (SDG) target of reducing MMR to less than 70 deaths per 100,000 live births, NMR to 12 per 1000 live births and U5MR to 25 per 1,000 live births by 2030 (108). Evidence from ethnographic research on cultural practices suggests a lack of knowledge of national guidelines around maternal and new-born healthcare practices (91, 98). Hence, along with investment and planning to improve health infrastructure and governance, the Government could make good use of integrative innovative technology (such as mHealth) to increase awareness of, and best practices in, MNCH services.

2.4 Emergence of mHealth in Bangladesh

Escalation of mobile phone coverage in Bangladesh was synchronized with the socio-economic and health transition phase at the beginning of the millennium and can be inferred to be related to the availability of cheaper mobile sets and reduction in mobile tariffs due to competition between telecom operators and involvement of the Bangladesh Telecommunication Regulatory Commission (BTRC) to regulate service prices. By the beginning of 2012 there were 86.5 million mobile phone subscribers in Bangladesh (109), even though the first mobile phone was expensive with a

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connection cost of nearly 1500 USD and a call charge of 0.25 USD per minute back in 1993 (110). Due to a rapid increase in mobile phone subscription, mobile phones were considered to be an important tool for improving governance and extension to rural people by the MOHFW (111, 112). Mobile phone based health services were included in the Health Information System (HIS) and eHealth strategies in 2011, with a vision of gradual automation of health systems to achieve “Digital Bangladesh Vision 2021”, under a mandate by the current Government (111). To keep pace with the global demand the national eHealth strategy was drafted with technical assistance from the Department for International Development (DFID) which included plans for building a robust national health data centre that would support data interoperability and allow collating data from all public and private organizations in the central database (113).

However, telehealth or mobile phones were first introduced for healthcare delivery in Bangladesh by a private company called Telemedicine Reference Centre Limited (TRCL) in 1999 where 200 specialists provided expert opinions to rural doctors in Bangladesh which was later expanded to consultations between physicians in Dhaka and the United States of America in 2001 (4, 114). Before mobile phone based consultation services were introduced by TRCL in 1999, the same year marked the first launch of an eHealth project by a not-for-profit organization called Swinfen Charitable Trust (SCT) and the first public eHealth project by the MOHFW (4, 114). The SCT project established a link between the Centre for the Rehabilitation of the Paralysed (CRP) in Dhaka, Bangladesh and the Royal Navy Hospital in Haslar, United Kingdom (UK) where images of patients of CRP were emailed to the physicians in UK for remote diagnosis and consultation (114). Although a lack of commitment from the government in the beginning inhibited the growth of the innovations, a coalition between the Bangladesh telemedicine association (BTA) and the Sustainable Development Network Programme (SDNP) was formed in 2003 that provided support to the on-going and sporadic ICT initiatives in the beginning of the millennium (4, 114). In 2005, videoconferencing was adopted in a

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rural general hospital in Faridpur where diabetic patients received remote consultation from specialist doctors of the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic disorders (BIRDEM) in Dhaka. Each patient was charged 600 BDT (USD 10) for the initial video consultation while following consultations were subsidized (114). The concept of remotely accessing a consultation service with medically trained doctors by mobile phones was successfully operationalized in Bangladesh by Telemedicine Reference Centre Limited (TRCL) and the largest telecom company, Grameen Phone (GP) in 2006 (4, 114, 115). Subscribers of GP were able to make health queries to a doctor by dialling a simple short code “789”; however the service call rate was extremely high at 5 taka per minute (4).

In 2008, the Directorate General of Health Services (DGHS) introduced eHealth services which included computerized facilities, internet connections and mHealth services to communicate with healthcare providers in health facilities at sub-district levels and established a data centre equipped with modern technology and firewalls to protect patient data (115). In 2009, all 64 district hospitals and 418 sub-district hospitals were upgraded with a mobile phone based hotline service. With this platform a 24/7 call centre with qualified doctors provided consultation service to local clients with the designated mobile phone numbers of each health facility at free of charge (116). Between 2011 and 2014, 43 telemedicine centres equipped with high internet bandwidth, large screen display, good quality telemedicine camera and peripherals were functional in different hospitals across the country, implemented by the MOHFW (113, 115). Since 2015, “Shasthy Batayon” (meaning health window), the first ever one-stop service and integrated national health helpline, established by the MOHFW, has been popularized under the five digit short code “16263” through the national media (78). By dialling this short code citizens are able to talk to a medical doctor for health advice, ask for referrals or contact information of medical facilities and specialized doctors, inform about any

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accidents and lodge complaints about any service from any land or mobile number at free of cost (78).

Ahmed et al. identified 26 initiatives (either pilot or full scale programme) that were implemented since 1990; among them almost 70% were deployed by private organizations and the rest were equally divided between public and NGO initiatives (4). Among the pilot initiatives a few received international recognition and are worth mentioning. One is the mCare programme that was piloted and implemented by the Johns Hopkins University, mPower Social and the Jivita project in the northern part (Gaibandha district) of Bangladesh from 2011 to 2015. The mCare platform calculated women's gestational age from their last menstruation period and sent automated SMS reminders to enrolled pregnant women and their significant family members and community health workers on upcoming antenatal care visits (117).

Another notable project is mTika, that was piloted between 2013-2014 in two hard-to-reach sub-districts with most haor (wetland) areas in Sunamganj district (north-eastern part of Bangladesh) and urban streets in two (out of ten) zones of Dhaka city by the Johns Hopkins University, mPower Social and ICDDR,B in close partnership with the MOHFW (113, 118, 119). The purpose of mTika was to increase timely attendance of immunization in intervention areas where immunization rate was lower than the national level (118, 119). For this, the project used an android-based Open Smart Register Platform (OSRP) which allowed the community health workers to register a pregnant woman in the service with their android phones, set unique code for pregnant woman and new-born baby in the system, and send automated reminders to pregnant woman's phone (after receiving confirmation on successful childbirth) for upcoming immunization appointments for the new-born baby at nearby immunization centres (119). Community health workers or personnel at immunization centres were able to update immunization status of clients after each visit at the

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centres (119). Each SMS contained sign symbols so that pregnant women who otherwise could not read were able to comprehend the SMS after receiving training from the project (118). The project was integrated with the national health system and thus information of immunization status of women was linked with the national database (118).

2.5 Aponjon: the first national mHealth service in Bangladesh

In 2010, a needs assessment study conducted jointly by Dnet, a social enterprise, and Panos London in the United Kingdom, identified barriers to women's health care seeking behaviour for reproductive health issues among 165 Bangladeshi women of reproductive age (120). The study was conducted in three remote rural areas and indicated that women did not seek professional advice for reproductive health issues including maternal morbidity mostly because of non-approval by a significant other (husband, mothers-in-law) to seek medical consultation, privacy, distance to health facilities, having no one to accompany to local health facility and long waiting time at the hospitals (120). More than 80% households had a mobile phone and women indicated that they preferred talking to a doctor (preferably a woman) over phone for primary consultation (120). At the same time, pilot interventions such as Mobile Technology for Community Health (MOTEC) service in Ghana and Text4baby messages service in North America had successfully deployed voice or text messages timed with women's gestational stages for improving women's knowledge on pregnancy, delivery and postpartum care (121, 122). Efficacy of text message reminders for improving healthcare behaviour in high-income countries has been captured in previous research (11, 123, 124). Considering similar low-cost SMS or voice messages to be suitable for interventions in Bangladesh, a plan for deploying the first mobile phone based health promotion service for maternal, neonatal and infant healthcare was formulated in Bangladesh. The service branded as "Aponjon" (meaning the dear one in Bangla) was implemented by Dnet, endorsed by the Access to

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information (A2I) project of the Prime Minister's Office and deployed as the first project under the global Mobile Alliance for Maternal Action (MAMA) initiative (125, 126). The service was piloted for a year among 1400 subscribers (recruited through community health workers of partners NGOs) before deployment at the end of 2012 (125). The service received a seed grant from the United States Agency for International Development (USAID) while Beximco Pharma was the major in-country founder partner for this programme (127).

Through the power of mobile phone technology, the Aponjon service provides important tips and information about maternal, neonatal and infant health to Bangladeshi pregnant women and mothers of 0-11 month old babies (125). To reach out to women in remote rural households, the service adopted a 360 degree campaign strategy, such as door-to-door recruitment by community health workers, television commercials, newspaper advertisements, billboards, leaflets and arrangement with local NGO clinics and pharmacies. Although not very popular, the service also has provision for self-enrolment (127). Any Bangladeshi woman who has access to a personal or shared phone can enrol in the service by providing her last menstruation date (for pregnancy messages) or the date of delivery of her last born child (for new-born baby's service) and receive two messages per week (125). Optionally, on the same or a different mobile phone number, a subscriber woman can include her husband or other family member (such as mother, mother-in-law, father or father-in-law) and receive an additional message every week (125). Women are asked about their preference for voice and text messages during enrolment. Automated messages are sent to enrolled women on specific days and time of the day in a week according to her gestation age and preference during subscription (125). The voice messages (push) are all 1 minute long in Bangla; the messages are designed around a central character called the "Daktar Apa" (Doctor sister) who discusses weekly tips and danger signs with another imaginary expectant woman "Rokeya" who gradually moves on to motherhood. Aponjon conducted exhaustive research before designing the

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content and style of the voice messages. And as a consequence, sometimes additional characters such as “Rokeya’s husband” or “Rokeya’s mother-in-law” appears in the typical rural joint family setting where they are heard receiving important tips on how to take care of Rokeya and her new-born baby from the doctor. If a subscriber misses a voice message, the ‘missed message’ tries to reach her three times on the same day. The subscribers can also retrieve messages by calling the service short-code “16227” (125). Alternatively, the text messages contain 161 characters and were originally written in transliterated Bangla so that most subscribers with their basic mobile phone sets could access them (125). The message content is culturally-sensitive, designed according to national and international MNCH guidelines and vetted by a team of international and national doctors, health experts and content experts of Baby Center programme of Johnson and Johnson (125, 127). The messages typically cost 2.3 BDT per message. However, subscriber women from ultra-poor households receive a fee-waiver (125). Since mid-2013, Aponjon subscriber women can talk to a pool of medically trained doctors on the 24/7 helpline service by calling the service short code “16227” (127, 128). Subscribers are charged 2.3 BDT per minute for their consultation (128).

Table: Topics covered in Aponjon messages

Criteria	Type of content
Pregnant	• Importance of antenatal care (ANC) visits and coverage of at least four ANCs • Importance of Tetanus Toxoid (TT) vaccination • Knowledge on danger symptoms of pregnancy and delivery • Plan for place of delivery and preparedness for emergency e.g. safe delivery kit, knowing blood group etc. • Best practice for new-born care right after birth, e.g. feeding colostrum, bathing new-born etc. • Nutrition and vaccination of women • Receiving help for household chores from family members

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	• Importance of postnatal care (PNC) visits right after delivery • Hygiene practice in household chores • Knowledge of birthing process • Pregnancy wellness, discomfort and tips
Mother of 0-11 months old baby	• Cord care • Danger symptoms of new-born babies • Exclusive breastfeeding practice up to six months of baby • Introduction of complementary food beside breast milk after 6 months • Importance of postnatal care visits • Nutrition of lactating mother • Pregnancy weight loss exercises • Immunization schedule and reminder for infants • Step by step new-born care and development milestones • Hygiene of new-born baby and mother • Family planning

Migration from the pregnancy to new-born baby's service is not automatic. On having a successful birth, a pregnant woman or her family member informs the Aponjon service about the date of birth of the new-born baby to receive new messages according to baby's age. Alternatively, subscriber women nearing delivery are contacted by call centre agents and updated to 'new service' on confirmation of their delivery. The service auto deactivates on child's first birthday. The service also has provision for opting out by subscribers before completion of the service.

Table-2: Sample messages [Source: Aponjon website (126)]

Purpose of the message	Target audience	Content
Antenatal care visit	Pregnant woman	You are now in 17 th week of your pregnancy. I am your Doctor Apa speaking. It is very important that your health gets checked from the beginning of pregnancy.

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		You may not feel unwell, but still you need to have at least four antenatal care visits throughout your pregnancy. The antenatal check-ups will help you understand how you and your unborn child are doing. The doctor can also advise you how to keep well during this time. If you haven't received five doses of tetanus vaccination before, then you'll need to take one now. Next week, I will talk in details on doses and procedures for tetanus vaccination.
Arrangement of safe delivery	Pregnant woman	You are now in 29th week of your pregnancy. I am your Doctor Apa speaking. Have you decided the place of your delivery yet? It is safe to arrange a delivery at a hospital, clinic or health facility. Please look out for a safe delivery place close to your home in advance and also make sure you can reach there in time. If a facility-based delivery is not possible, then contact a trained birth attendant in advance for home-based delivery. Discuss your delivery plans with your family members and ask for their assistance. I will tell you about pregnancy danger symptoms next week. Aponjon will always remain beside you.
Initiation of breastfeeding right after birth	Pregnant woman	You are now in 32nd week of pregnancy. I am your Doctor Apa speaking. Did you know that mum's breast milk is the best feed for a new-born baby right after birth? The first breast milk is yellowish in colour and called 'colostrum' which has important elements that improve baby's resistance against diseases. Start breastfeeding your baby within an hour after birth; the baby will get all nutrition in mum's breast milk. Some people may tell you to feed the baby honey, oil, palm water, which is injurious to the baby's health. Feed the baby only breast milk for the first 6 months. I will tell you about new born baby's care next week. Aponjon is always beside you.
Delayed bathing	Pregnant woman	You are now in 33rd week of your pregnancy. I am your Doctor Apa speaking. Today I am going to tell you something very important for your baby, please share this information with your family members as well. A new-born baby can get cold very easily; their skin is very delicate. So do not bathe your baby for the first three days after delivery, because this can cause rapid loss of body temperature of the baby. Instead, use a soft clean cloth to wipe the baby and afterwards wrap your baby well. I will tell you about pregnancy wellness next week. Aponjon is always beside you.
Postnatal care visit	Pregnant woman	You are now in 37th week of your pregnancy. I am your Doctor Apa speaking. Your baby is getting ready for birth. You'll experience labour pain soon. Keep contact with your healthcare provider. Contact your doctor if you observe any danger signs. Another important information; you'll need to see your health care provider within 24 hours of childbirth for the first visit, then on the third day of delivery for the second visit, on the seventh day of delivery for the third visit and on 42nd week after delivery for the fourth visit. These visits are important for you and your baby. Are you experiencing water break? I will talk more on delivery symptoms next week.
Understanding danger signs in new-born baby	New-born baby's mum	Your baby is now 3 weeks old. I am your Doctor Apa speaking. If your breast is not aching, you are able to breastfeed comfortably and feel light at your breasts after each feed then it's a good sign. Also, if your baby feeds 6 to 8 times properly, and pees 6-8 times a day that means your baby is getting enough feed. And, look out for danger symptoms such as convulsion, yellow skin, problem with breathing, incessant vomiting, infection around umbilical stump, problem sucking milk, fever, cold, weak and frail. You'll need to contact the doctor immediately if you see any of these symptoms in your child.

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		Next week I will talk about how to place your baby in bed.
Information on breastfeeding for working mums	New-born baby's mum	(Text message) By this time working mums are getting ready to get back to work. You can store breast-milk in a cup before you go to work. The milk will be okay for the next 8 hours. Someone can feed the baby the preserved milk with a spoon in your absence. Ensure that you inform the caregiver the feeding timetable and procedure of feeding properly.

Starting from the end of the year 2012, the Aponjon service scaled up over two years in three phases. In each phase community healthcare providers and other social mobilizers from selected districts were trained and actively involved in recruiting potential subscribers. By mid of 2014 Aponjon service had a subscriber base of 1 million.

Other than Aponjon service there are three more mHealth services that were deployed under the global MAMA initiative with the aim to improve health outcomes around maternal, neonatal and infant health. MAMA South Africa had initially launched in 2011 through a mobisite, a website optimized for viewing on mobile phones and text messages (127). MAMA South Africa later scaled and had transformed into national MomConnect service in 2015 (127, 129, 130). In 2015 'mMitra' service piloted in three states of India while in 2016 'Hello Mama' service piloted in two states of Nigeria for a year and was only offered to eligible women through community health workers in designated health facilities (127, 131). Like Aponjon service, both mMitra and Hello Mama service offered text or voice messages to their subscribers and had provision to include husbands or other family members in the service while MAMA South Africa did not include husbands or family members in the service as most of the women in disadvantaged households did not live with the father of the children and women were the decision makers for their health and for their children's health (127).

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Among the four initiatives, only Aponjon service in Bangladesh and MomConnect service in South Africa have scaled. Except Aponjon, all three initiatives offered free service to their subscribers (127).

3. What has been shown to work for mHealth in MNCH?

Evidence of the efficacy of the mHealth intervention for maternal and new-born health indicators in low-income countries is mixed. Before 2014, there were fewer reports of mHealth interventions in low-income countries; earlier interventions lacked theoretical rigour and robust methodology, are mostly pilots and did not always capture measurable outcomes (3, 132-134). Chen et al. reported a significant increase in reports of mHealth studies from 2011 to 2016 (135). Lee et al. conducted a systematic review and meta-analysis of observational studies, case-control studies, randomized controlled trials and cohort studies of mHealth interventions for pregnant women and children under-5 years in low- and middle-income countries between 1990 and early 2014 and found only one study in Tanzania that reported an impact on maternal or neonatal morbidity or mortality (68, 71, 73, 132). Most MNCH mHealth interventions focused on improving birth preparedness, hospital attendance, counselling services of community health workers and vaccination coverage, helping in decision making and reducing delay to reaching health facilities (132, 136-138).

Evidence of effectiveness of mHealth interventions for improving maternal and new-born health outcomes are growing in low-income countries with low to moderate effect. For example, coverage of four or more antenatal check-ups was significantly improved among pregnant women receiving SMS and customized counselling (supported by mobile phone based Job-aids) by health workers in Tanzania and Kenya (68, 69). Lund et al. reported a significant increase in childbirths assisted by skilled birth attendants among urban residents in Tanzania who received text messages and mobile phone vouchers to contact healthcare providers; however the effect was not seen among rural

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residents (71). Also, there was a significant reduction in perinatal mortality in the intervention group (73). A meta-analysis of three studies from Nigeria (139), China (140), and Kenya (141) showed significant increase in the rates of initiation of breastfeeding right after birth and exclusive breastfeeding up to 3 to 4 months or 6 months among women in the intervention group over women in the non-intervention groups (132). Watkins et al. reported significant improvement in usage of mosquito bed nets and improved rates of pre- and postnatal check-ups and initiation of breastfeeding of new-born babies within an hour of birth in an intervention in Malawi (142). Text messages impacted on mother-to-child HIV transmission (MTCT) in Kenya; women in the intervention group had a 0% transmission rate at both 9 and 18 months whereas women in the non-intervention group had a 9% MTCT rate at 18 months (69). Pilot interventions in Indonesia and Bangladesh reported improvement of MNCH knowledge among community healthcare providers and improved communication with clients on emergency issues (66, 143). Oyeyemi and Wynn reported a significant increase in utilization of primary health care facilities (expressed as the ratio of the number of deliveries to the number of antenatal registrations) by women who were provided with a mobile phone to communicate with the health care providers in Nigeria (144). An intervention that included a mobile phone consultation between community healthcare providers and a local health centre in Uganda had improved facility-based delivery, antenatal care attendance, birth preparedness, cord and thermal care, and breastfeeding practices in the catchment areas (145, 146). A feasibility study of an SMS-based vaccination reminder and monitoring service in select locations in Bangladesh reported a statistically significant improvement in full vaccination coverage among infants over 298 days (118).

However, not all studies found a difference in expected health or behavioural outcomes in mHealth intervention groups. Unger et al. did not find a significant increase in facility-based delivery among intervention groups receiving one-way or two-way text messages from nurses than the control

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group but reported a significant increase in adoption of exclusive breastfeeding practices and contraception methods in intervention groups (72). Similarly, there was no significant improvement in ANC coverage or rate of institutional deliveries among pregnant women in Uttar Pradesh, India, where health workers were supported by audio-video counselling materials in their mobile phones, although self-reports of maternal complication and uptake of iron-folic acid supplementation had increased (75). The RapidSMS intervention in Rwanda did not observe any difference in usage of health facilities for deliveries, antenatal check-ups and immunization of infants due to an overall high coverage of behavioural outcome indicators (147). Amoakoh et al. observed a higher risk of institutional neonatal deaths in intervention clusters in the Easter region of Ghana that tested the efficacy of emergency decision support protocols for frontline healthcare workers (148).

Although evidence of efficacy of mHealth interventions is no longer in the nascent stage, most interventions that have been shown to work had mostly evaluated the efficacy of text messages and had involved follow up services from health workers. There is a dearth of literature on the effectiveness of unidirectional educational services, especially of voice messages. Most research studies from low-income countries are reported from Africa. Few studies have been reported from South Asia and they are mostly formative research or pilot studies although evidence is growing on the effectiveness of mobile phone based health promotion services on maternal and child health indicators in South Asian countries. It is noteworthy that MNCH indicators such as the under-5 child mortality rate and maternal mortality ratio are higher in Afghanistan, Bangladesh, India and Pakistan compared to Sri Lanka, Maldives and Nepal (84). Therefore, it is important to evaluate the scope of mHealth interventions in reducing maternal, neonatal and child mortality and morbidity in low-performing countries in South Asia.

4. Rationale for this research

I have considered the “Aponjon” service as a case study for my PhD, to understand the effectiveness of health promotional messages to improve women’s behaviour around maternal, neonatal and infant health care. The reasons for nominating the service are as following:

- 1) Bangladesh is known for adopting best practices and innovations in health services technology for maternal and under-5 child healthcare to drop down one of the worst maternal and under-5 child mortality situations in the world (86, 106). Therefore it is essential to understand the effects of mobile phone technology in improving maternal, neonatal and infant health indicators that require momentum in this country.
- 2) Although there had been private initiatives for telemedicine service in Bangladesh before 2010 (4), Aponjon is the first national mHealth service for improving maternal, neonatal and infant healthcare that was endorsed by the Prime Minister’s specialized wing for digital health technology known as “Access to Information (A2I)”. The service was deployed from a global perspective to improve access to healthcare by the power of mobile phone technology and was the first project of the global MAMA initiative before launching in other countries (South Africa, India and Nigeria) (127, 149, 150). The service includes extensive partnership with local NGOs to deploy community health workers to recruit subscribers from hard-to-reach areas and low-income households. Aponjon service implementers introduced the first voice messaging service in the history of Bangladesh and offered the service through all telecom companies. Of note is that service integration with all (six) telecom companies was painstaking work as mobile phone tariffs for the telecom companies were different from Aponjon and the service design required telecom companies, for the first time in the history of Bangladesh, to charge a flat rate for eligible subscribers and discounts for subscribers from ultra-poor households on push text or voice messaging service. Usually the sender is charged for calling or sending messages. The

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integration was possible because of the involvement of Bangladesh Telecommunication Regulatory Commission (BTRC) in deploying the service. The service aspires to be sustainable by cross-subsidy from subscription cost and corporate sponsorship which is quite different from most other mHealth interventions in the world which are mostly funded by donors or the Government. So it is essential to understand the experiences of subscribers who are part of a mHealth service that has a differential charging policy. It is noteworthy that most health interventions in Bangladesh operated under public or NGO initiatives are donor-funded and are provided to the target population free-of-charge (82). Taking these considerations into account, I have designed a study to address the following aims.

5. Aims, research questions and objectives

Aims

1. To evaluate the impact of a mobile based health educational service (Aponjon) on health care behaviour among expectant and new mothers enrolled in the service
2. To describe the place of an mHealth service (Aponjon) in the overall provision of maternal and new-born healthcare in Bangladesh
3. To suggest recommendations for the establishment and operation of mHealth services for expectant and new mothers in other resource-constrained countries.

Research Questions

1. What is the impact of the regular non-interactive mobile messaging service on health care behaviour of enrolled women?

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2. How useful and appropriate do participants in the service find the information provided through the interactive mobile based counselling and prescription service?
3. Are there any underlying factors that affect women's adoption of mHealth services or following advice for expected behavioural outcomes?
4. In an integrated health system that provides maternal and child healthcare, what are the areas that mHealth can best support?

Objectives

1. To investigate the impact of mobile phone messages on delivery and postpartum healthcare practices among users and non-users
2. To investigate perceived benefits and barriers to accessing Aponjon consultation service among users and doctors
3. To explore socio-economic factors or other experiences that may affect expected behavioural outcomes around pregnancy, delivery decisions and postpartum healthcare seeking behaviour and women's intention to adopt mHealth messages
4. To investigate the effect of women's differential access to messages on their satisfaction, habit of using the service and expected behavioural outcomes during pregnancy
5. To understand what is required to provide a holistic approach to respond to the needs of mothers and families who seek treatment through mHealth for maternal and new-born health

This set of research questions and objectives have enabled me to assess the Aponjon service holistically by including the perspectives of women subscribers and their families and care providers as well as measuring its uptake and effectiveness. Ultimately, I hope that this evaluation of the

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Aponjon service will be useful for mHealth implementers deploying voice messages in resource-limited settings and for scaling similar services.

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CHAPTER 2. Research methodology

In this chapter I am going to discuss the theoretical perspective of my research; how my research aims and questions are investigated through a conceptual framework and mixed methods research design. Although research methods for each research question are discussed in separate papers in following chapters, I have provided an overall description of the sample size, location, plans for data analysis and interpretation in this chapter.

1. Conceptual framework

It is important to construct a theoretical or conceptual framework during the planning stage of a research proposal. Liehr and Smith described a theoretical framework as a structure that provides “guidance for the researcher as study questions are fine-tuned, methods for measuring variables are selected and analyses are planned”(1, 2). Imenda opined that a theoretical framework “is the application of a theory, or a set of concepts drawn from one and the same theory, to offer an explanation of an event, or shed some light on a particular phenomenon or research problem” (2). Some consider that a conceptual framework is slightly different from a theoretical framework as it “provides a model for relationships between variables that may or may not imply a particular theoretical perspective, with the purpose of describing a phenomenon” (3-5). Miles and Hubermann suggested that a conceptual framework “explains either graphically or in narrative form, the main things to be studied -the key factors, concepts, or variables and the presumed relationships among them” (6). A conceptual framework is a synthesis of theoretical and empirical findings from literature reviews when a researcher assumes that current research questions cannot be answered within a scope of a particular theory (1, 2).

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My conceptual framework (Figure-1) is based on learning from three theories. The first theory I have considered is the 'Theory of planned behaviour' by Icek Ajzen which itself originated from the 'Theory of reasoned action' (7). The theory of planned behaviour (TPB) states that positive attitudes, subjective norms (a person's belief whether significant other believes s/he should engage in that behaviour) and perceived behavioural control (individual's perception of the extent to which perception of the behaviour is easy or difficult), together shape an individual's behavioural intentions and behaviours (8).

The second theory I have considered is Roger's diffusion of innovation theory. Diffusion of innovations theory was first developed by E. M. Rogers in 1962 which he had modified four times until the late 90's. Rogers coined different terms to explain how an innovation or a novel idea gains momentum over time and diffuses through a specific population or social system. Adoption of innovation (such as mHealth) in a social system is determined by five attributes of the innovation, namely, relative advantage, compatibility, complexity, trialability and observability. Relative advantage is defined as "the degree to which an innovation is perceived as better than the idea it supersedes"; this is where a social network, change agents and opinion leaders influence individuals with prospective advantage of innovation. Compatibility is regarded as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and to use; complexity has an inverse relationship with adoption of innovation. Trialability is the degree to which an innovation may be experimented with on a limited basis; this has a positive relationship with adoption. Observability is the degree to which the results of an innovation are visible to others; this is also positively related to rates of adoption (9). Rogers explained five stages of innovation-decision process when an innovation is first processed- a) knowledge; when the individual is exposed to the innovation and gains an understanding of it, b)

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persuasion; when the individual forms a favourable or unfavourable attitude toward the innovation, c) decision; when the individual adopts or rejects the innovation, d) implementation; when an individual adopts the innovation and put this into use and e) confirmation; when an individual seeks reinforcement for a decision already made but may reverse the decision if receives conflicting messages (9). Also Rogers explained adoption of innovation through an S-curve over time to approach normality with five categories of adopters in a society based on when they adopted innovation: innovators, early adopters, early majority, late majority and laggards. Innovators are cosmopolites, venturesome individuals who want to try out new ideas. Early adopters are respected by local people and thought of as role models; they are often the opinion leaders and they have this societal pressure to test an innovation first and let their peers know about their subjective decision. Early majority are not leaders in adopting innovation and are not the late majority, “they follow in deliberate willingness to adopt an innovation, but seldom lead”. Late majority do not adopt until most others in the society have adopted, they are sceptical about new innovations. The laggards are the last to adopt an innovation in the society; they are suspicious of innovations and have a rather traditional point-of-view (9).

The third theory that I have considered is “The Unified Theory of Acceptance and Use of Technology (UTAUT) model” proposed by Venkatesh et al. in 2003 to understand user acceptance of computers and other emerging information technology. The model itself was developed from eight other models –the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behaviour, a model combining the technology acceptance model and the theory of planned behaviour, the model of personal computer utilization, the innovation diffusion theory, and the social cognitive theory (10). The UTAUT model has four main constructs as direct determinants of user acceptance and behaviour, they are, performance expectancy, effort expectancy, social influence and facilitating conditions. Performance expectancy remains the

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dominant determinant and is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance”. Effort efficiency is the degree of ease associated with one’s use of the system. Social influence is regarded as an influential determinant for women’s adoption of new technology in this model and is defined as “the degree to which an individual perceives that important others believe that he or she should use the new system”. Facilitating conditions are defined by Venkatesh et al. to be the degree to which one believes that an organizational and technical infrastructure exists to support the use of the system. Like previous models, the UTAUT model does not include self-efficacy and anxiety as direct determinants of this model. Age and gender were two key moderators for all constructs and facilitating conditions directly influenced use behaviour (11). In 2012, Venkatesh et al. revised the previous model and included three more constructs (hedonic motivation, price value and habit) as determinants of behavioural intention and use behaviour. Venkatesh et al. defined hedonic motivation as ‘the fun or motivation derived from using a technology’. In this model facilitating conditions influenced behavioural intention unlike the previous model (12).

The three theories elaborate how and why a person would adopt a certain intervention and the factors that may affect their decision or behaviour; which I found relevant for conceptualizing my framework. While the first theory by Ajzen discussed the correlation of a new behaviour (in my thesis implementation of behaviour changes suggested by ‘Aponjon’ messages) with a person’s willingness to change, Rogers theory elaborated the complexities around perceiving an innovation (intervention) useful before agreeing to adopt it and UTAUT model confirmed factors (such as age, gender, social influence, support from the intervention, price and habit) that control the adoption rate.

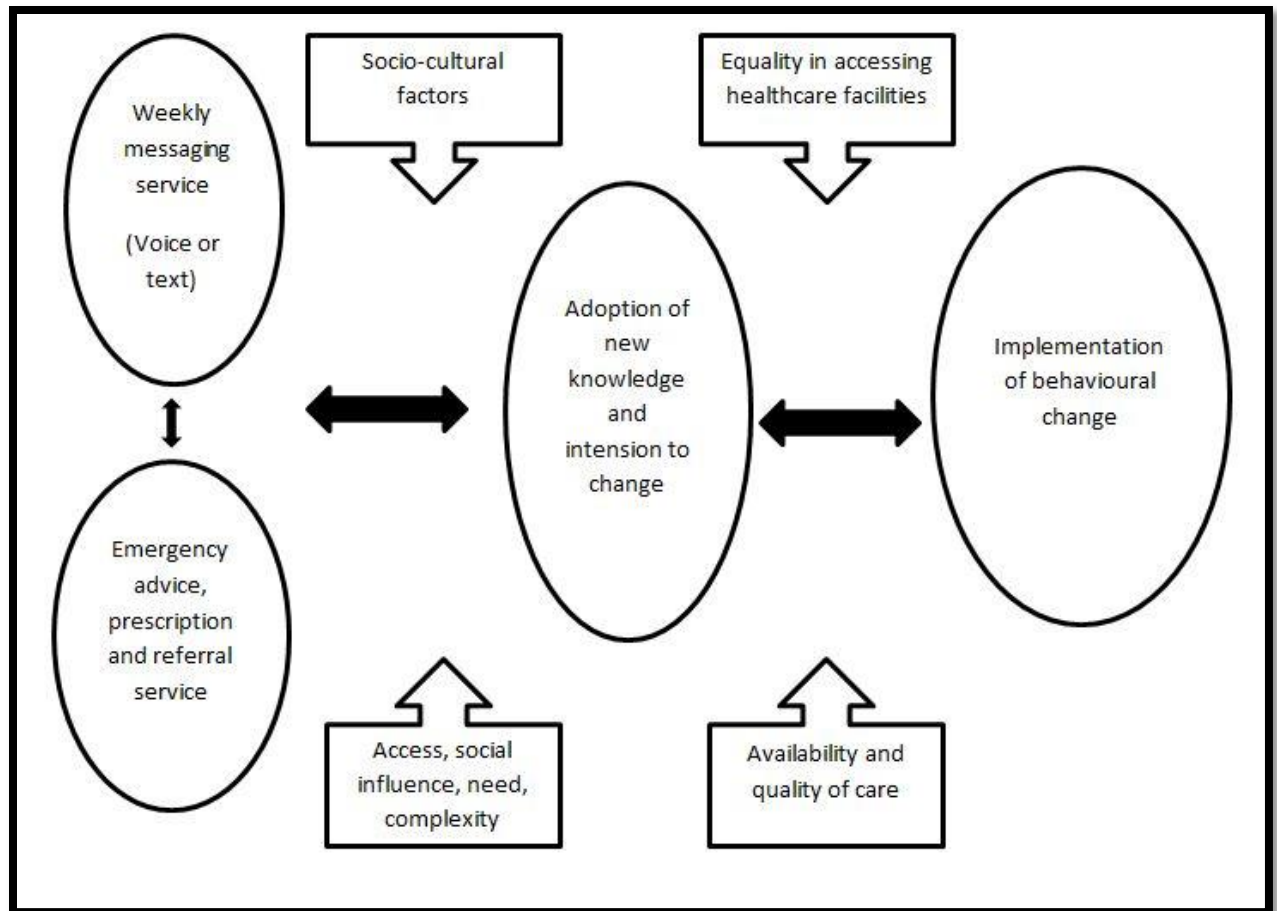


Figure-1. Conceptual framework for my thesis

The core elements of the framework (Figure-1) used in my thesis are subscriber women's access to weekly messages and 24*7 consultation services, the intention to adopt good practices among users and the implementation of expected behaviour. Behavioural change or implementation of health messages into behavioural change is measured against implementation of practices during delivery, new-born healthcare, pre- and postnatal care and healthcare seeking behaviour from medically trained behaviour. Behavioural intention to change is a combination of a positive attitude to accept new knowledge after being convinced of the relative advantage of a mHealth service over other existing health interventions. Women's access to the service is dependent on their socio-cultural background (such as income, parity, tradition, education, place of residence) (13, 14), social influence (such as husband or other adopters) (13-15), personal need (9) and complexity (such as

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literacy, phone ownership, technological efficiency, service complexity, network and coverage) (10) , which is likely to affect behavioural intention to adopt information and change. Because Aponjon messages aim to improve delivery related behavioural outcomes, women's access to quality healthcare facilities is crucial to implement their intention to change.

2. Research Design

I have adopted a mixed methods approach for my thesis which I have considered as a logical way to answer my research questions. According to Creswell, mixed methods research is “a research design (or methodology) in which the researcher collects, analyses, and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry” (16). Kelle argued that mixed methods research can enhance validity and provide a fuller picture and deeper understanding of the research undertaken (16). Chen suggested that a mixed methods approach allows the researcher to retain the structure of quantitative and qualitative methods and alternatively alter, adapt and synthesize their structures to fit the research and its cost. Bazeley and Hunter extended the scope of mixed methods research to include a combination of any styles or approaches/methods/data analyses, beyond the typical combination of quantitative and qualitative methods (16). Although mixed methods and multi-methods research both use more than one approach in the study, Bazeley identified a fundamental difference between these two where in multi-methods research different approaches are spliced together only at the end of the study whereas in mixed methods studies different approaches are integrated in the design, data collection and analysis phases throughout the research programme (16).

In health research, mixed methods are often used for multiple reasons; depending on the purpose of the research the researchers may merge quantitative and qualitative data to enhance and enrich the meaning of a single perspective (17). Quantitative research, particularly randomized controlled

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trials, remains the dominant approach in health research because of its strength in controlling for confounding and its ability to produce generalizable results through a large and representative sample size (18, 19). Quantitative and qualitative research have different research paradigms, as the former has a post positivist stance using a deductive approach in which an a-priori hypothesis is generally tested, while the latter interprets multiple realities through a social constructivist lens, relying on inductive approach, allowing hypotheses or propositions to be generated from data (18). The job of mixing methods is often challenging because of the two different philosophical positions held by quantitative and qualitative researchers (17). Greene described the diverse philosophical positions to be “dialectical stances that bridge post positivist and social constructivist worldviews, pragmatic perspectives, and transformative perspectives” (17, 20). While quantitative research provides substantial evidence on measurable health outcomes, this cannot answer some questions regarding complex social or cultural phenomena that have considerable impact on the research undertaken; qualitative research in this context helps identify potential barriers that affect particular health interventions or the behaviour of patients and healthcare providers (18, 19). “Qualitative data (such as in-depth interviews, case studies, ethnography, phenomenology) may help researchers understand processes, especially those that emerge over time, provide detailed information about setting or context, and emphasize the voices of participants through quotes” (17).

Mixed methods designs may differ in several ways, such as analytic logic, timing (whether data is collected concurrently or in a sequence), priority (whether research methods are equally emphasized or one is given priority over other), point of interface (whether data is mixed during the period of data collection, data analysis and/or data interpretation) and choice between a single or multiphase programme of inquiry (17). Creswell et al. suggested four types of mixed methods designs: a) convergent designs where data is concurrently mixed, b) sequential designs that can be either explanatory or exploratory depending on which dataset builds on the other; if a qualitative

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analysis is followed by a quantitative study it is an explanatory sequential design while the opposite sequence is observed in an exploratory sequential design, c) embedded or nested designs when one method is embedded in another at the same time and d) multiphase designs where multiple projects conducted over time are linked together to understand a common problem (17). For my research I used explanatory sequential design twice. In the first design (explanatory sequential design-1) quantitative data was analysed to understand the effectiveness of health messages for users, and then from the same sampling frame participants were selected for in-depth interviews to understand their perceptions related to the adoption of the service, and their socio-economic experience that contributes to their health behaviours. In this research, more emphasis was provided on quantitative survey as this remained the main source of data collection.

In the second set of explanatory sequential design (referred as explanatory sequential design-2), evaluation of patients and doctors perception on the consultation service was conducted by first analysing data from customer service management database and then interviewing select callers and doctors from the same pool. For evaluation of the consultation service equal emphasis was placed on quantitative data gathered from the call centre and in-depth interviews. Both types of data provided a full picture of effectiveness and adoption of the consultation service.

Usability of using mixed methods and inferences from the findings are reported in the discussion (Chapter-7).

2.1 Explanatory sequential design-1:

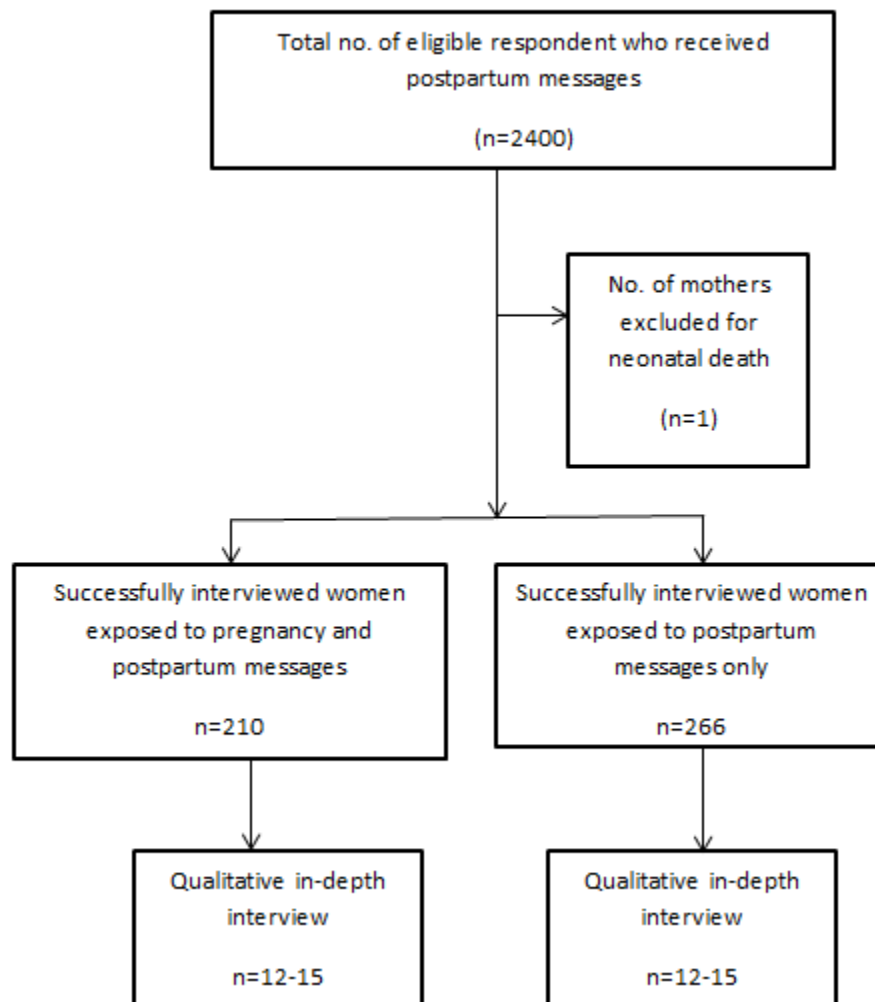


Figure-2. Flow diagram for explanatory sequential mixed methods study-1

Research questions 1 and 3 were investigated through an explanatory sequential mixed methods design-1 (Figure-2). In phase-1, data collected during a survey was investigated to understand the effect of Aponjon messages (non-interactive) on knowledge, satisfaction and behavioural outcomes of subscriber women. Analysis of the survey data guided identification of participants for follow-up qualitative interviews in phase-2, to gain an in-depth understanding on women's experiences with

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Aponjon service and healthcare practices in general. The following sections contain information on sampling, data collection, analysis and interpretation for both these phases.

2.1.1 Phase 1. Quantitative research

2.1.1.1 Sampling:

Maternal and new-born healthcare outcomes were evaluated among women who were enrolled in the Aponjon service for a significant amount of time during pregnancy or after childbirth. For the quantitative portion, I have analysed secondary data collected by Aponjon service implementing agency (Dnet) during their regular operations research. Dnet conducted a retrospective cross-sectional survey among Aponjon subscribers in selected sub-districts of five districts (Bogura, Bagerhat, Patuakhali, Chittagong and Laxmipur) in Bangladesh, which were purposively selected to reflect the remoteness, cultural diversity, geographical dispersion, diversity in local partners' engagement, and maximum acquisition of subscribers. Although randomized controlled trial is considered the gold standard for evaluating health interventions (21), Dnet did not use a proper trial group because of operational challenges and funding constraints. Hence, an inexpensive retrospective cross-sectional survey method was considered suitable for Dnet's operations research. A cross-sectional study is a type of observational study where the outcomes and exposures in the study are measured at the same time and it differs from other observational studies (such as case-control study or cohort study) where participants are selected based on their inclusion and exclusion criteria in the study (22). The survey was conducted between the month of February and April, in 2014.

The select sites represent the phase by phase escalation of the Aponjon service; phase 2 which had begun in mid of 2013 had more subscribers (due to active operational activities) than phase 1 that had initiated at the end of 2012. To match the total number of subscribers from these two phases,

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three locations (Bagerhat, Patuakhali and Laxmipur) were included from phase 1 and two (Bogura and Chittagong) from phase 2.

Aponjon subscribers from select locations were considered for the survey if they fell under any of the following categories depending on when and how long they were exposed to the service:

- a) Mother of 3-18 months old baby, enrolled during pregnancy and exposed to the service for at least 3 months,
- b) Mother of 3-18 months old baby, enrolled after childbirth, exposed to the service for at least 3 months

Exclusion criteria included: women whose last born child did not survive (such as stillbirth, perinatal or neonatal deaths).

A total of 2400 subscribers met the inclusion criteria from the purposively selected locations. The sampling strategy for Dnet's survey contains the following steps:

Step1. Sub-districts in five districts were purposively selected for sampling. The sub-districts were selected where local NGOs agreed to assist with data collection by identifying households of subscribers with the help of the community health workers (who recruited the subscribers).

Step2. The sampling frame consisted of two groups: a) women who were mothers of 3-18 months old babies and received pregnancy and postpartum messages (exposed) and b) women who were mothers of 3-18 months old babies and received only postpartum messages (not-exposed),

Step3. Because of the difference in Aponjon subscribers' in five districts (two with larger subscriber base than other three) proportionally more respondents were recruited from districts that contained more subscribers.

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Step4. Mothers were recruited in each sub-district based on their recruitment time to the service (before or after childbirth) as mentioned in step 2. Dnet a-priori estimated sample size which is discussed in paper-1 (chapter-3).

2.1.1.2 Survey questionnaire:

Survey questionnaires included common questions related to socio-demographic information and how subscriber women accessed messages. The survey questionnaires were pre-tested prior to the main survey on a limited number of respondents. Pretesting of the questionnaire was performed to understand any ambiguity of words, misinterpretation of questions and any problem with the questionnaire or the process of administering the questionnaire.

2.1.1.3 Data collection of surveys:

A team of 24 experienced field researchers conducted data collection in select locations for the study while a field supervisor monitored their work. Having in mind the cultural barriers to interviewing female respondents from rural families who maintained the purdah system (23), the field research team contained an equal number of males and females. Purdah, typically meaning a curtain, is a restriction imposed on women from both Muslim and Hindu families in Bangladesh, Pakistan and North India in South Asia region where women are secluded and veiled and are not permitted to visit male members outside the house (23). Having female interviewers allows access to households to interview women in private and to establish trust during rapport building. Respondent women were randomly selected from the sampling frame in target locations and were contacted by phone (if possible) before a house visit was planned by field researchers; local community health workers of partner NGOs assisted the field enumerators to locate the households in remote areas. If a potential respondent could not be met after two attempts, that interview was cancelled.

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The purpose of the research was read to each potential respondent and explained, e.g. such as why they were selected for the survey, what type of questions they were to be asked, what will happen to the data, how confidentiality of the data will be maintained, any risk or benefit associated with participating in the research. All respondents were given the right to not to answer any question and the option to stop or leave the interview at any time they wanted. Respondents were also given the name and address of the principal researcher if they had further queries or changed their minds about participating in the research. An interview was only conducted if the potential respondent agreed to participate. Respondents' identifications were masked by code numbers and only the principal investigator had access to the data. Field data were checked for internal validity before entering into the final database. Missing values were checked by running descriptive statistics.

2.1.1.4 Selection of variables:

Research question-1 "What is the impact of the regular non-interactive mobile messaging service on health care behaviour of enrolled women?" and objective -1 "To investigate the impact of mobile phone messages on delivery and postpartum healthcare practices among users and non-users" were investigated through one set of variables. The effect of birth preparedness messages in the last trimester during pregnancy were measured against outcome variables –assistance during delivery (categorical), initiation of breastfeeding right after birth (dichotomous), timing of bathing of newborn baby (categorical) and frequency of recommended postnatal care visits (count); which are deemed necessary to reduce maternal, perinatal and neonatal mortality (24, 25). Women's exposure to prenatal messages remained the exposure or predictor variable for this research question and objective. Covariates (such as age, education, parity etc.) for this research were selected because of their importance in the study or because of their demonstrated association with

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maternal and new-born health related outcomes in mHealth interventions in previous research (25, 26). The variables are described in detail in paper-3 (Chapter-3).

2.1.1.5 Data analysis strategy:

Data screening is essential before data analysis and if neglected could lead to poor quality of output choosing the wrong type of analysis (27). For certain analyses it is important to identify multicollinearity and outliers (28). Multicollinearity occurs when two or more variables are extremely correlated and inflate the size of error terms (27). Outliers are “any observations that are numerically distant compared to the rest of the data set” (27, 29) and must be excluded from analysis to avoid poor model fit (28). Also identifying missing values, linearity, singularity, homoscedasticity is also important in data screening (27), which will be done through conducting univariate and multivariate test statistics for all variables. I have performed collinearity diagnostics tests to identify multicollinearity. Variables that were affecting other variables performance were excluded from the final model.

Because the purpose of my research is to understand the effect of Aponjon service as well as socio-economic factors on subscriber women’s healthcare behaviour and practices, multivariable analysis was used to understand the effect of independent variables on outcome variables (30). Multivariable and multivariate analysis though used interchangeably are statistically distinct in nature; “multivariate analysis refers to statistical models that have two or more dependent or outcome variables, and multivariable analysis refers to statistical models in which there are multiple independent variables” (31). Using multivariable models one can assess the relationship between a number of variables while adjusting for potential confounders. Multivariate models are often derived from longitudinal studies where repeated measures are taken to assess outcome of an

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individual over a period of time, or from nested/clustered data to assess outcomes of multiple individuals in each cluster (31).

Binary logistic regression analysis is considered for dichotomous outcome variables (30) while multinomial logistic regression analysis for evaluating categorical outcome variables and generalized linear regression analysis for count data. For research question-1, because of the type of outcome variable I used binary logistic regression, multinomial logistic regression and generalized regression analysis as appropriate. For count data one may decide on the type of generalized regression analysis to be conducted. Poisson is a generalized linear model for count data where a random outcome/ dependent variable is said to have a Poisson distribution with assumption that logarithm of its expected values can be modelled by a linear combination of unknown parameters . A characteristic of Poisson distribution is that its mean is equal to its variance meaning any factor that affects one will affect another; which the Poisson model captures very well for count data (32). In contrast, “Negative binomial regression is a generalization of Poisson regression which loosens the restrictive assumption that the variance is equal to the mean made by the Poisson model” (33). The dependent variable in the negative binomial model follows a negative binomial distribution (33). A Poisson model may not be appropriate when observed variance is greater than the mean, a condition known as over-dispersion typically indicated when the Pearson χ^2 is greater than 1.0 (34). Another common problem when the Poisson model may not work is excess zeros (this could be a case in my data with postnatal check-ups where many women may have never received any visits) (32). A negative binomial model is a preferred choice over a Poisson model in case of over-dispersion and zero inflation. Fitness of the Poisson and negative binomial model is measured with Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). Therefore, I have considered these factors when choosing the right model for count data (Chapter-3). Poisson or Negative parameter estimates were interpreted as Incidence rate ratios (33).

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2.1.2 Phase 2. Qualitative research

2.1.2.1 Sampling

The sample selection for the qualitative portion was reliant on the analysis of survey data (quantitative portion). Participants for the qualitative in-depth interviews were selected from the sample list of mothers whose last born babies were between 3-18 months of age during the survey (survey-1) [Figure-2]. Participants were purposively sampled to reflect on the different backgrounds of subscribers and their access to the service and other healthcare services. Purposive sampling or non-probability sampling is used in qualitative research which refers to intentional selection of participants to understand the central phenomenon (6).

2.1.2.2 Interview guidelines and data collection

Interviews are a more personalized form of data collection method than survey questionnaires (35). In a qualitative interview the researcher has the flexibility to capture personal observation and comments. Open-ended interview guidelines were used for follow up interviews with selected survey respondents and pilot-tested (see Annex-2). Participants were asked about their socio-demographic background, then about Aponjon messages and their pregnancy and birthing experiences.

Although face-to-face interviews are preferred, telephone interviews can also be used if respondents can be reached over the phone. From the pool of survey respondents in phase -1, I interviewed respondents over phone for the qualitative research in phase-2 because political unrest at the time of research made it dangerous for me to travel alone into rural areas. In addition, telephone interviews had two advantages: 1) they show how many phones are operational and how well the subscribers can handle telephone communication (effort efficiency) (12) and 2) the

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interviews can be recorded on the phone. Prior to the interview the participants were read out the information sheet in Bangla and asked for their consent to participate in the survey. The verbal consent was recorded. I conducted all interviews in dialects wherever necessary. I used probes and asked for elaborations wherever necessary. The whole interview was recorded with permission from the participant. I also interviewed women who shared a phone with family members. After concluding each interview I thanked the participant and reminded them of their rights to withdraw from the research and gave them the contact details to reach me. After finishing each interview I summarised the interviews and other observations from the interviews.

2.1.2.3 Data analysis

Each recorded interview was saved under a code name. Verbatim transcriptions were made first in Bangla and later translated to English. The interviews were coded, organized and analysed for themes with the help of Atlas Ti software (36).

Data analysis steps included: 1) repeated reading of the interviews looking for similarities, emotions, biases and of general notes that was written down during interviews, 2) systematic organisation of raw data into codes, categories and subcategories by exploring words and concepts both inductively and deductively to develop relevant themes, 3) looking for patterns and interconnections between themes, between individual and global themes and between words and non-verbal cues, 4) mapping themes and juxtaposing themes with relevant literature, 5) building and verifying theories (if any) and 6) relating findings with the research questions (37).

2.2 Explanatory Sequential Design-2

The second explanatory sequential design investigates research question-2 and was conducted by analysing call centre data of 24*7 hotline services for a specified time period and interviewing callers and doctors who used the service during that time.

While the call centre data provided an understanding on the call volumes, call length or seriousness of calls graded by the doctors, the interviews provided a holistic picture of the usability of the consultation service. The call centre data retrieved as excel files were analysed by statistical software SPSS 24.0 (Chapter-4).

2.2.1 Interviews

Doctors working at the Aponjon consultation service were eligible for participation in the study. The interview time and place were organized through Dnet and the call centre management authority. I interviewed the doctors in person at the call centre before or after their scheduled hours. I also provided the doctors with the information sheet prior to the interview. They were not obligated to participate in the research meaning their participation in the research had no negative consequences in their workplace. Upon receiving verbal and written consent from the doctors I recorded the interviews. I maintained anonymity of the doctor's identity in publications. The interview questions broadly covered doctor's background information, professional experience, experience with calls from Aponjon subscribers, benefits and limitations of the service and position of telehealth service in the context of maternal and child healthcare in resource limited settings like Bangladesh.

The callers were selected from the call log data exclusively used for this research; callers who had made calls during a specified time period were selected using systematic sampling strategy from two

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sampling frames (one for women and another for husbands). Systematic sampling is a statistical method where the start is randomly selected in an ordered sampling frame and then proceeds with the selection of every k th element from that point onwards (35). Systematic sampling ensures that each element has the same probability of happening and is calculated as $k = N/n$, where k is the ratio of sampling frame size N and the desired sample size n , and is formally called the “sampling ratio” (35). In other words, systematic sampling is random sampling with a system. Randomization in sampling technique ensures external validity or generalizability of the results to a wider population (35).

I dialled the phone numbers of the callers and interviewed until data saturation occurred. The concept of data saturation in qualitative research does not follow any particular guideline and varies from one researcher to another (38). According to Fusch et al. there is no “one- size-fits-all” to reach data saturation (38). Unlike quantitative research, sample size has little to do with data saturation in qualitative research (38, 39). One may attain a lot of data (thick) that is rich i.e. many layered, intricate, detailed and nuanced only from six interviews (38, 39). Usually data saturation means a point in research where there is no chance of getting any new data, themes or coding and that the researcher is able to replicate the study (39). Morse and Field argue that ‘appropriateness’ and ‘adequacy’ are the two main determinants for sampling in qualitative research while Marshall suggests that a researcher should be pragmatic and flexible enough to collect adequate sample size that sufficiently answers the research question (40-42).

The interviews of the doctors and callers were analysed with the help of Atlas Ti software.

2.2.2 Triangulation

Triangulation is another way of ensuring data saturation in mixed methods research. According to Denzin “triangulation involves the employment of multiple external methods to collect data as well

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as the analysis of the data” (38, 43). Triangulation allows researchers to explore the same phenomenon from different levels and perspectives and ensures validity and richness of data (38). ‘Saturation’ or ‘good analysis’ depends on the expertise of the researcher to extract the information and interpret it (38). Denzin elaborated Ellingson’s post-modern attitude to triangulation known as “multigenre crystallization” (44, 45). Ellingson dismisses the narrow conception of triangulation and asserts the crystal with multiple lenses to be the central image of the qualitative inquiry, not the triangle (44, 45). Denzin rephrased crystallization as “multiple forms of analysis and genres of representation into a coherent text” (45).

In my exploration of research question 2, I used multiple forms of analysis on data collected from different sources to provide me a deeper understanding of the usefulness of the consultation service. A diagram on data triangulation can be found in paper-2 (Chapter-4).

2.3 Effect of differential access on women’s service adoption

Aponjon service was offered to women once they had confirmed that they could access messages on their personal phone or on a phone that they shared with their husbands or family members. Formative research suggested that women tended to share their personal phone with family members meaning there would be occasions when someone else other than the target women would access the messages (46). Women in lower income households are more likely to share their phones with their family members (46, 47). Therefore, it was essential to explore the association between women’s unequal access to messages and their pregnancy related behaviour. Objective-4 specifically explores the fundamental construct of the conceptual framework of my thesis that is the association of women’s access to messages with intention to change. I analysed Aponjon’s survey data from 2014 on 459 pregnant women from the same geographical locations (Bogura, Bagerhat,

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Chittagong, Laxmipur and Patuakhali) at the same time as survey-1. Pregnant women were eligible to participate in the survey if they met the following criteria:

- 1) If they were still in their pregnancy or just gave birth and did not terminate the last pregnancy (willingly or unwillingly)
- 2) If they received pregnancy messages from Aponjon for at least 2 months and
- 3) If they were 18 years and above during the time of survey. It is noteworthy that adolescent women (less than 18 years old) were excluded to avoid hassles with arranging consent of guardians or husbands. And also because it was assumed that older women would have more independence in accessing the phone sets by themselves than adolescent women.

A sampling frame with the details of 2200 potential respondents was prepared who matched the above criteria. Aponjon a-priori estimated that on the basis of how women accessed messages during the pilot (an anticipated ratio of 1:2) approximately 400 respondents were required to detect a difference in proportions with outcomes of interest of 15%, with 80% power and a 5% significance level. (Figure-3) The full sampling strategy is discussed in Chapter-6.

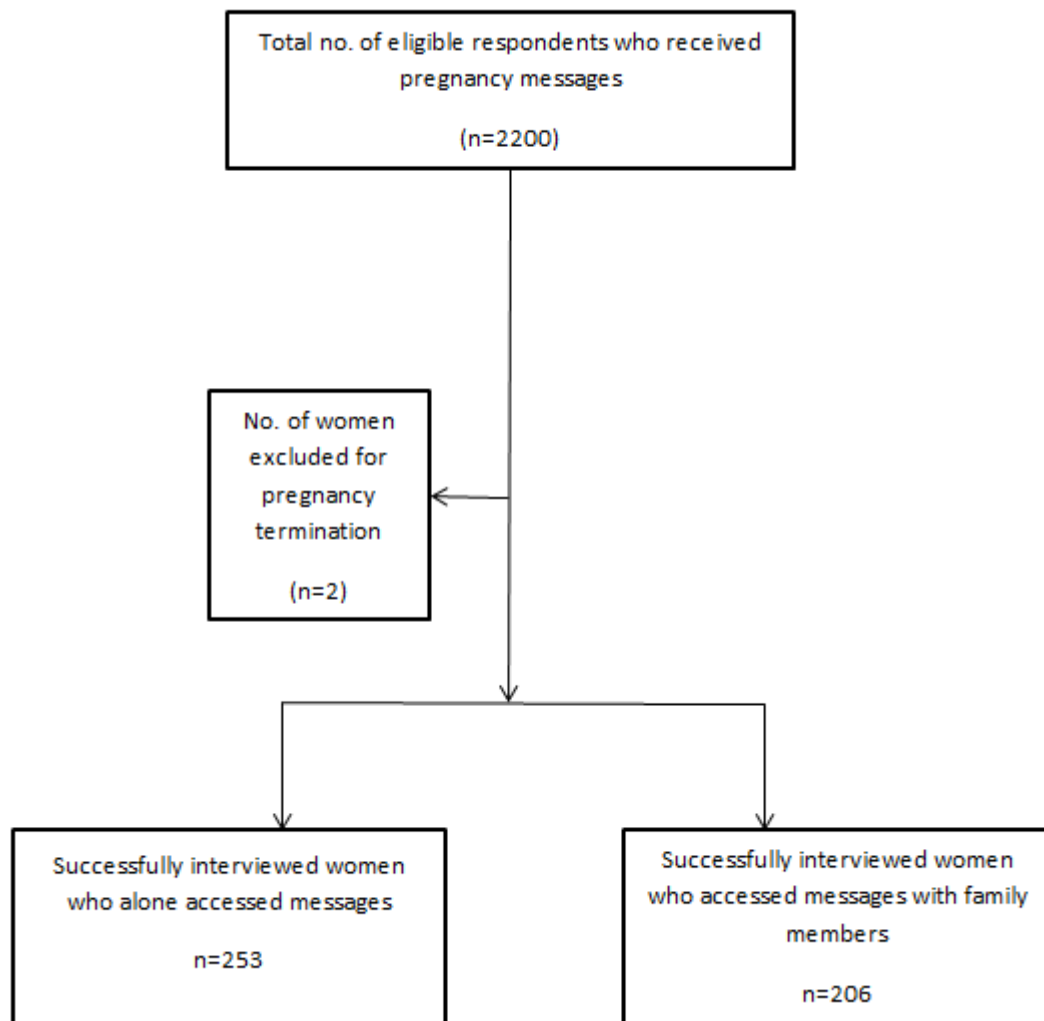


Figure-3. Flow diagram for pregnant women recruitment for Aponjon's survey

2.3.1 Selecting variables

In this study, women's differential access to messages (independent or shared) is an independent or predictor variable (26) while the effect of women's unequal access to messages is evaluated by three sets of outcome variables. The first set of outcome variables are service related dependent variables such as service satisfaction (dichotomous) and recall of the service short code (dichotomous). The outcome variable 'Service satisfaction' is related to performance expectancy of subscribers where satisfaction will be higher when subscribers observe the benefit of accessing the

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service (9, 12). Respondent's ability to recall the service short code is a way of measuring their knowledge on the facilitating condition of the service (12). I assumed that women who accessed the service (messages) every time by themselves were more aware of how to contact the call centre by dialling the short code than women who do not.

A second set of outcome variables measures women's behavioural intention to adopt birth preparedness messages such as knowledge on danger signs (dichotomous), arrangement of blood donor for delivery and complications (dichotomous) and delivery plan with the presence of a skilled birth attendant or at a health facility (dichotomous). Aponjon places a lot of emphasis on birth preparedness messages. These variables are included in this study because of their importance in WHO guidelines to improving birth preparedness activities among pregnant women (48).

The third set of outcome variables are self-reported behavioural changes such as uptake of nutritious food five times a day during pregnancy (dichotomous), maintaining hygiene by washing hands with soap especially after defecation and before preparing meal (dichotomous) and drinking potable water (dichotomous). These behaviours have implications for unborn child's growth and the well-being of the mother and have been a part of nutritional education campaigns around the world (49-51).

A detailed description of other covariates and how the variables are generated from the survey questions is discussed in paper-4 (Chapter-6).

2.3.2 Data preparation and analysis

Before data analysis I have conducted frequency tests to see the completeness of the data. I recoded some variables, for example, satisfaction on the service was expressed using a likert scale of 1-5 which was recoded to dichotomous variables. I used SPSS 24.0 for data analysis. Because I

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wanted to explore other factors that may be affecting outcomes of interest, I conducted multivariable logistic regression for each outcome variable. Data analysis is explained in detail in paper-4 (Chapter-6).

3. Limitations

The limitations of the study are explained in each paper (Chapters 3-6). First, I used secondary survey data of Aponjon that may have limited my ability to ensure internal validity and evaluate the effectiveness of the messages on different health outcomes not captured during surveys (35). Internal validity examines whether the observed change (effect) in a dependent variable is caused by the independent variable (cause) considered in the experiment and not by variables extraneous to the research context (35). Internal validity may be hampered during research specially a field survey when cause and effects are measured at the same time which defeats temporal precedence and makes it equally likely that the expected effect is influenced by the expected cause rather than the reverse (35). The survey design lacked a proper control group and a large sample size with adequate power to detect small changes (52). The sample size and power of a study are two major determinants of the risk of reporting of false-negative findings (52). A study with more power (preferably 90%) means there is less risk for Type II errors (false-negatives) while larger sample size is required for increasing power (52).

Second, the phone interviews were challenging at times when respondents could not hear properly. Sometimes the microphone of the respondent did not work efficiently and hence I had to repeat a lot of questions. Because of the poor quality of phone network and sound system, some recordings were of poor quality.

Third, recall bias is a problem with interviews in paper-3. Interviewing survey respondents after almost two years was challenging as they did not have fresh memories of the service and often

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required a lot of probes to recall their service experience. Recounts on the postpartum healthcare practices (such as when was the baby first given a bath or the number of postnatal care visits) also differed from paper-1 in some instances which infers problems with self-reported data.

4. Ethical considerations

4.1 Approval of ethics committee

The research (secondary and primary) was approved by the Science and Medical Delegated Ethics Review Committee (DERC) of the Australian National University (protocols 2015/425 and 2015/618) on 30 July, 2015 and 9 December, 2015 respectively.

Dnet (the implementing agency of Aponjon) provided permission to use their survey and call centre data and provided permission to contact their subscribers for my research. Dnet received Institutional Review Board (IRB) exemption for their surveys (operational research).

4.2 Informed consent

All interviews were conducted after ensuring that the interviewees understood the purpose of the research and why they were selected for the study. Verbal and written consents were collected for all face-to-face interviews. Verbal consents were recorded for interviews that were conducted over phone. The interviews were conducted by expert field researchers. Participants were given their rights to not to answer any question or withdraw from the research.

4.3 Confidentiality

The dataset used for this research is stored on a password-protected computer. The identity of each participant was replaced with individual code.

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Chapter 3. Evaluation of the effect of non-interactive messaging service on healthcare behaviour of enrolled women

Chapter 3 contains paper 1 which was published by *BMC Health Services Research*. The paper presents an evaluation of Aponjon's non-interactive messages during pregnancy on women's delivery decisions and immediate postpartum healthcare practices. Four outcome variables from Aponjon's survey data were evaluated; delivery by skilled birth attendant or at a health facility, initiation of breastfeeding right after birth, delay of bathing of new born baby and frequency of postpartum care visits within 42 days of childbirth among women who received pregnancy messages and who did not. Socio-economic factors contributing to women's delivery and postpartum healthcare practices were also evaluated. The paper contributes to better understanding of the effectiveness of pregnancy messages on following WHO guidelines around essential postpartum maternal and neonatal healthcare practices.

RESEARCH ARTICLE

Open Access



The impact of mobile phone based messages on maternal and child healthcare behaviour: a retrospective cross-sectional survey in Bangladesh

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Abstract

Background: Mobile phones are gradually becoming an integral part of healthcare services worldwide. We assessed the association between Aponjon mobile phone based messaging services and practices regarding childbirth and care of mother and neonates in selected areas in Bangladesh.

Methods: In early 2014, 476 subscriber mothers whose last born child's age was between 3 and 18 months, were recruited to the study by Dnet from selected areas of Bangladesh. One group of mothers received the early warning messages from Aponjon during pregnancy (exposed; $n = 210$) while the other group of new mothers did not receive the messages during pregnancy as they had enrolled in the service after childbirth (non-exposed; $n = 266$). We undertook regression analyses to investigate the relationship between timing of exposure to Aponjon messages and socio-economic factors and outcomes of safe delivery, immediate breastfeeding post birth, delayed bathing of the neonate, and number of postnatal care (PNC) visits.

Results: Women reported delivering babies at home without a skilled birth attendant (SBA) ($n = 58$, 12%), at home with SBA ($n = 111$, 23%) and at health facilities ($n = 307$, 65%). Most ($n = 443$, 93%) women breastfed babies immediately post birth. Babies were bathed after 72 h ($n = 294$, 62%), between 48 and 72 ($n = 100$, 21%) and between 0 and 47 ($n = 80$, 17%) hours after birth. PNC frequencies were reported as none ($n = 273$, 57%), 1 ($n = 79$, 17%), 2 ($n = 54$, 11%), 3 ($n = 34$, 7%) and 4 ($n = 36$, 8%). There was no significant association between exposure to Aponjon messages during pregnancy and presence of a SBA at birth, breastfeeding practices, and postnatal care visits, although delayed bathing up to 48 h was significant at the 10% but not 5% level (RRR 1.7; 95% CI 0.93–3.0; $p = 0.083$). Women with higher education, from higher income, older in age, with birth order 1 or 2 were more likely to birth at health facilities. Facility based delivery was an independent factor for delayed bathing and having postnatal care visits.

Conclusions: Low cost mobile phone messages may have the potential to positively influence maternal and child healthcare behaviours, such as delayed timing of first bath, in resource-poor settings. Further studies are needed, with adequate sample size to detect significant change.

Keywords: mhealth, Delayed bathing, Postnatal care visits, Breastfeeding, Bangladesh

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Background

Neonatal mortality remains unacceptably high in resource limited countries such as Bangladesh where the rate currently stands at 28 per 1000; 61% of under-5 child mortality [1]. Bangladesh aims to reduce neonatal mortality to 21 per 1000 live births by 2016 although it is still unclear how this might be most effectively achieved [2].

One avenue for reducing neonatal mortality is to improve compliance with the World Health Organization's (WHO) recommendations concerning delivery and neonatal care. Currently, in Bangladesh, less than half (42%) of deliveries are assisted by a medically trained personnel and slightly more than a third of mothers (39%) and new-born babies (36%) receive timely postnatal care (PNC) from a trained provider [1, 3, 4]. In contravention of WHO guidelines, 32% of babies in Bangladesh are bathed within the first 6 h of life putting them at risk of hypothermia and 49% of new-born babies do not receive breast milk in their first hour of life increasing their risk of infection [1, 5–8].

Mobile phones have recently been adopted to disseminate health information and interventions (mHealth) in low and middle income countries [9]. In Bangladesh there has been a rapid proliferation of mobile phone usage throughout the country since 1998. By 2012, there were more than 90 million mobile phone subscribers, creating an opportunity for personalized access to health information for all [10]. The health infrastructure of the country has undergone major reforms and the Ministry of Health and Family Welfare (MOHFW) now provides a platform for public-private mHealth initiatives in Bangladesh [11].

One such initiative is the Aponjon service which provides weekly voice or text messages primarily to pregnant women and mothers with new born babies to improve maternal and child healthcare outcomes [12]. The service was officially launched in 2012 after a year-long pilot study and is available through all telecommunication operators in the country to a subscriber base of more than a million people. The United States Agency for International Development (USAID) provided a seed grant and the project was implemented by Dnet, a social enterprise. Aponjon receives in-kind grants from corporate companies and collaborates with local Non-Government Organizations (NGOs) to promote the service across the country [13].

Generally, there is a lack of evidence on the effectiveness of scalable mHealth services [14]. There are few peer-reviewed studies on implementation and evaluation of mHealth programmes in low and middle-income countries around the world [15]. Although randomized trials elsewhere show that mobile phone based reminders increase maternal attendance at hospitals, skilled birth attendance in delivery, exclusive breastfeeding, immunization, adherence with family planning

methods and other best practices, ambiguous descriptions of interventions and their mechanisms of impact present difficulties for interpretation and replication [16–21]. Most studies of mHealth in low and middle income countries lack rigorous methodologies and are unable to draw robust conclusions about impacts on patient health outcomes [21]. Aponjon is the first national scalable mHealth service in Bangladesh, however, currently little is known about how mHealth services like this will be integrated into the existing health system [22].

The aim of this cross-sectional study of Aponjon subscribers collected in 2014 by Dnet is to evaluate the effectiveness of a mobile phone based intervention in Bangladesh designed to improve compliance with WHO guidelines related to delivery and neonatal care: assistance of a skilled birth attendant during delivery, breastfeeding within an hour after birth, timing of the baby's first bath and the number of routine postnatal care visits within the first 42 days. This study also explores other factors that impact on maternal and new-born care practices.

Methods

Aponjon service

The Aponjon service offers information on pregnancy, delivery, essential new born care and nutrition for pregnant women and new mothers via mobile phone voice or text messages. A woman can enrol in the service any time during her pregnancy and continue to receive the phone messages until the baby turns 1 year of age. She can also enrol in the service after her baby is born and receive messages appropriate for her baby's stage of growth until the baby turns 1 year of age. Interested families can dial up a numerical short code which was widely disseminated through the media to enrol in the service. Health workers of partner NGOs also recruited women during monthly door-to-door routine antenatal care visits. The service is provided in Bangla, in either recorded voice messages or in text format, subject to individual choice. Voice messages are 1 min long while text messages are limited to 161 characters and only appropriate for people who can read transliterated Bangla. A woman can also include her husband or other nominated family member in the service. Throughout the service period, a woman receives 2 messages a week, while her nominated family member will receive 1 message a week. Each message cost only BDT 2.3 (0.02 USD) to keep the service within reach of general population.

Survey

Data were obtained from a survey conducted by Dnet as a part of routine operations research to monitor the Aponjon service milestones. The survey was conducted between February–April 2014 in five (Bagerhat, Bogra,

Chittagong, Laxmipur and Patuakhali) of the 64 districts in Bangladesh. The survey districts were purposively selected to reflect the remoteness, diversity, geographical dispersion and maximum acquisition of subscribers. From within these districts, Dnet recruited participants from their database of subscribers which contained women's cell phone numbers, location and service history. As a result 2433 new mothers who had been exposed to the service for at least for 3 months during pregnancy or after childbirth, who had a live birth in the last delivery and whose last born child's age was between 3 and 18 months were eligible. Due to the availability of health workers to undertake the survey, a maximum of 966 women could potentially be contacted. Women were systematically sampled district by district, and phoned to seek verbal consent and to arrange a date and time to be interviewed, until the required number had been recruited. Face-to-face interviews were conducted in participants' homes by two researchers, including one woman, to build rapport with respondents. Information on the survey, including protection of confidentiality, was read aloud to potential respondents and written consent was taken before each interview. The interviews were conducted in Bangla using a semi-structured questionnaire and lasted about an hour. Respondents were excluded from the survey if they could not be contacted by phone for an appointment, were not at home when the interviewers visited to conduct the interview, or they did not want to participate. In most of the cases women who were not at home or were visiting relatives outside the survey areas for an indefinite time were not followed up for interviews.

The survey asked about subscribers' access to messages, the comprehension and generalizability of messages, the influence of the service on subscribers' knowledge of maternal and child health and user satisfaction with the service (Additional file 1). This study received approval to analyse the survey data collected by Dnet in 2014 from Dnet and from the Humanities & Social Sciences Delegated Ethics Review Committee (DERC) of Australian National University.

Measures

One group of new mothers was enrolled and exposed to the messages during pregnancy, and the other group was enrolled in the service after delivery and were not exposed to the messages during pregnancy. These two groups were defined as "exposed" and "not-exposed" respectively, based on the timing of their inclusion in the service as indicated in the service database. The ratio of exposed to unexposed women varied across districts.

Aponjon provides repeat early warning messages to pregnant women based on current WHO guidelines which: encourage women to plan their delivery with a skilled birth attendant (SBA) at home or at a health facility, initiate colostrum feeding within an hour of birth, delay bathing of the new-born baby up to 3 days, and ensure 4 postnatal care visits of the mother and new-born within 42 days of delivery. We propose that subscribers who received the early warning messages during pregnancy would be more likely to undertake these health practices compared to women who did not receive messages until after the birth of the baby (Fig. 1).

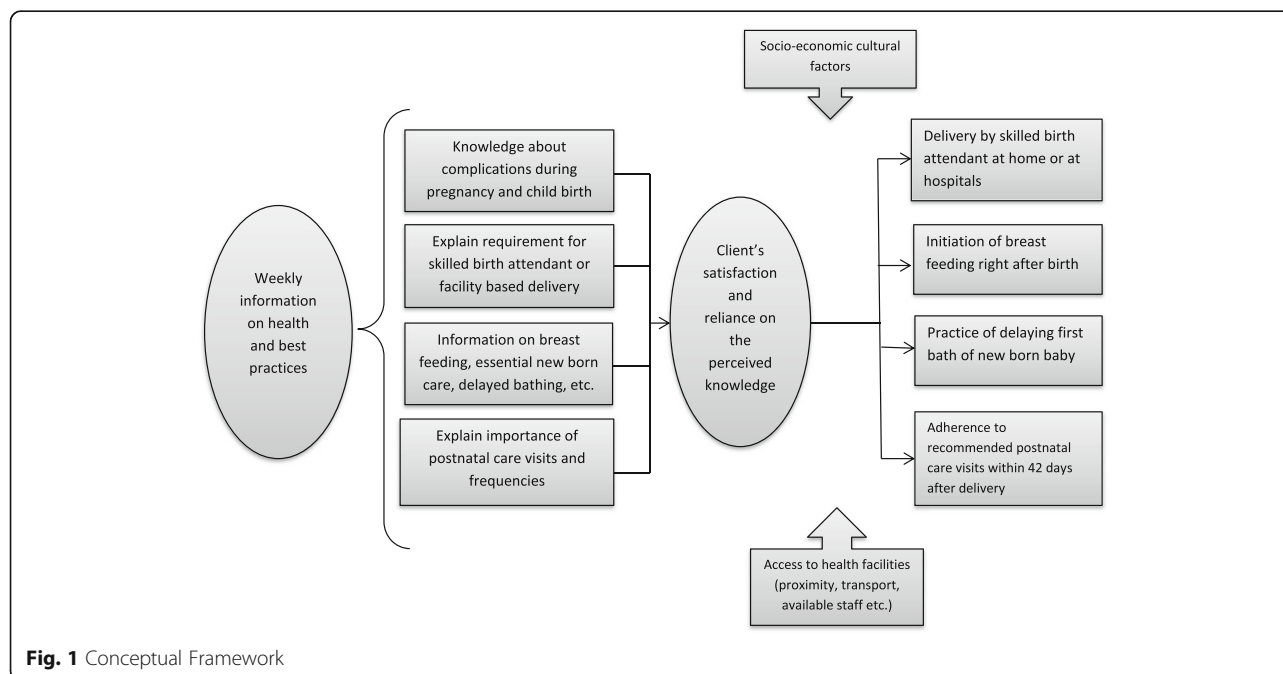


Fig. 1 Conceptual Framework

The outcomes of interest were based on the overall aims of the Aponjon program and the messages delivered to Aponjon subscribers. The first outcome “assistance during delivery” derived from two survey questions. Women were asked “Where was your baby born?” and “Who assisted the delivery (in case of home delivery)?”. These responses were then grouped into: “unskilled birth attendant at home”; “skilled birth attendant at home” and “trained personnel at health facility”.

The second outcome “breast feeding immediately post birth” was generated as a binary variable from the question “What did you feed your baby right after birth?”. The response option “fed breast milk” was coded as “Yes” and “fed honey, sweetened water or mustard oil” was coded as “No”.

From the question “When did you first bathe your baby after birth?” emerged the third outcome variable “timing of first bath”. Aponjon, following the national guidelines, recommends that the first bath is given at least 72 h after delivery. Because the risk of hypothermia is higher with earlier timing of first bath, the outcome variable has been categorized into three groups: 0–47 h, 48–72 h and 72 + hours. The fourth outcome variable “frequency of postnatal care visits” (by a medically trained provider) within 42 days of delivery is a count variable, with responses 0, 1, 2, 3, 4.

Other potential covariates were based on factors demonstrated to be associated with maternal and neonatal outcomes in previous research, or hypothesised to be important in this study [23]. They were: age (<25 years and 25 years or more), women’s education (no or primary education, junior secondary education and secondary education), family income (less than 10,000 BDT and BDT 10,000 or more), birth order (1, 2 and 3 or more), district and place of residence (urban or rural). We considered facility based delivery (at health facilities or at home), a part of the first outcome, as a covariate for other outcomes.

Statistical methods

The sample characteristics are described using numbers and percentages. Bivariate analysis was performed to compare characteristics between exposure groups and to examine associations between explanatory and outcome variables using Chi-squared tests.

We undertook multiple regression analyses to investigate the relationship between “exposure to early warning messages” and the outcomes of interest, adjusted for women’s age, education, family income, place of residence, birth order and district (to account for the sampling strategy) using a model appropriate for the distribution of each outcome: multinomial regression analysis for “assistance during delivery” and “timing of first bath”, logistic regression analysis for “breast feeding

immediately post birth”, and negative binomial regression for “frequency of postnatal care visits”. “Facility based delivery” was included in all of the above models except in the model for “assistance during delivery”. The results are expressed as Relative Risk Ratios (RRR) for multinomial, Odds Ratio (OR) for binary logistic and Incidence Rate Ratios (IRR) for negative binomial regression models, with 95% confidence intervals.

Dnet estimated a sample size of approximately 400 was required, with an anticipated ratio of exposed to unexposed of 1:2, to detect a difference in proportions with outcomes of interest between exposed and unexposed of 15%, with 80% power and a 5% significance level. Assuming a consent rate of 60%, it was expected that 660 Dnet subscribers would need to be contacted for the study.

Results

Of 660 Dnet subscribers contacted, 476 (72%) respondents were interviewed (exposed =210, non-exposed =266). The socio-demographic characteristics of the 476 survey participants are shown in Table 1. The respondents were mostly recipients of voice ($n = 470$, 99%) messages rather than text ($n = 6$, 1%) messages. There is no significant difference in age and socio-economic background of the two groups except there is significant difference in districts and age of last born children. In district D there are more respondents in the exposed group and in district E more respondents are in the non-exposed group. Significantly more children were less than 6 months age (51%) in the exposed group while exposed group had more babies belonging to the age group 6–12 months (44%).

Approximately two-thirds of participants were assisted during delivery by “trained personnel at a health facility” ($n = 307$, 65%) while 111 (23%) women reported the presence of a skilled birth attendant and the rest ($n = 58$, 12%) were assisted by untrained relatives or local traditional birth attendants at a home delivery (Table 2). Exposure to messages during pregnancy was not statistically significantly associated with the presence of an unskilled birth attendant at a home delivery (RRR: 1.6; 95% CI 0.84–2.9; $p = 0.156$) or with a skilled birth attendant at home (RRR: 1.2; 95% CI 0.71–1.9; $p = 0.514$) relative to a health facility delivery. Women’s education and family income were statistically significantly associated with the assistance of an unskilled birth attendant during delivery. Women who had no education or primary education only (RRR: 12.5; 95% CI 3.5–45.0; $p < 0.001$) or those with junior secondary education (RRR: 6.4; 95% CI 1.8–22.9; $p = 0.005$) were more likely than women who completed secondary education to deliver at home by an unskilled birth attendant rather than at a health facility. Similarly, women with a lower family income (RRR: 2.6, 95% CI 1.3–5.1; $p = 0.005$)

Table 1 Socio-demographic characteristics of respondents

Characteristic	Exposed (n = 210)	Non-exposed (n = 266)	Chi-squared test
Age of respondent women			
< 25 years	129 (61%)	148 (56%)	$\chi^2 = 1.617$; df = 1; $p = 0.204$
≥ 25 years	81 (39%)	118 (44%)	
Family monthly income			
< 10,000 BDT	107 (51%)	116 (44%)	$\chi^2 = 2.541$; df = 1; $p = 0.111$
≥ 10,000 BDT	103 (49%)	150 (56%)	
Women's education			
None or primary education	86 (41%)	100 (37%)	$\chi^2 = 0.576$; df = 2; $p = 0.757$
Junior secondary school	65 (31%)	87 (33%)	
Secondary school or higher	59 (28%)	79 (30%)	
Access to sanitary latrine			
Yes	194 (92%)	244 (92%)	$\chi^2 = 0.068$; df = 1; $p = 0.795$
No	16 (8%)	16 (8%)	
Access to potable drinking water			
Yes	209 (99%)	263 (99%)	$\chi^2 = 0.598$; df = 1; $p = 0.439$
No	1 (1%)	3 (1%)	
Residence			
Urban	134 (64%)	127 (48%)	$\chi^2 = 12.229$; df = 1; $p < 0.001$
Rural	76 (36%)	139 (52%)	
^a Districts			
District A	33 (16%)	28 (11%)	$\chi^2 = 36.524$; df = 4; $p < 0.001$
District B	44 (21%)	72 (27%)	
District C	62 (29%)	53 (20%)	
District D	40 (19%)	22 (8%)	
District E	31 (15%)	91 (34%)	
Number of living children			
1	91 (43%)	112 (42%)	$\chi^2 = 1.452$; df = 2; $p = 0.484$
2	73 (35%)	105 (40%)	
≥ 3	46 (22%)	49 (18%)	
Age of last born child (living)			
< 6 months	107 (51%)	52 (20%)	$\chi^2 = 66.775$; df = 2; $p < 0.001$
6–12 months	84 (40%)	125 (47%)	
13–18 months	19 (9%)	89 (33%)	
Type of messages received			
Voice	207 (99%)	263 (99%)	$\chi^2 = 0.085$; df = 1; $p = 0.770$
Text	3 (1%)	3 (1%)	
Woman's access to phone			
Shares phone	92 (44%)	119 (45%)	$\chi^2 = 0.001$; df = 1; $p = 0.969$
Never shares phone	118 (56%)	147 (55%)	

^aDistricts name have been labelled to maintain anonymity

were more likely to give birth at home with an unskilled birth attendant than at health facilities. Women with none or primary education (RRR: 4.6; 95% CI 2.2–9.5; $p < 0.001$) and who were younger (RRR: 2.7; 95% CI 1.4–5.3; $p = 0.003$) were more likely to give birth at home with a SBA than at health facilities. Women whose child had a birth order of 1 (RRR: 0.22; 95% CI 0.06–0.52; $p = 0.001$) or 2 (RRR: 0.29; 95% CI 0.14–0.59; $p = 0.001$) were less likely to deliver at home with a SBA relative to having a facility delivery while women residing in rural areas (RRR: 2.1; 95% CI 1.2–3.8; $p = 0.14$) were more likely to have deliveries at home attended by a SBA than at a health facility.

Women from district A were more likely to deliver at home with an unskilled birth attendant (RRR: 12.1; 95% CI 3.7–40.1; $p < 0.001$) or by a SBA (RRR: 11.3; 95% CI 4.6–27.6; $p < 0.001$) than at health facilities (Table 2). Similarly respondents from district C were more likely to have births at home with (RRR: 2.5; 95% CI 1.2–5.2; $p = 0.014$) or without a SBA (RRR: 4.5; 95% CI: 1.6–12.3; $p = 0.003$) while women from district B (RRR: 0.38; 95% CI 0.16–0.91; $p = 0.03$) were less likely to deliver at home with a SBA than at health facilities.

Most women ($n = 443$, 93%) fed their baby colostrum (Table 3) immediately after birth; the remaining 7% ($n = 33$) fed sweetened water, honey or mustard oil. Women's exposure to mobile messages had no significant association with "breast feeding immediately post birth". Respondents from districts A & D (OR: 9.6; 95% CI 2.4–37.6; $p = 0.004$), C (OR: 5.6; 95% CI 1.7–18.3; $p = 0.001$) and E (OR: 3.6; 95% CI 1.4–9.4; $p = 0.007$) had higher odds of initiating breastfeeding right after birth relative to district B. Women's age, education, income, birth order, place of residence and facility based delivery were not significantly associated with colostrum feeding (Table 3).

Overall, 62% ($n = 294$) of women bathed the baby 72 h or more after delivery, while 17% ($n = 80$) bathed babies in the first 48 h and 21% ($n = 100$) between 48 and 72 h. Women's exposure to messages during pregnancy was not associated with bathing within the first 48 h, relative to delaying for at least 72 h, at the 5% level, but was significant at the 10% level (RRR 1.7; 95% CI 0.93–3.0; $p = 0.083$) in the adjusted regression model (Table 4). Younger (<25 years) women (RRR: 2.8; 95% CI 1.4–5.9; $p = 0.005$), were more likely to bathe their baby within the first 2 days relative to after 72 h. Women who did not deliver at a health facility were more likely to bathe their babies within 0–47 h (RRR: 4.8; 95% CI 2.6–9.1; $p < 0.001$) or within 48–72 h (RRR: 2.4; 95% CI 1.3–4.2; $p = 0.003$) than after 72 h. Women having their first (RRR: 0.3; 95% CI 0.1–0.8; $p = 0.025$) or second child (RRR: 0.3; 95% CI 0.1–0.8; $p = 0.010$) were less likely to bathe their babies within the first 2 days, relative to after

Table 2 Factors associated with presence of a skilled birth attendant during delivery

Variables	Presence of skilled birth attendant at delivery					
	At home by unskilled birth attendant N = 58		At home by skilled birth attendant N = 111		At health facilities ^a N = 307	
	n (%)	RRR (95%CI)	n (%)	RRR (95%CI)	n (%)	RRR
Exposure to intervention						
No	35/266 (13%)	1.6 (0.84–2.9)	57/266 (21%)	1.2 (0.71–1.9)	174/266 (66%)	1.0
Yes ^a	23/210 (11%)	1.0	54/210 (26%)	1.0	133/210 (63%)	1.0
Age						
< 25	32/277 (11%)	1.4 (0.64–3.0)	66/277 (24%)	2.7 (1.4–5.3) **	179/277 (65%)	1.0
25 or more ^a	26/199 (13%)	1.0	45/199 (23%)	1.0	128/199 (64%)	1.0
Education						
No or primary education	35/186 (19%)	12.5 (3.5–45.0)* *	61/186 (33%)	4.6 (2.2–9.5)* *	90/186 (48%)	1.0
Junior secondary	20/152 (13%)	6.4 (1.8–22.9)* *	31/152 (20%)	1.9 (0.94–3.9)	101/152 (67%)	1.0
Secondary ^a	3/138 (2%)	1.0	19/138 (14%)	1.0	116/138 (84%)	1.0
Income						
< 10,000BDT	40/223 (18%)	2.6 (1.3–5.1) *	61/223 (27%)	1.3 (0.77–2.2)	122/223 (55%)	1.0
10,000 BDT or above ^a	18/253 (7%)	1.0	50/253 (20%)	1.0	185/253 (73%)	1.0
Birth order						
1	22/203 (11%)	0.71 (0.25–2.0)	41/203 (20%)	0.22 (0.06–0.52) *	140/203 (69%)	1.0
2	23/708 (13%)	0.81 (0.33–1.9)	36/178 (20%)	0.29 (0.14–0.59) *	119/178 (67%)	1.0
3 or more ^a	13/95 (14%)	1.0	34/95 (36%)	1.0	48/95 (50%)	1.0
Residence						
Rural	25/215 (11%)	1.4 (0.72–2.9)	53/215 (25%)	2.1 (1.2–3.8) *	137/215 (64%)	1.0
Urban ^a	33/261 (13%)	1.0	58/261 (22%)	1.0	170/261 (65%)	1.0
Districts						
District A	11/62 (18%)	12.1 (3.7–40.1) **	28/61 (46%)	11.3 (4.6–27.6) **	22/61 (36%)	1.0
District B	15/116 (13%)	2.2 (0.83–5.9)	11/116 (77%)	0.38 (0.16–0.91) *	90/116 (10%)	1.0
District C	17/115 (15%)	4.5 (1.6–12.3) **	32/115 (28%)	2.5 (1.2–5.2) *	66/115 (57%)	1.0
District D	7/62 (11%)	2.3 (0.65–8.2)	16/62 (26%)	2.2 (0.86–5.6)	39/62 (63%)	1.0
District E ^a	8/122 (7%)	1.0	24/122 (20%)	1.0	90/122 (74%)	1.0

^adelivery at health facilities, exposure to intervention, age 25 years or more, secondary education, income above 10,000 BDT, birth order 3 or more, urban residence and district E are reference category and RRR is expressed as 1.0. Significance is expressed as * when $p < 0.05$ and ** at $p < 0.005$

3 days, than women having at least their third child. Women from district B were more likely to bathe their babies within the first 48 h (RRR: 2.9; 95% CI 1.4–6.1; $p = 0.004$) or within 48–72 h (RRR: 3.4; 95% CI 1.6–7.1; $p = 0.001$), while those from district D were less likely to bathe their babies within the first 2 days (RRR: 0.20; 95% CI 0.05–0.74; $p = 0.016$) and those from district A were more likely to bathe within 48–72 h (RRR: 3.2; 95% CI 1.3–7.6; $p = 0.008$), relative to after 72 h, than women from district E.

More than half the women ($n = 273$, 57%) did not have postnatal care (PNC) visits within 42 days after childbirth. The rest reported having 1 ($n = 79$, 17%), 2 ($n = 54$, 11%), 3 ($n = 34$, 7%) or 4 visits ($n = 36$, 8%). Negative binomial analysis showed that women's exposure to mobile phone messages during pregnancy had no

association with the number of PNC visits at the 5% significance level (IRR: 1.2; 95%CI 0.94–1.6; $p = 0.117$), as shown in Table 5. Women who had a facility based delivery had a 52% higher rate of PNCs than women who birthed at home (IRR: 1.52; 95% CI: 1.1–2.1; $p < 0.001$). Urban women had 63% higher rate of PNC visits than rural women (IRR: 1.63; 95% CI 1.2–2.2; $p = 0.002$). Districts B (RRR: 0.57; 95% CI 0.36–0.91; $p = 0.018$), C (RRR: 0.41; 95% CI 0.26–0.64; $p < 0.001$), D (RRR: 0.12; 95%CI 0.06–0.23; $p < 0.001$) and E (RRR: 0.30; 95% CI 0.18–0.50; $p < 0.001$) had lower rates of PNC visits than District A.

Discussion

We have analysed the impact of mobile phone messages (voice or text) among women who were recruited in the

Table 3 Breast milk feeding practice right after birth and associated factors

Variables	Fed breast milk after birth (N = 476)		
	Yes n (%)	No n (%)	OR (95% CI)
Exposure to intervention			
No ^a	245 (92%)	21 (8%)	1.0
Yes	198 (94%)	12 (6%)	1.1 (0.51–2.5)
Age			
< 25 ^a	253 (91%)	24 (9%)	1.0
25 or more	190 (96%)	9 (4%)	1.5 (0.54–3.6)
Education			
No or primary education	173 (93%)	13 (7%)	0.93 (0.32–2.6)
Junior secondary	140 (92%)	12 (8%)	0.76 (0.27–2.1)
Secondary ^a	130 (94%)	8 (6%)	1.0
Income			
< 10,000BDT ^a	204 (92%)	19 (8%)	1.0
10,000 BDT or above	239 (96%)	14 (5%)	1.9 (0.86–4.4)
Birth Order			
1	186/203 (92%)	17/203 (8%)	0.32 (0.07–1.4)
2	165/178 (93%)	13/178 (7%)	0.38 (0.09–1.5)
3 or more ^a	92/95 (97%)	3/95 (3%)	1.0
Residence			
Rural ^a	196/215 (91%)	19/215 (9%)	1.0
Urban	247/261 (95%)	14/261 (5%)	1.3 (0.56–2.9)
District			
District A + D	120/123 (98%)	3/123 (2%)	9.6 (2.4–37.6) **
District B ^a	98/116 (85%)	18/116 (15%)	1.0
District C	111/115 (96%)	4/115 (4%)	5.6 (1.7–18.3) **
District E	114/122 (93%)	8/122 (7%)	3.6 (1.4–9.4) *
Facility based delivery			
No ^a	157/169 (93%)	12/169 (7%)	1.0
Yes	286/307 (93%)	21/307 (7%)	1.4 (0.63–3.5)

^ano-exposure to intervention, age 25 years or less, secondary education, income below 10,000 BDT, birth order 3 or more, rural residence and district B and delivery not at health facility are reference category and OR is expressed as 1.0. Significance is expressed as * when $p < 0.05$ and ** at $p < 0.005$. As all women in one district breastfed within 1 h of birth, this district had been combined with another for this analysis (A + D)

Aponjon service during their pregnancy or the postnatal period. Our study has two strengths: one, it identifies the relationship between timing of receipt of mobile phone messages and several outcomes and two, we consider the impact of other covariates on health behaviour of women, an important consideration when designing a mobile phone based health information service. While in the model adjusted for all covariates (age, education, income, place of residence, birth order, facility delivery) and district, the timing of receipt of mobile phone messages was not associated with timing of first bath at the 5% level, a p value of 0.083 indicates that there may be some evidence of an association for bathing within 48 h versus after 3 days, particularly given that the study was only powered to detect moderate to large associations. Delaying the “timing of first bath” is an important contribution to neonatal care as early bathing is a long-standing cultural practice often found in ultra-poor households in which relatives bathe the baby within a few hours after birth even on a cold night to respond to perceptions of birth-related pollution [24–26]. This practice contributes to neonatal mortality by leading to a drop in the baby’s body temperature [24, 27, 28]. The “warm chain” guideline suggests that birthing should occur in a warm delivery room, that the baby is immediately dried and wrapped, has skin-to-skin contact with mother, is breastfed immediately after birth and that bathing is delayed until the second or third day when the baby is healthy and has a normal temperature [5]. In our study, bathing 72 h or more after birth was most common among older women (age > 25 years), women with one or two children and women who had a facility based delivery. Timing of the first bath varied substantially among the study districts, with two districts in particular more likely to bathe their babies within 2 days, a finding consistent with national survey data [1]. This could be due to cultural belief and practice in that region which is beyond the scope of this analysis. This variation is worth exploring in further studies, as it may provide useful information on factors that influence the effectiveness of such messages.

The timing of exposure to mobile phone messages had no significant association with the rest of the outcome variables. Women from a privileged background (higher education and higher income), those who lived in urban areas and those who had their first or second child were more likely to deliver at a health facility; a finding consistent with previous studies [1, 29–32]. It is likely that poorer women and their families choose untrained traditional birth attendants for deliveries to minimise expenses [32–34]. Previous studies have shown that the older a woman is at marriage the more likely she is to use a facility for delivery which correlates with our finding that

Table 4 Factors associated with timing of first bath of new-born baby

Variables	0–47 h (N = 80)		48–72 h (N = 100)		72+ hours ^a (N = 294)	
	n (%)	RRR (95% CI)	n (%)	RRR (95% CI)	n (%)	RRR
Exposure to intervention						
No	53/265 (20%)	1.7 (0.93–3.0)	55/265 (21%)	1.2 (0.72–1.9)	156/265 (59%)	1.0
Yes ^a	27/209 (13%)	1.0	45/209 (21%)	1.0	137/209 (63%)	1.0
Age						
< 25	52/277 (19%)	2.8 (1.4–5.9) *	63/277 (23%)	1.6 (0.8–3.0)	161/277 (58%)	1.0
25 or more ^a	28/197 (14%)	1.0	37/197 (19%)	1.0	132/197 (67%)	1.0
Education						
No or primary education	38/185 (20%)	1.3 (0.59–3.1)	42/185 (23%)	1.1 (0.58–2.2)	105/185 (57%)	1.0
Junior secondary	29/152 (19%)	1.6 (0.75–3.6)	28/152 (18%)	0.93 (0.49–1.6)	95/152 (63%)	1.0
Secondary ^a	13/137 (10%)	1.0	30/137 (22%)	1.0	93/137 (68%)	1.0
Income						
< 10,000BDT	43/223 (19%)	1.3 (0.70–2.3)	45/223 (20%)	0.93 (0.54–1.6)	135/223 (61%)	1.0
10,000 BDT or above ^a	37/251 (15%)	1.0	55/251 (22%)	1.0	158/251 (63%)	1.0
Birth Order						
1	31/203 (15%)	0.34 (0.13–0.87) *	49/203 (24%)	0.83 (0.35–1.9)	123/203 (61%)	1.0
2	25/176 (14%)	0.34 (0.14–0.77) *	31/176 (18%)	0.63 (0.30–1.3)	120/176 (68%)	1.0
3 or more ^a	24/95 (25%)	1.0	20/95 (21%)	1.0	51/95 (54%)	1.0
Residence						
Rural	43/214 (20%)	0.80 (0.43–1.5)	41/214 (19%)	0.79 (0.46–1.4)	130/214 (61%)	1.0
Urban ^a	37/260 (14%)	1.0	59/260 (23%)	1.0	164/260 (63%)	1.0
Districts						
District A	11/61 (18%)	0.75 (0.25–2.2)	28/61 (46%)	3.2 (1.3–7.6) *	22/61 (36%)	1.0
District B	15/116 (13%)	2.9 (1.4–6.1) *	11/116 (9%)	3.4 (1.6–7.1) **	90/116 (78%)	1.0
District C	17/115 (15%)	0.50 (0.21–1.2)	32/115 (28%)	1.0 (0.45–2.3)	66/115 (57%)	1.0
District D	7/62 (11%)	0.20 (0.05–0.74) *	16/62 (26%)	0.71 (0.26–1.9)	39/62 (63%)	1.0
District E ^a	8/122 (6%)	1.0	24/122 (20%)	1.0	90/122 (74%)	1.0
Facility based delivery						
No	46/168 (27%)	4.8 (2.6–9.1) **	45/168 (27%)	2.4 (1.3–4.2) **	77/168 (46%)	1.0
Yes ^a	34/306 (11%)	1.0	55/306 (18%)	1.0	217/306 (71%)	1.0

^abathing 72+ hours, exposure to intervention, age 25 years or more, secondary education, income above 10,000 BDT, birth order 3 or more, urban residence and district E are reference category and RRR is expressed as 1.0. Significance is expressed as * at $p < 0.05$ and ** at $p < 0.005$.

younger mothers are more likely to give birth at home with a SBA than at a health facility [35].

It was common among the study respondents to initiate breastfeeding in the first hour after delivery irrespective of their socio-economic status. However, there was some variation across districts, possibly due to differences in cultural practices and beliefs.

Though number of PNC visits is gradually increasing in Bangladesh, more than 60% of mothers and new born babies do not get PNC within the first 2 days of birth by a medically trained provider [1]. In some cultural contexts women are secluded after childbirth and prohibited from seeing anyone outside family members except

when very ill, when a provider is summoned to the home [36, 37]. Previous research suggests that the family's lack of knowledge about symptoms of illness, concern over medical costs, social disparity and reliance on non-medical healers has delayed seeking proper healthcare and contributes to maternal and child mortality [31, 38–41]. Our findings confirm existing knowledge that women's higher education and urban residence have a pertinent role in PNC visit frequencies [42]. Facility based delivery was an independent factor for the number of PNC visits in our study. It is evident from other studies that facility based delivery has a significant role in initiating the recommended first PNC visit on the same

Table 5 Factors associated with frequency of postnatal care visits

Variables	PNC in 42 days					IRR (95%CI)
	No visits (n = 273)	1 visit (n = 74)	2 visits (n = 54)	3 visits (n = 34)	4 visits (n = 36)	
Exposure to intervention						
No ^a	158/266 (60%)	48/266 (18%)	32/266 (12%)	11/266 (4%)	17/266 (6%)	1.0
Yes	115/210 (55%)	31/210 (15%)	22/210 (10%)	23/210 (11%)	19/210 (9%)	1.2 (0.94–1.6)
Age						
< 25 ^a	163/277 (59%)	42/277 (15%)	30/277 (11%)	20/277 (7%)	22/277 (8%)	1.0
25 or more	110/199 (55%)	37/199 (19%)	24/199 (12%)	14/199 (7%)	14/199 (7%)	0.82 (0.57–1.7)
Education						
No or primary education ^a	121/186 (65%)	26/186 (14%)	21/186 (11%)	11/186 (6%)	7/186 (4%)	1.0
Junior secondary	81/152 (53%)	32/152 (21%)	18/152 (12%)	11/152 (7%)	10/152 (7%)	1.3 (0.90–1.8)
Secondary	71/138 (51%)	21/138 (15%)	15/138 (11%)	12/138 (9%)	19/138 (14%)	1.4 (0.96–2.1)
Income						
< 10,000BDT ^a	141/223 (63%)	35/223 (16%)	24/223 (11%)	9/223 (4%)	14/223 (6%)	1.0
10,000 BDT or above	132/253 (52%)	44/253 (17%)	30/253 (12%)	25/253 (10%)	22/253 (9%)	1.2 (0.87–1.8)
Birth Order						
1 ^a	117/203 (58%)	33/203 (16%)	23/203 (11%)	12/203 (6%)	18/203 (9%)	1.0
2	106/178 (60%)	25/178 (14%)	19/178 (11%)	13/178 (7%)	15/178 (8%)	1.1 (0.9–1.8)
3 or more	50/95 (53%)	21/95 (22%)	12/95 (13%)	9/95 (9%)	3/95 (3%)	1.4 (0.9–2.4)
Residence						
Rural ^a	140/215 (65%)	37/215 (17%)	16/215 (7%)	12/215 (6%)	10/215 (5%)	1.0
Urban	133/261 (51%)	42/261 (16%)	38/261 (15%)	22/261 (8%)	26/261 (10%)	1.63 (1.2–2.2) **
District						
District A ^a	22/61 (36%)	3/61 (5%)	13/61 (21%)	8/61 (13%)	15/61 (25%)	1.0
District B	46/116 (40%)	29/116 (25%)	21/116 (18%)	11/116 (9%)	9/116 (8%)	0.57 (0.36–0.91) *
District C	70/115 (61%)	17/115 (15%)	11/115 (10%)	9/115 (7%)	8/115 (7%)	0.41 (0.26–0.64) **
District D	48/62 (77%)	11/62 (18%)	2/62 (3%)	1/62 (2%)	0/62 (0%)	0.12 (0.06–0.23) **
District E	87/122 (71%)	19/122 (16%)	7/122 (6%)	5/122 (4%)	4/122 (3%)	0.30 (0.18–0.50) **
Facility based delivery						
No ^a	113/169 (67%)	20/169 (12%)	13/169 (8%)	11/169 (6%)	12/169 (7%)	1.0
Yes	160/307 (52%)	59/307 (19%)	41/307 (13%)	23/307 (8%)	24/307 (8%)	1.52 (1.2–2.1) *

^ano-exposure to intervention, age 25 years or less, no or primary education, income below 10,000 BDT, birth order 1, rural residence and district A are reference category and IRR is expressed as 1.0. Significance is expressed as * at $p < 0.05$ and ** at $p < 0.005$

or next day, which may be reinforced by hospital staff after delivery [1, 4, 43, 44].

As facility delivery is an independent factor for the outcomes delayed bathing and PNC visits, we raise the question whether the messages that refer to practices that are already widely adopted should be de-emphasised and the service should concentrate on messages during pregnancy such as “planning facility based delivery over home delivery” which would contribute to other best practices. It is known from other research that women’s higher education and wealth are pivotal in delaying marriage and conception [45]. Since educated women, older mothers and women with one or two children reinforced good practices regarding delivery place,

delaying bathing and the number of PNC visits, we anticipate national efforts aimed at improving indicators of women’s autonomy (e.g. women’s education and income) will lead to maternal and child health improvements over time. Mobile messaging, especially voice messaging which does not require participants to be literate, may be one route to address these disparities.

Limitations

As this was an observational rather than a randomized study, the study did not have a formal control group and instead we categorised users based on their inclusion in the service at different time points during the pregnancy or the post-natal period, which may limit generalizability

of the analysis and causation cannot be ascertained. Due to the sample size our ability to observe an association between early messages and outcomes was limited. The power of our study was based on a moderate to large association, hence small differences in the outcomes associated with the timing of receipt of the Aponjon messages could not be captured. In addition we cannot exclude the possibility of study participants being exposed to health related information from the health workers during their routine antenatal care visits at home. We do not have information on the partner organizations' health promotion activities in their catchment area or the time of inclusion of the districts in the service which could help us to understand the difference in the outcomes. The study relies on self-report of practices which can introduce bias and problems of recall and may lead to overestimation of performance [46]. District is a potential confounder for the study due to the recruitment strategy of the service where health workers from different partner organizations recruited subscribers in different districts at different point of service year. The association between district and some of the outcomes may reflect cultural practices and other factors not captured in our study. There are many contextual factors which contribute to delivery practices which the survey did not attempt to capture, such as information on the experiences of families regarding their access to local health facilities, availability of qualified staff and equipment at local facilities, and current and previous pregnancy complications [29, 35, 47–49]. Nevertheless, this study contributes to our understanding of what can be achieved by a service such as Aponjon which is one of the first to scale up in a resource-limited country. Our study points to the need for larger studies and randomised designs to overcome the limitations encountered in this study.

Conclusion

Our results indicate that mobile phone text or voice messages may delay timing of first bath within the first 48 h after birth. Although a formal control group and larger sample size would produce more generalizable results and potentially allow detection of small to moderate associations, our study suggests that low-cost mobile phone educational service may work as catalysts in improving maternal and child health behaviour in resource-limited settings. Our study demonstrates yet again that addressing maternal and child health disparities requires investment in what we already know works, such as training health staff, building health facilities and educating women. Mobile phone messages may be a promising addition to ensure that such interventions achieve maximum impact. We plan to undertake additional research in the Aponjon sample by exploring

participants' perceptions and experiences of the Aponjon healthcare service with the aim of providing information to help develop a national framework for an integrated health system.

Additional file

Additional file 1: Questionnaire used during the survey of Dnet to interview Aponjon subscribers. (PDF 939 kb)

Abbreviations

ANU: The Australian National University; BDT: Bangladeshi Taka (currency); DERC: Delegated Ethics Review Committee; Dnet: Implementing agency of Aponjon service in Bangladesh; IRB: Institutional Review Board; mHealth: Mobile Health as in health practice supported by mobile phones; MOHFW: Ministry of Health and Family Welfare; NGO: Non-Government Organizations; PNC: Postnatal Care; SBA: Skilled Birth Attendant; USAID: The United States Agency for International Development; USD: The United States Dollar (currency)

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Availability of data and materials

The data that support the findings of this study are available from Dnet but restrictions apply to the availability of these data, which were used under permission for the current study, and so are not publicly available.

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Authors' contributions

MA had a key role in conception, design, analysis and interpretation of data and was a major contributor in writing the manuscript. CD made substantial contributions in analysis and interpretation of data. CD, CB and KL made substantial contributions to the design of the work and had been involved in critically revising the manuscript for important intellectual content. All authors proofread, approved the final manuscript and are accountable for all aspects of the work.

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Competing interests

The views in the publication are those of the authors only and do not necessarily reflect the views of the institutions involved in this publication. The authors did not receive any kind of funding in any form from the implementing agency or did not undertake any contract that may limit their ability to complete the research as planned.

Consent for publication

Dnet had the following agreement with the respondents in the consent form regarding photographs and information to be used in the publication: "We may also ask to take photos of you. The pictures may be published in reports and journal articles but would never include your name or name of this venue. Photos may be posted online in reports or the project website. After we take the photographs, you may view them and request that they not be used. The information from this study may be used in the future for other studies on similar topics. You will not benefit directly from participating in this research." The full consent form is available from corresponding author on request.

Ethics approval and consent to participate

The original Aponjon research by Dnet was IRB-exempt after review of the Abt Associates Institutional Review Board, USA as the purpose of the research was to improve a communication strategy only. To conduct the surveys as part of the routine operations research, Dnet followed the guidelines of Demographic health survey (DHS) methodology toolkit (http://www.dhsprogram.com/pubs/pdf/DHSM1/DHS6_Interviewer_Manual_19Oct2012_DHSM1.pdf) prepared by MEASURE DHS/ICF International who provided technical assistance to National Institute of Population Research and Training (NIPORT), Ministry of Health and Family Welfare (MOHFW) to conduct national DHS programs in Bangladesh (<https://dhsprogram.com/pubs/pdf/fr265/fr265.pdf>).

This study received approval to analyse the survey data collected by Dnet in 2014 from Dnet and from the Humanities & Social Sciences Delegated Ethics Review Committee (DERC) of The Australian National University. Before the interviews, Dnet read aloud the consent form describing purpose of the survey, selection criteria and rights to withdraw from the research at any time to the participants. Dnet collected written consent of all participants and replaced each identity with a code.

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Chapter 4. Evaluation of the interactive mobile phone based consultation service on maternal, neonatal and infant healthcare practices

Paper 2, *published by JMIR mHealth and uHealth*, is presented in this chapter which investigated the usefulness of a 24*7 hotline service with medically trained doctors to improve maternal, neonatal and infant healthcare practices among subscribers. Data generated from the call centre were merged with findings from qualitative interviews with subscribers and their husbands who used the service and with doctors, who provided them with remote consultations. The triangulation of data from this mixed methods study demonstrates the benefits and challenges of providing a remote consultation service and offers recommendations to build on an efficient referral service. Findings from this paper will be useful for policy makers and practitioners who are implementing or planning to integrate telehealth service into an existing health system.

Original Paper

Patients' and Doctors' Perceptions of a Mobile Phone–Based Consultation Service for Maternal, Neonatal, and Infant Health Care in Bangladesh: A Mixed-Methods Study

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Abstract

Background: A mobile-based consultation service, or telehealth, can be used for remote consultations with health care professionals for screening, self-care management, and referral. In rural Bangladesh, where there is high demand for scarce male and even scarcer female doctors, remote consultations may help women seeking maternal and child health care. Aponjon is a mHealth service in Bangladesh that provides weekly voice or text messages to pregnant women, new mothers, and family members on various aspects of maternal, neonatal, and infant health. Subscribers can also access a dedicated 24*7 call center to discuss maternal, neonatal, and infant health or emergencies with medically trained doctors. The service provides advice, primary diagnoses, prescriptions, and referrals to subscriber callers.

Objective: We investigated the Aponjon service to understand access, acceptability, usability, benefits, and challenges of a mobile phone-based consultation service.

Methods: We conducted call log data analysis for September to November 2015 to understand how many unique subscribers accessed the service, who accessed the service, the geographical distribution of callers, and the purpose of the calls. We also conducted a qualitative exploratory substudy of eight married women and eight married men who were subscribers to and accessed the service during this time to understand their experiences. We interviewed 11 doctors from the same service who provided phone consultations to subscribers.

Results: Approximately 3894 unique subscribers accessed the service for single or multiple consultations during the study period; 68.36% (2662/3894) of subscribers were from rural households, and 53.00% (2064/3894) of calls were made by pregnant women or new mothers. Approximately 96.08% (5081/5288) calls were nonurgent, 2.69% (142/5288) semiurgent, and 1.23% (65/5288) urgent. Almost 64.7% (134/207) semiurgent or urgent calls came between 8 PM and 8 AM. Callers found the consultation service trustworthy, cost-effective, and convenient. The doctors dispelled misconceptions and promoted good health care practices, regular health check-ups, and responsible use of medicine. They helped families understand the severity of sicknesses and advised them to seek care at health facilities for semiurgent or urgent conditions. The service lacked a pro-poor policy to support talk times of subscribers from poor households and a proper referral system to help patients find the right care at the right facilities.

Conclusions: Although a regular messaging service is constrained by a one-way communication system, this service using the same platform, gave subscribers access to an abbreviated “consultation” with medical doctors. The consultations provided subscribers with valued medical advice and support, although they were limited in their population reach and their integration into the wider medical system. Further research is required to understand the impact of advice and referral, cost-effectiveness, and willingness to pay for mHealth consultation services, but this research suggests that these services should be supported or even expanded.

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KEYWORDS

mobile-based consultation; mHealth; remote diagnosis; referral

Introduction

Telehealth, or mobile-based (mHealth), remote consultation service has the potential to improve maternal and neonatal health outcomes in developing countries such as Bangladesh, where mobile phone subscription rates are very high [1] and there is disparity within the health system in the distribution of trained doctors and qualified medical professionals in urban and rural areas [2,3]. Although Bangladesh has made significant improvements in reducing the maternal mortality ratio by 40% between 2001 and 2010 to 194 per 100,000 live births [4], it is still higher than in other South Asian countries [5]. The neonatal mortality rate (28 per 1000 live births) is also alarmingly high and contributes to almost two-thirds of the total under-five child mortality rate in Bangladesh [6]. Delay in seeking care from a health facility or formal health care provider is a major contributor to maternal and neonatal fatalities [7,8]. Research suggests that delay in seeking care is related to cost, inability to understand the severity of symptoms, and use of informal health care providers [4,7,8]. Furthermore, it is considered culturally inappropriate for women to seek maternal health care from male providers [9], yet female doctors are scarce in remote settings [2,9]. With the potential to address many of the barriers to seeking timely health care, a mobile-based consultation service could be used as a health promotion tool in raising awareness among women and their families in remote settings [10].

Mobile phone consultations between pregnant women and nurses at obstetric call centers were found to be effective in providing triage for determining emergency cases, helping patients manage nonurgent symptoms, and increasing efficiency in emergency departments at local hospitals in selected rural states of North America [11]. Another study in Australia found telephone helplines have potential for improving mother's confidence and sustaining breastfeeding [12]. Evidence of interventions involving direct communication between client and provider is scarce in developing countries and is mostly reported in pilot studies [13,14]. Text and sometimes voice messages are the preferred interventions, seeking moderate positive behavioral outcomes in these settings [15,16] due to cultural contexts and operational challenges [13,17-20]. A pilot study in Southern Malawi reported a decrease in hospital attendance for child-related illnesses among an intervention group who were entitled to text or voice messages and a toll-free hotline service for maternal, neonatal, and child health care (MNCH) [21]. Community-skilled birth attendants who accessed toll-free mobile phones to consult with remote physicians were found to have improved confidence in treating and referring patients and gaining the trust of patients in a clustered randomized controlled trial in a subdistrict of Bangladesh [14]. Pilot interventions involving toll-free communication also allowed pregnant women to initiate calls to their local midwives regarding danger signs of pregnancy and delivery in Zanzibar [22] and Bangladesh [14]. Qualitative evidence from pilot projects in India suggested that 24-hour obstetric mobile

phone-based helplines could potentially mitigate delays associated with seeking care, reaching proper health facilities, and receiving treatment [13].

Approximately 95% of urban and 84% of rural households in Bangladesh have access to a single mobile phone [1]. A study in a rural subdistrict reported an increase in household mobile phone ownership from 2% in 2004 to 81% in 2012 [23] indicating a rapid uptake of mobile phone technologies in a decade across the country [1]. Competitive pricing among telecom operators significantly dropped service prices for mobile phone owners and closed the "digital gap" of mobile phone ownership between low and high socioeconomic status (SES) households in Bangladesh; low SES households who were once behind the race were increasingly entering the mobile phone consumer market [24]. Understanding the multifaceted benefits of mobile phones in health care, the Government of Bangladesh adopted mHealth in its national Health Information Strategy to increase the performance of local facilities and access to health by all citizens [25].

In 2007, a private mHealth initiative in Bangladesh led to the development of a 24-hour helpline service run by the largest mobile phone operator, Grameenphone, in collaboration with Telemedicine Reference Centre Limited [26,27]. It initially charged 15 Bangladeshi taka (BDT; equivalent to US \$0.18) for the first three minutes and then 5 BDT (US \$0.06) for every subsequent minute [27]. In 2016, the helpline was made free to Grameenphone subscribers with additional benefits to support hospitalization costs under the new service name Tonic [28]. Following in the footsteps of Grameenphone, other telecom operators have introduced 24-hour remote counseling services to their subscribers [29]. There are also emergency mobile phone numbers provided for the district (*zilla*) and subdistrict (*upazilla*) public hospitals to reach physicians remotely free of charge [25]. The Ministry of Health and Family Welfare initiated a helpline service, "Shasthya batayan," operated by a private call center, which provided citizens access to a doctor's consultation and ambulance services through their mobile phones; customers were typically charged the usual call rates per minute [30]. However, there is a need for more scientific literature that correlates the effect of these teleconsultation services on the health outcomes of callers.

In addition to teleconsultation services, other mHealth initiatives in Bangladesh have involved the use of mobile phones to educate consumers about preventive health care behaviors and services. One such service, Aponjon, provides information to pregnant women and new mothers regarding pregnancy, delivery, and neonatal and infant health care since 2012 [31,32]. Registered female subscribers are entitled to receive two voice or text messages a week and an optional single message for their family member [31,32]. Based on feedback from subscribers who reported the need to talk to a medically trained doctor over the phone [31], Aponjon expanded its messaging service in 2013 to include consultations between patients and doctors [33,34]. The hotline service, 24*7, is available to Aponjon subscribers

and uses a pool of medically trained, mostly female doctors [33,34]. The hotline service was critically vetted by experts in the field to ensure adherence with the national drug regulatory policy and counseling guidelines before being rolled out [29]. Subscribers are typically charged 2.3 BDT (US \$0.03) per minute for the consultation service [34].

Although the Aponjon messaging service has been evaluated [32], the effectiveness of the medical consultation service has not. The voice and text messages show no or minimum effect on delivery and neonatal care practices among subscribers [32], although a quasi-experimental evaluation study [35] suggested that prolonged exposure to messages (6 months) can bring about behavioral changes. Another pilot study tested the feasibility of the nutrition counseling service among pregnant women and new mothers along with a mobile cash transfer system; however, the efficacy of the intervention is yet to be determined [36]. Given that the mobile-based consultation service involves the consumer calling (as opposed to being called) for advice and interaction with a health care professional, the acceptability of the service and effect on health behaviors are likely to be different to that of one-way messaging services. There is a dearth of literature on the effectiveness of mHealth consultation services for maternal and newborn health in resource-limited settings including Bangladesh [16,37]. The objective of this study is to describe the call volumes, the purpose of the calls, the experiences of subscribers, and the perception of doctors who provided consultations through the Aponjon service with a focus on acceptability, usefulness, and health promotion in the setting of Bangladesh.

Methods

Setting

Bangladesh is a country situated in South Asia with a population of more than 150 million in a land size of 147,570 km², surrounded by India in the north, west, and east; Myanmar in the southeast; and the Bay of Bengal in the south [38]. Approximately 90% of the population is Muslim, 9% Hindu, and the remaining 1% are other religions such as Buddhists and Christians [39,40]. The economy of Bangladesh is rapidly progressing; the gross domestic product growth has been significant at a rate of 6% for the last decade, which has led Bangladesh to achieve lower middle-income country status in 2015 [41]. Administratively, the country is divided into 8 divisions, which are further divided into 64 districts (*zillas*) and 545 subdistricts (*upazillas*) [42]. The subdistricts, or *upazillas*, are further divided into urban areas (consisting of wards; *mohollas* or cluster of households make up each ward) and rural areas (consisting of union *parishads*; *mouzas* or clusters of villages make up each union *parishad*) [38].

Approximately 75% of the population resides in rural areas, although there is a trend of rapid urbanization [38]. The Ministry of Health and Family Welfare has the key responsibility to provide universal health coverage to urban and rural populations and operates a dual system of general health and family planning services through two Directorates General of Health Services and Family Planning in district hospitals, *upazilla* health complexes at the subdistrict level, union health and family

welfare centers at the union level, and community clinics at the ward level [3]. Apart from government initiatives, private sector (formal and informal) and nongovernment organizations (NGOs) have established a network of facilities to provide health and family planning services [3]. There is no structured referral system or national health insurance policy; health services are mostly financed by each households' out-of-pocket payment system [3]. Treatment facilities and medicine at public health facilities are subsidized; however, the quality of service has largely been criticized for the shortage and inequitable distribution of skilled health professionals in rural areas, lack of proper equipment, staff absenteeism, and governance issues [2,3]. Private facilities that have major state-of-the-art treatment equipment are urban-centric, costly, and remain out of reach of poor people [2,3].

Aponjon Service

The Aponjon (meaning “the close or dear one” in Bangla) service was rolled out phase by phase across Bangladesh after being initially launched in 2012 [31,32]. The service underwent a year-long pilot before launching. Aponjon collaborated with the Government of Bangladesh and local NGOs to scale the service and recruit subscribers across the country [33]. The service is available through all telecommunication operators in the country [32].

The core service includes a messaging service—both interactive voice responses (IVRs) and text messages [31,32]. Typically, IVR messages are 1 minute long; the contents are structured around a female “doctor” (called *daktar apa*), who advises pregnant women, new mothers, and their husbands or caregivers on various aspects of pregnancy, delivery, postpartum and newborn care, illness symptoms, and nutrition [31]. The text messages were transliterated as Unicode and were not supported by basic mobile phones, resulting in it being popular among subscribers with higher education [31]. However, IVRs also became very popular among rural subscribers; 99% of them were receiving IVRs [32]. By mid-2014 the service had one million registered subscribers. Any pregnant woman can register in the service from 6 weeks of pregnancy if they have access to a mobile phone [31]. A potential subscriber may enroll her own phone or a phone that she shares with her husband or family members [31]. IVR messages are scheduled to be sent to subscribers according to their preferred time and days of the week to decrease the chance of them being missed [31]. Missed IVR messages can be retrieved by calling the service [31]. By the end of pregnancy, pregnant women are able to update their service to that for a new mother and receive messages for baby and mother until the child turns 1 year of age [31]. A new mother who did not receive the service for pregnancy can enroll in the new mother's service [31]. Prospective subscribers are recruited to the service in several ways. The most popular way is through the thousands of community health workers [31] working under the flagship of different NGOs in Bangladesh [43]; they register interested women in the service during their monthly door-to-door visits for antenatal and postpartum care. Pregnant women and new mothers can also enroll with the help of paramedics or doctors at health centers [31]. The other option is to directly call the service for enrollment; the short code of

the service had been popularized through advertisements in television, billboards, leaflets, and newspapers [31,32].

Since mid-2013, Aponjon subscribers can additionally talk to a doctor by dialing the service short code [34]. A pool of medically trained doctors, located in a central call center of Aponjon service in Dhaka city, handle calls regarding medical queries from subscriber women from across Bangladesh [34]. The purpose of the consultation service is to support subscribers to understand the severity of symptoms, help in decision making during emergencies, and improve understanding of maternal, neonatal, and infant health care practices at home through one-to-one consultation.

The Aponjon service has a pro-poor policy [31,32]; the socioeconomic data gathered during enrollment are assessed to consider the eligibility of marginalized subscribers to receive the messages free of charge. The rest of the subscribers pay 2.3 BDT (US\$ 0.03) per message [32]. Aponjon subscribers accessing the service under any telecom operator will have similar pricing experiences. The “free of charge” policy is not applicable when subscribers access the consultation service; they pay the usual call rate for outgoing calls.

Study Design

We conducted a mixed methods study. In September 2015, the service had approximately 1,135,839 subscribers from across Bangladesh. Anyone registered in the service could access the 24*7 consultation service. We analyzed the call log data of the consultation service. We also conducted qualitative interviews with subscribers who contacted the consultation service and with Aponjon doctors who provided consultations.

All participants provided written and verbal consent for this study. The study received ethics approval from the Science and Medical Delegated Ethics Research Committee, the Australian National University, along with permission from Dnet, the implementing agency of Aponjon in Bangladesh.

Quantitative Data Collection

Each day, the Aponjon consultation service received an average of 150 calls from existing subscriber women's cell numbers. All calls were logged on the service “customer relationship management” (CRM) database including date, time, callers' mobile phone numbers, location, call duration, type of caller (subscriber woman/husband/family member), severity of the condition for which advice was sought (general, semiurgent, and urgent), and type of advice provided by the doctors. For the quantitative study, we retrospectively accessed the CRM database and extracted data for the period of September 1 to November 30, 2015.

Qualitative Data Collection

All interviews were conducted between December 2015 and January 2016. For this study, we accessed the CRM database for calls made in the 3 months prior to data collection to reduce users' recall bias. Only subscriber women and their husbands who made calls to the Aponjon consultation service in the past 3 months for maternal-, neonatal-, and infant health care-related

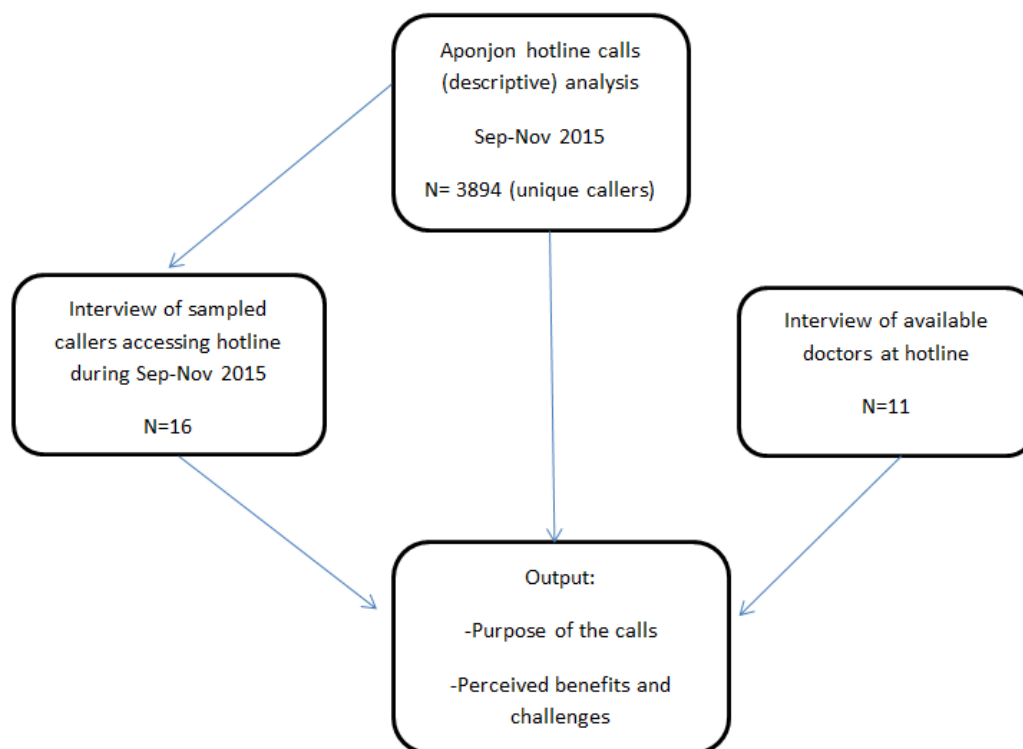
queries were eligible for interviews. Exclusion criteria included callers who made calls for nonmedical purposes, who were younger than 18 years of age, and family members other than husbands. From the CRM database, we identified unique callers, prepared a sampling frame for two different types of callers (subscriber women or husbands), and systematically called every fifth caller. Each mobile phone was called a maximum of two times; we reached a caller almost 40% of the time (after making 81 call attempts to 45 phone numbers). Of the contacted callers, 18 agreed to participate in the study, and we arranged a convenient time for phone interviews. Two potential participants were excluded because they did not fit the entry criteria. Overall, 16 different families—eight women subscribers and eight husbands of subscribers—were recruited. Recruitment continued until data saturation was achieved, meaning that very little new relevant information was likely to be gained from further interviews with callers [44,45].

Recruitment of participant doctors was supported by Aponjon management. At the time of data collection, 16 medical doctors (12 females and 4 males) were registered for roster duties at the consultation service for morning, day, or night shifts. All doctors were contacted and informed about the research through Aponjon management. Among them, 11 doctors (9 females and 2 males) were available before or after their roster at the call center and were interviewed. The remaining doctors who could not be interviewed did not have a roster or were on leave.

We prepared interview guides for consumers (callers) and doctors which contained open-ended questions. Consumer participants were read the purpose of the research over the phone, and they gave verbal consent to participate and have their interviews recorded. Each phone interview lasted between 25 and 35 minutes. Participants were asked about their experience using the Aponjon hotline service—why they used it; the benefits, costs, and limitations of the service; and access to other health care providers. Participants' socioeconomic information, such as age, education, monthly income, birth order, family size, occupation, and place of residence, was collected. Participants were also asked about how they individually accessed mobile phones, whether they had the capacity to receive or make calls, read, and send text messages without any help. Additionally, husbands (n=8) were asked how their wives accessed mobile phones.

All the doctors' interviews were conducted face-to-face at the call center before or after their rosters. The doctors read the participation sheet before giving signed consent to participate and have their interviews recorded. Doctors were asked about their motivation to work in consultation service under mHealth initiatives, the type of advice they provided at Aponjon, callers' expectations, and the benefits and barriers to a mobile-based consulting service. The interviews lasted between 35 and 50 minutes.

Author MA conducted all interviews in Bangla. All participants (callers and doctors) were given their rights to not answer any question or withdraw from the research at any point of time. Identities of all participants were masked by IDs.

Figure 1. Mixed methods data triangulation plan.

Data Analysis

The CRM database for the targeted period was analyzed with statistical software SPSS version 24.0 using a descriptive data analysis method. We ran frequency tests to describe patterns of call duration, type of callers, type of calls based on severity, and timing of calls; data were presented as frequencies, means, modes (where applicable), and percentages.

Professional transcribers and the author MA shared transcriptions of the interviews. All transcripts were converted to Bangla text. Author MA checked the recordings and transcripts. Transcripts were translated into English by author MA and then coded using Atlas Ti software for storage and to assist with analysis [35]. The transcripts were repeatedly read by authors to compare the doctors' and clients' experiences. A thematic analysis approach was used for identifying, analyzing, and reporting patterns (themes) within data [46]. Using this approach, a number of smaller subthemes [46] were identified inductively and then organized under two key metathemes identified by the authors: perceived benefits and perceived challenges. These two metathemes were developed after conducting a comparative analysis of concepts coded in different participant groups (participant callers and doctors). Codes and statements from participant groups were compared to assess positive and negative perceptions of the service [47], and were entered in a matrix. These similar perceptions from callers and doctors form the basis of the subthemes and are illustrated by quotes from both callers and doctors. A diagram (Figure 1) is provided on data triangulation for this study.

Results

Quantitative Findings

Who Were the Callers?

Approximately 3894 unique subscribers accessed the service during the 3 months for single or multiple consultations. There were three different caller groups based on who was making the calls from a single registered mobile number. There were 53.00% (2064/3894) who were subscriber women in the first group, who always made calls by themselves and consulted doctors directly. The second group contained callers other than subscriber women; 33.98% (1323/3894) of calls were made by husbands or family members who consulted doctors for subscriber women's or babies' symptoms. The third group, 13.02% (507/3894), were mixed callers (both subscriber women and husband or family members) from the same phone, inferring subscriber women shared mobile phones with family members.

The callers came from diverse areas across the country; call logs suggest that the service was accessed by callers from eight (8/13) districts in Dhaka, seven (7/11) districts in Chattogram, four (4/6) districts in Barisal, six (6/10) districts in Khulna, four (4/8) districts in Rajshahi, four (4/8) districts in Rangpur, one (1/4) district in Mymensingh, and four (4/4) districts in Sylhet division. In all, 68.36% (2662/3894) of calls came from rural households (Table 1).

Table 1. Caller type and location (N=3894).

Criteria	n (%)
Who called	
Only subscriber women (pregnant/new mother)	2064 (53.00)
Subscriber women and husband/family member	507 (13.02)
Husband/family member	1323 (33.98)
Place of residence	
Rural	2662 (68.36)
Urban	1232 (31.64)

Table 2. Category of calls (N=5288).

Category of calls	Subject of queries about neonates and infants	Subject of queries about pregnant women	Subject of queries about new mothers	n (%)
General	Queries on general cold, fever, nutrition, neonatal and infant health care, development milestones, growth, play, immunization, and medicine; primary diagnosis of neonatal and infant illnesses	Queries on pregnancy health care, nutrition, fetal development, delivery, general cold, lifestyle, and medication; primary symptoms of pregnancy discomfort and illnesses	Queries on family planning methods, maternal health, reproductive health, and breastfeeding; primary symptoms of reproductive health and postdelivery complications	5081 (96.08)
Semiurgent	Neonatal and infant diseases, infection, birth-related injury, and developmental delays	Pregnancy and delivery-related danger signs	Maternal health issues	142 (2.69)
Urgent	Neonatal and infant illnesses, developmental problems, and birth-related injury	Pregnancy and delivery-related danger signs	Maternal health issues	65 (1.23)

Type of Calls

A total of 13,101 incoming calls were handled during this period. The minimum call duration for a complete conversation was recorded at 1 minute 40 seconds and the maximum at approximately 16 minutes.

The problems stated by the patients were triaged into nonurgent, semiurgent, and urgent categories by the doctors depending on the severity of symptoms. Complete data on the problem statement, advice, and related notes by the doctor were available for 5288 calls. From the available data, most calls were nonurgent (5081/5288, 96.08%); callers were seeking general advice on nutrition, growth, development on pregnancy, delivery, neonatal and infant health, and postpartum maternal

health. The rest of the calls were made for semiurgent (142/5288, 2.69%) and urgent conditions (65/5288, 1.23%). Nonurgent calls were provided with self-care advice, prescriptions, appointment advice with local physicians, or referral to local facilities. Semiurgent and urgent calls required an emergency visit to local health facilities for labor, delivery, and newborn illnesses. A schematic guideline of the type of calls is provided in [Table 2](#).

The call center received most calls for urgent or semiurgent conditions at night. Out of 207 such calls, 64.7% (134/207) calls came between 8 pm and 8 am ([Table 3](#)). Almost 56.1% (116/207) of late night calls were made by husbands and 43.9% (91/207) by pregnant women or new mothers.

Table 3. Morphology of emergency (urgent and semiurgent) calls (N=207).

Criteria	Urgent (n=65), n	Semiurgent (n=142), n	Total (N=207), n (%)
Call time			
8 am-2 pm	18	15	33 (16.0)
2 pm-8 pm	17	23	40 (19.3)
8 pm-8 am	30	104	134 (64.7)
Who called			
Pregnant woman	19	21	40 (19.3)
New mother	5	46	51 (24.6)
Husband	41	75	116 (56.1)
Purpose of the calls			
Pregnancy or delivery related	38	63	101 (48.8)
New born health	24	75	99 (47.8)
Maternal health (postdelivery)	3	4	7 (3.4)

Call Interruption, Missed Calls, and Preferences

The CRM data for the study period indicated that 152 calls were ended by callers before the doctors could finish providing their advice, and 64 calls were disrupted due to a poor network. There were 342 missed calls reported in the call notes in which callers cut the call after one ring.

Special notes suggest that there were three incidents in which the subscriber called back to update on prognosis, one incident in which the female subscriber asked to talk to a female doctor, and one incident in which the female subscriber wanted to talk to the doctor she previously consulted.

Qualitative Findings

The callers, eight women and eight husbands representing 16 families (Table 4), came from diverse geographic locations in Bangladesh; they were a mix of rural (12/16) and urban residents (4/16). Most of the participating families were middle income. The women callers (Table 4) were mainly younger than 25 years (5/8); two were in their late teens (18 and 19 years). Educational levels differed between families of female callers and male callers. Female callers and their husbands had higher levels of education (most of them had completed higher secondary education) than male callers and their wives. Women callers reported more autonomy in accessing mobile phones (such as making and receiving calls, texting, and owning a personal phone) than women whose husbands called Aponjon.

Table 4. Background information of participants (Aponjon subscribers) (N=16)

Characteristics	Caller women n (n=8),	Caller husband (n=8), n
Age of participants (years)		
<20	2	0
20-24	5	1
≥25	1	7
Access to Aponjon messages		
Regular	7	5
Sometimes	1	2
Never	0	1
Type of messages received		
Voice	8	5
text	0	3
Who received Aponjon messages		
Husband	0	3
Wife	8	0
Both	0	4
Never received messages	0	1
Aponjon subscriber woman possesses a functional personal mobile phone		
Yes	8	2
No	0	6
Mobile phone literacy of Aponjon subscriber women		
Can receive and make calls		
Yes	8	5
No	0	3
Can send/read text messages		
Yes	8	3
No	0	5
Educational qualification of subscriber women/wives		
None or primary education	0	3
Junior secondary education	2	0
Secondary school or higher	6	4
Don't know	0	1
Educational qualification (husbands)		
None or primary education	0	3
Junior secondary education	0	0
Secondary school or higher	6	5
Don't know	2	0
Family monthly income (BDT)		
<10,000	0	1
10,000-50,000	8	6
>50,000	0	1
Occupation of woman		
Homemaker	6	8

Characteristics	Caller women n (n=8),	Caller husband (n=8), n
Teacher	1	0
Student	1	0
Occupation of husband		
Overseas work	4	0
Unemployed	0	1
Small or large business	3	5
Other paid jobs	1	2
Family type		
Nuclear	1	1
Extended	6	7
Stays with parents (husband overseas)	1	0
Number of children		
Expecting first child	2	0
1	3	5
2	3	1
3 or more	0	2
History of miscarriage/stillbirth/abortion		
Miscarriage/abortion	1	1
Child death (obstructed delivery)	1	0
Division		
Dhaka	5	3
Rangpur	1	0
Rajshahi	0	3
Chittagong	2	0
Khulna	0	2

Table 5. Demographics of participant physicians (N=11).

Characteristics	Physicians
Gender, n	
Female	9
Male	2
Age (years)	
Median (IQR)	28 (3)
Mean (SD)	28 (2)
Range	25-32
Duty hours per week at call center	
Median (IQR)	21 (7)
Mean (SD)	18.9 (4.7)
Range	11-28
Experience with Aponjon service, n	
<3 months	2
>6 months	1
>1 year	8
Experience after graduation (years), n	
1-3	2
3-5	5
>5	4
Special training, n	
Gynecology	4
Pediatrics	5
Medicine	2

Unlike a previous study [32], in which all Aponjon subscribers were enrolled in the service through health workers, only one-third (5/16) of participants were recruited to the service via this method. The remaining participants enrolled via a nurse or paramedics (6/16) during antenatal visits at hospitals and by self-enrollment (5/16) after seeing advertisements on television or in the newspaper.

All participating doctors (n=11) were medically trained and had received training in gynecology and pediatrics. The doctors were young with few years of experience after graduating from medical school (Table 5). In addition to working at the call center, they also worked at private and public health facilities.

Theme 1: Perceived Benefits

Access

All callers were satisfied with the consultation service because they could access a trained doctor any time they wanted. Women who were able to make calls on their own found the service convenient to access medical advice without relying on male members to organize a visit to a general practitioner (GP). Women had a sense of relief because they could discuss their pregnancy stages, newborn care practices, and symptoms of illnesses with Aponjon doctors. One teenaged new mother accessed the service frequently to discuss newborn care and

disease symptoms. The doctors also reported receiving calls from young women and their husbands. The customer-centric approach of the call center encouraged doctors to use friendly greetings, to listen to queries with patience, and to provide practical advice. There was a policy that the “customers hang up calls, not the doctors,” which encouraged callers to contact the service without any reservation. The doctors reported that they could allocate more time to patients’ problems at call centers, which was impossible at crowded outdoor services at health facilities. Some doctors thought mobile consultation encouraged shy women to discuss their reproductive health. One doctor reported:

There are women who do not want to visit a doctor; they feel shy. But since we don't see the patients face-to-face some women think their privacy is protected and they share their private problems with us. I have received many calls like that. When we receive the calls, we tell our name like “I am Doctor X.” Women who use the service regularly remember our names and sometimes would ask for the same doctor [Doctor 6]

One anxious pregnant woman illustrated how the service gave her ready access to reassurance and information:

I had a miscarriage before this one, so naturally I am a bit tensed all the time and I want to clarify the symptoms with a doctor every now and then. I feel very low when my Gyne doesn't pick up the call or if she hurries through my calls. She won't suggest anything on phone, and asks me to visit her chamber right at that moment, which is not always possible especially if it is late at night. So, I call Aponjon doctors whenever I am feeling unwell. They listen to me patiently, and they advise me whether my conditions are severe. If they ask me to see my Gyne or visit a hospital for a check-up, I do that without any delay. [Caller 8, rural pregnant woman]

The service was convenient for rural people living in remote areas who otherwise had two options: travel for several hours to discuss a health-related concern with a qualified doctor at a facility or consult the local drugstore salesman who has no professional qualifications. Husbands who were unable to allocate time, money, or leave from work to accompany their wives to health facilities thought a mobile phone-based consultation service was a convenient option for initial diagnosis. Sometimes husbands would organize phone calls so that their wives could talk to the doctors. One husband stated:

I have been accessing this service for almost a year now since the beginning of my wife's pregnancy. I often make a call to the service, I even called yesterday. It is difficult to find doctors (for a visit) all the time, and I work in the [...] department. So, I cannot always make time to take my wife to see a doctor. It takes a lot of time-waiting in the queue, traveling, and the fee [private doctor's] is between 300 and 400 taka [US\$ 3.56 to 4.74] which is costly for us. So, I like this service for primary consultation. It's very useful as we can call anytime and get good advice. [Caller 3, rural father]

The doctors reported receiving calls from both disadvantaged rural community and urban households, although more came from rural Bangladesh. This is not surprising as Aponjon recruited a large proportion of its client base through rural community health workers. The doctors considered their job rewarding and felt that they were useful in availing themselves to rural patients.

I have received calls from poorest of the poor (rural) to bankers (urban). But most of the time the callers are low-income people who are located in very remote places and live quite far away from health facilities or upazilla [subdistrict] health complexes. I think this [call from low-income households in rural areas] is because most of the recruitments to the service were done by NGO health workers. They [patients] are able to know where they have to go or what to do by making a call to us. Most of these calls are nonurgent, but we get urgent calls too mostly at night. I feel very happy at the end of the day that I can be of some help to rural people who need it most. [Doctor 11]

The option to talk to a doctor at the call center regarding maternal and newborn health was advertised on TV channels

and newspapers, which interested some participants to enroll in the service. Availability of female doctors at the call center encouraged women callers to access the consultation service; some participant women would rather wait for female doctors to be rostered on if the problem was not acute. The service was useful to clients at night time when visiting a doctor was not possible. The doctors reported that they were getting increased calls regarding problems that required urgent attention mostly late at night. One such incident noted by a participant woman:

We were very worried one night when my son [infant] became ill. My husband contacted Aponjon. At that time the doctor gave us a good solution which improved his condition. In the morning we took him to a hospital. [Caller 6, rural mother]

Trust

Participating callers explained that they considered Aponjon's consultation service to be a trusted source of medical information and clinical advice. Aponjon doctors confirmed that they graded the severity of the illnesses after careful consideration of the symptoms. Often, on request of the women who made the call, they motivated reluctant family members to seek treatment from health facilities. The doctors reported that they received many calls in which callers sought a "second opinion" from them regarding cesarean delivery or other treatment at hospitals.

One doctor stated:

I once referred a mother for further investigation to nearby medical hospital; her baby suffered from brain injury during delivery which required proper treatment to avoid impairment. Doctors at Mymensingh Medical College Hospital referred her to Centre for Rehabilitation of Paralyzed in Savar, specialized for this treatment. But the mother was in a dilemma and called me from the hospital for assurance. [Doctor 9]

Aponjon's mobile phone-based consultation service offered a convenient medium to families through which they could demystify cultural myths and practices with someone who they believed to have superior knowledge and medical training—*pash kora daktar* with a Bachelor of Medicine, Bachelor of Surgery (MBBS) degree. Doctors reported receiving calls from women, their husbands, and even mothers-in-law who sought advice on the care of pregnant women, lactating mothers, and newborn babies. Mothers-in-law are powerful household members who have considerable influence on the birthing and health care practices of their daughters-in-law. For example, some female callers (Aponjon subscribers) rang on behalf of their mothers-in-law to inquire about commonly practiced rituals, such as rubbing mustard oil on the newborn baby's umbilical stump. "I could overhear the mother-in-law asking her [daughter-in-law] to ask me these questions," said a doctor. Some anxious mothers-in-law called to inquire about nutrition for pregnant women, how to increase the production of breast milk, or the illness symptoms of the mother and infant. The doctors supported new fathers, who then felt empowered to

resist the traditional practices of elderly family members. One new father reported:

The doctor told me not to feed newborn babies mustard oil. He also told me that we should not perform shak dewa [vapor treatment] around umbilical stump of newborn baby. That was so helpful! You know how murubbi [elderly family members] ask us to do that. I prevented them [from performing on my newborn]. Instead, we applied a powder [chlorhexidine] which the doctor told me over phone. [Caller 2, rural father]

Satisfied husbands wanted to expand the service beyond the current scope (pregnancy, postpartum maternal health, newborn and infant health) and expressed an intention to use the consultation service for both men's and women's health in all age groups.

Cost

The service price (2.3 taka per minute or US \$0.03) did not seem to be a barrier to access direct consultation service for the participant callers; they were willing to pay for the consultation service. As this participant suggests, the cost of the service is lower than the cost of attending a face-to-face medical consultation:

We [he and his wife] practically are bokolom [illiterate]. They send us recorded messages, we both listen. The consultation service with doctors through mobile phone is very helpful for us. They give us direct advice. I cannot close my shop and spend time traveling and waiting to see a doctor all the time. Every day I sell products worth 1000 to 1200 taka [US \$11.85 to \$14.22], my profit remains 100 to 150 taka [US \$1.19 to \$1.78] and with that money the four of us have to survive. How can I close my shop for a moment, tell me?...I don't find the service expensive. If you [Aponjon] need money, tell me, I will flexi [mobile cash] some money [to Aponjon], no problem. [Caller 1, rural father]

Another participant weighed the cost against the value of a child's health:

I don't think the charge [for consultation service] is too much. You can't ignore your child's health, right? I visit my baby's pediatrician quite often who is available 2 days a week and located only 10 to 15 minutes away from my home. But still I think there are so many queries I should ask, and I prefer calling Aponjon. I don't have to book tickets and go through all the hassles [at hospitals] for phone consultations. [Caller 16, urban mother]

These quotations suggest that participants made thoughtful decisions about cost by considering a number of elements.

Raising Awareness and Assisting with Decision Making

Some participants found the consultation service to be very useful besides the weekly messages they received; they had the scope to discuss their confusion regarding any messages with the doctors. Doctors reported receiving calls from patients

requesting clarification on weekly messages. Some participants reported problems with receiving messages due to a network problem or inadequate balance issues in their mobile phones; they thought calling the doctors was always a good option to catch up with what they had missed. One participant husband stated:

I tell my friends about the service. We get shundor shundor [nice] messages every week from this service. My wife and I both receive the messages and have learnt new information. The messages have made us conscious about a lot of things. And then whenever we have a query regarding our baby I straightaway call and talk to the [Aponjon] doctor who is again helping us with proper advice and (sometimes) medication. I can share everything [with the doctor] which is a great thing. [Caller 9, urban father]

Interviews with both the callers and doctors suggest that doctors were able to raise awareness about the dangerous signs of pregnancy, delivery, and neonatal illnesses. Doctors reported a common "inertia of families toward seeking help from outside" and in response worked to educate callers on a range of issues, such as routine antenatal checks, counting of fetal movements, and symptoms of eclampsia (one of the most prominent causes of maternal mortality in Bangladesh) [4].

My wife is expecting our fourth child...it was not a planned pregnancy...our first child is an adult. Never before [for other pregnancies], my wife had an ultrasound, but this time when Aponjon doctor told us to do that, we performed the test. [Now] we know the baby is okay [inside the womb] and we also know the expected date of delivery. [Caller 17, rural father]

The doctors reportedly interfered with callers' decisions to seek care from untrained providers, such as the local drugstore salesman or traditional healers. One incident reported by a doctor:

Once a newborn baby was having convulsions, and the family decided to take the baby to a Kabiraj [nonformal provider] to perform jhar-phoonk [rituals believed to have magical effects] which is harmful [to the baby]. The father of the child called Aponjon...I asked him to remove the patient [child] to a hospital immediately. I explained the illness of the child and he understood it. [Doctor 8]

A telephone consultation with doctors during an emergency such as a prelabor rupture of a membrane (water break) or prolonged labor can help family members make a safer decision and ultimately save the life of the mother and the unborn child. One such incident reported by a doctor magnifies the need for such guidance during emergencies:

My shift was almost over that night when the husband called. He was confused as the village doctor gave saline [at home] and left saying that in the morning everything will be fine [a vaginal delivery]...I suspected it could be a case of an obstructed labor and instructed him to remove his wife to a hospital that night...We later received a call from the husband

that an emergency cesarean procedure had saved his wife and baby. The doctors at the hospital said he was just in time. [Doctor 4]

Authentic Prescribing

Callers from both urban and rural households reported purchasing medicine for simple or severe complications from local drugstores. Drugstore salespeople are typically unqualified allopaths with no formal degree, having learned their trade via apprenticeship with a qualified or unqualified practitioner [48]. Medication dispensing is often negotiated depending on the severity of the complaint, the economic situation of the patient, and the range of available medicines [48]. Aponjon doctors reported alerting callers to the inappropriate use of medications. Additionally, the service has the capacity to provide callers with prescriptions for over-the-counter drugs if required. The doctors took great care to spell the names of prescribed medicines correctly. Usually, if the patients were unable to follow the doctor's instruction, they sought help from a literate person in the family to write down the names of medicines. Sometimes patients would call the doctors from the pharmacy so that the doctors could talk directly to the salesperson about the particular medicine. One doctor reported:

Patients expect that we will give them solutions for everything through medicines. They want names of medicines which they can purchase from pharmacies and get cured without visiting health facilities. We do not support that. As we cannot see the patients, we provide advice and prescribe over-the-counter drugs if necessary. We ask them to notify us about their condition within a few days. If the condition persists, we ask them to visit local health facilities. [Doctor 5]

One participating mother explained the importance of receiving trained medical advice:

My son is only 4 months. There is no pediatrician in my area. So, I saw a provider who gave three medicines. Then I called to Aponjon and told the doctor the name of the medicines. The doctor asked me not to follow those medicines as my son is too young and insisted to see a pediatrician. I did not give the medicine [and] saw a pediatrician from the district hospital. [Caller 4, teenaged rural mother]

Theme 2: Perceived Challenges

Logistical Issues

The doctors and callers both mentioned problems with consultations when the network dropped out. For example, an anxious husband reportedly was desperately trying to contact a doctor when his wife's labor progressed, but "the calls failed again and again." Apart from network issues, the call center line can be busy forcing callers to try several times:

Overall, I like the service. For consultations, I spend approximately 20 taka [US \$0.24]. Sometimes getting the line through to the doctors takes time. There is network problem, and then often the lines are busy. But still, I make the calls. [Caller 12, rural mother]

Equal Access

As noted previously, most participants considered the service call rate (2.3 taka or US \$0.03 per minute) "cheap." However, we do not know if the service was inaccessible to low-income households. Even among households who could afford the service, doctors reported that the quality of consultation was compromised when clients kept the consultation time short to manage the expense. One doctor reported:

Usually, most patients want us to explain the cause of their symptoms and often the discussion can lead up to 15 to 20 minutes depending on the patient's query. Sometimes the network can be problematic; the phone line can get disrupted. Clients call back and finish the discussion. But some clients cannot afford long conversations; they are in a rush. They don't even want us to greet them, they straight jump to their problems and want us to give them a solution in the quickest possible time. They tell us "hurry up" [taratari bolen]. Sometimes before we have finished, they just hang up. We cannot even record their case history properly. [Doctor 1]

Visual Examination

The doctors reported that their foremost challenge in virtual consultation was the difficulty diagnosing symptoms without the ability to conduct a visual examination. For example, the doctors could not verify whether a person actually had "jaundice." They often had to innovate ways to understand the temperature of a "feverish" child over the phone if the parent did not have a thermometer or was not confident in using one. Doctors sometimes faced challenges understanding patients' colloquial language and had to spend time seeking clearer descriptions of symptoms. Similarly, prescription of over-the-counter drugs was difficult without knowing the baby's weight and checking for other fatal illnesses such as pneumonia. As one doctor said, "We cannot always rely on how they explain the symptoms. What is a 'mild' condition according to them can be 'severe' in our diagnosis." Consequently, referral to a health facility for diagnosis was a common outcome of calls.

Referral and Follow Ups

Aponjon doctors identified the lack of connection between the consultation service and available care and emergency services as a key weakness in the service. The doctors were unable to follow up with patients about referrals and expressed concerns about whether patients could navigate the right care at the right facilities. Indeed, according to patient callers, delay in finding the right care often varied depending on the distance between their residence and a quality health facility, their financial situation, and social connections. For example, a female rural participant had to organize overnight stays at her parents' house in the city when she needed to visit a pediatrician at a public hospital. Similarly, another participant, a first-time father, had relocated his pregnant wife from his ancestral village home to his residence near his workplace because his work colleagues had alerted him to the availability of quality emergency obstetric services, which were hard to find in rural areas. A doctor also reported his experience of receiving patients at urban facilities

with much worse symptoms due to a significant delay in finding the right care:

I have seen parents from remote areas seeking treatment at private hospitals for neonates with severe illnesses. They travel from very remote areas to the city. The neonates get admitted at neonatal intensive care [at the private hospital]. What can those [rural] parents do? The local [public] facilities probably don't have the support. [Doctor 2]

The service also lacked a policy to follow up on how patients were complying with medical advice at home regarding issues such as prescriptions. Doctors stressed the need for a database to track patients' case histories, prognoses, and referral outcomes.

Discussion

We investigated the access, acceptability, usability, benefits, and challenges of a mHealth consultation service in Bangladesh. Our research is novel because we have combined analyses from both call log data and perceptions of patients and providers. We analyzed call center data on frequency, duration, urgency level, and advice sought by subscriber callers of a mHealth consultation service who also accessed the regular messaging service. We also conducted in-depth interviews with subscriber callers and doctors of the mHealth consultation service regarding their perceptions, and the perceived benefits and barriers in using such a service for maternal, neonatal, and infant health. Our analyses of call log data and qualitative interviews are complementary. Overall, our findings suggest that the consultation service was trusted among callers and contributed to significant changes in health care-seeking behavior (Table 6). The call log data suggest that more than half the calls were from subscriber women (pregnant women or new mothers) and that majority of all callers were rural residents. This suggests that mobile phones may help address culturally determined gender norms in Bangladesh by enabling “shy” women to discuss their personal health issues with female doctors who are hard to find in rural communities [2,49]. The service may lead to a paradigm shift in how women seek health care. Young married women in low-income households are generally guided

by their husbands and mothers-in-law, who may deter them from accessing skilled maternal health care services [49,50]. This research shows that some women were reluctant to visit maternal health care services due to distance, cost, fear of hospitals, privacy concerns, unavailability of female physicians in local facilities, need for a male chaperone, and being refused approval of husbands or mothers-in-law who thought the symptoms were not so severe or could be cured at home [9,49]. We find that Aponjon's remote consultation service has the potential to empower women in rural communities to discuss their queries regarding maternal, neonatal, and infant health. Findings from qualitative interviews suggest almost all participant caller women and their husbands found the consultation service convenient, accessible, and cost-effective for any medical advice and primary diagnosis. Trust in the service encouraged husbands to make phones available to their wives to consult Aponjon physicians; a step toward reducing the gender gap in women's ownership and access to phones in Bangladesh [51]. Our findings provide useful evidence for mHealth implementers in similar socioeconomic and cultural settings of other South Asian countries, such as Nepal, India, and Pakistan [52,53].

This study suggests that the mHealth comprehensive system of messages and the consultation service is moving in the right direction to respond to the growing consciousness of maternal and newborn's health and aligns well with other national interventions to improve infant health and well-being [3,6]. Talking to a doctor by phone is a plausible solution for subscribers with limited mobile phone literacy who may find it difficult to retrieve missed IVR messages [20,58].

Remote mobile consultation may improve people's decision making during emergencies and reduce delay in reaching health facilities [10,59]. Call center data and qualitative interviews suggest that the real-time advice was instrumental in helping families understand the graveness of symptoms and encouraging them to seek immediate help, especially at night when visiting a doctor is technically impossible. The Aponjon consultation service was able to influence mothers-in-law and husbands, particularly, in advising the family to attend a medical service rather than a traditional healer.

Table 6. Identified benefits and ways forward.

Benefits	Way forward
The service was available 24*7, especially at night	Since there is a need for consultation late at night when physical visits to doctor is not possible, Aponjon service could open the consultation service to non-Aponjon subscribers (pregnant women and new mothers)
Women could talk with female doctors	During enrollment, community health workers or call center agents should inform women about the option to talk to a female doctor regarding symptoms and illnesses
Consultation service was cost-effective because it saved time, money, and absence from work	Each consultation should be documented in electronic medical records to improve consultation time and quality in following sessions; the service may include electronic prescriptions which patients can access through Aponjon apps [54]
Advice of doctors relieved pregnant women and new mothers of anxiety; dispelled myths and wrong practices	The service may extend counseling services to women who experienced miscarriage, stillbirth, and postpartum depression with accredited psychologists [55]
The service helped families to understand graveness of symptoms and making decisions during emergencies	The consultation service needs to improve referral system linked with local facilities so that the families may seek treatment at local facilities without delay [56]
Doctors were instrumental in raising awareness about unnecessary medication from unauthorized personnel	Drug Procurement Act [57] should be strengthened so that purchase of antibiotics and other medicines without a prescription is prohibited

Table 7. Identified challenges and recommendations.

Challenges	Recommendations
Consultation gets disrupted due to network problem	There is no immediate solution for such disruption, while continued investment in infrastructure of telecommunication network will improve the quality of calls in future
Talk time is expensive for the poor	Aponjon may create a toll-free option for selected communities where subscribers have low wealth index [14]; Aponjon may also explore other ideas such as mobile cash transfer to marginalized customers for talk times [36]
Doctors struggle to diagnose certain symptoms without visual examination	In this context, a training program of local providers, such as village doctors, community health workers, and <i>Dai</i> s, should be revived. Since the local providers are the foremost people to be contacted during delivery or any other illnesses, their explanation of symptoms could provide a realistic picture of the condition of the patients to the doctors over phone [14,58]
Referrals of the doctors to seek treatment at health facilities or a specialist service is not specific	A proper integrated system plan is required; the consultation service requires to be linked with existing local facilities; a smooth connection for emergency transport needs to be organized between consultation service and existing facilities; data interoperability between service centers and a national patient database is warranted [61-66]
The consultation service did not follow up patients on medication and referrals	Toll-free follow-up calls and reminder text messages to patients regarding appointments and medication need to be integrated in the service [67]

Despite several benefits recounted by callers and doctors regarding the consultation service, we find that the service has potential to improve and thus have included recommendations (Table 7). In terms of equity, the consultation service may still be too costly for low-income households who reportedly kept conversations short to minimize talk times. Under such circumstances, the current pro-poor policy of the service [31] is not effective in securing access for low-income households free of charge, pushing them to rely on unqualified health professionals for low-cost treatment [2,3]. Customized approaches of previous interventions, such as a toll-free communication line [14] or mobile cash transfer [36], for “talk times” remain options to keep the service affordable to low-income households. The service may build on the successes of the national maternity voucher system in selected districts by increasing utilization of delivery facilities in marginalized communities and providing similar support to subscriber women from low-income households to be able to receive discounted MNCH services at local facilities [60].

Our study findings suggest that the doctors provided triage based on the severity of symptoms, but lacked an operational referral

service to support their decisions, leaving patients to their own resources to find a physician or health facility. A study in rural India suggested there was an increase in utilization of MNCH services and growing demand for facility-based services by pregnant women after sessions of mHealth-supported counseling service by community health workers [68]. To respond to similar circumstances, we propose that an m-referral linked with the consultation service is essential to increase the efficacy of Aponjon service. In fact, a well-functioning mHealth service is incomplete without a proper referral service and is undeniably reliant on the capacity and readiness of the existing health system to provide quality care to citizens [69]. The government is progressing major reforms in the health system to ensure access to universal health coverage by all citizens [3], and m-referral can play a pivotal role in these reforms by offering patients real-time information on existing health care and referrals to quality medical care. An integrated referral system could provide routine toll-free follow-up calls to referred patients to ensure patient well-being and adherence to treatments [67]. In particular, the service could assist users from rural low-income households navigate the health system and

potentially avoid the ingrained practice of bribery by poorly trained staff and *dalals* (middlemen) in public health facilities [2,70]. Referrals from Aponjon to specific destinations would require thorough information on the existing capacity of local facilities. For example, adherence with a referral advice was high in a recent pilot study [56] in Bangladesh in which the efficacy of an emergency transport system for referring sepsis patients to nearby local facilities was tested, after assessment by a call center with the aid of a geographic information system. Although this study was conducted among a small population, lessons from this study may guide the Aponjon consultation service in establishing linkages with local health facilities for referrals. The referral system also needs to build a framework for electronic medical health records and a robust platform for data interoperability between consultation services and health facilities, which will allow transfer of patient data such as symptoms, primary assessment, past medical history, findings, treatment, medication, care plan, special notes, and immunization [61,62]. The need for a national database for patient electronic health records is indispensable to accommodate heterogeneous patient data from different sources. This will improve the referral system, treatment, and allocation of medical professionals accordingly, and enhance the prospects of longitudinal studies evaluating disease causation and prevention [63–65]. Due to growing concerns about security breaches of electronic records worldwide, the system will need to ensure the protection of patient identity, maintenance and monitoring of firewalls, training of medical staff on confidentiality and ethics, and access of data to appropriate personnel only [66].

The doctors expressed difficulties in understanding the symptoms of patients who could not express themselves well over the phone and felt the necessity for a visual examination. The need for visual examination may be mitigated by images sent from smartphone apps by patients [71]; however, this may not be a practical solution in Bangladesh where smartphones are still not a cheap option for rural disadvantaged households [72], and maneuvering a smartphone requires soft skills beyond the limited ability to receive or make calls. We suggest that local resources, such as the village doctors, *Dai*s (traditional birth attendants), or community health workers, the first people to be contacted during emergencies, may help explain the symptoms to remote doctors and arrange emergency referrals in rural areas [14]. Capacity building of local resources is a prerequisite for this model to work and requires a well-structured and coordinated national capacity building program. mHealth-linked call centers established between village doctors and professional medical doctors were suggested as a model to build the capacity of semiqualfied professionals in Chakaria, Bangladesh [58]. Semiqualfied or unqualified village doctors account for approximately 80% of local providers in Bangladesh and are known for inappropriate medication, polypharmacy (prescribing five or more medicines in one prescription), and inappropriate injections at the “patient’s demand” [73]. mHealth-linked professional training of village doctors could improve remote diagnosis and adherence to an appropriate prescription policy in Bangladesh [57]. We could benefit from mHealth doctors’ advocacy in raising awareness among callers about appropriate pharmaceutical prescriptions and use, thus

contributing toward a change of behavior in consuming self-medicated antibiotics purchased without prescription at local drugstores [74]. Additionally, a national strategy and initiatives to train traditional *Dai*s and community health workers should also be revived [3]. Evidence from another study that showed improved performance of community health workers in screening high-risk patients with the aid of mHealth algorithms and training modules may be adopted in programs targeted to build the capacity of community health workers [68,75].

Our study is limited by a number of factors. First, the sample size for interviews was small, which may impact the generalizability of our findings; however, data triangulation (analysis of call log data) was adopted to minimize the limitation [45]. Second, due to the systematic sampling of interviewees from the call log list, low-income households are underrepresented in the qualitative study [76]. Third, we had access to limited data in the call list; a dataset containing clients’ age, education, occupation, economic status, and follow-up results could improve analysis on adoption of mobile phone consultation service among women. Fourth, our research does not address sustainability issues such as operational costs, technological challenges, and revenue generation by the call center. This is vital information for understanding the possibilities of service expansion and escalation. A future quantitative study including a cost-effectiveness analysis, willingness to pay among callers, and the effects of doctors’ remote consultations on health outcomes and referrals is warranted.

Despite the limitations, our study is significant for a number of reasons. We presented experiences of two groups of families—one where women could access the service themselves and the other where women had to rely on their husbands—to understand how gender, autonomy, and mobile phone literacy play a role in women’s utilization of telehealth care. These are important considerations when designing future mHealth interventions. We advocate that the inclusion of husbands in health interventions would accelerate women’s access to health care for positive outcomes. Our study reports on the experiences of doctors who recounted the benefits and challenges of remote diagnosis in comparison to health facilities. The call log data inform us about the call time, frequencies, level of urgency, and access of subscribers. These insights offer the opportunity to improve our understanding of the benefits and challenges of mHealth as services develop and expand across Bangladesh and other low-income countries.

Mobile phone consultations or telehealth for maternal, neonatal, and infant health care are a feasible primary health care activity to increase access to professional medical advice, especially in remote areas of Bangladesh. A remote consultation service may influence some of the cultural and economic factors that delay maternal and child health care-seeking practices. A collaborative well-designed referral system connected with specialists and emergency MNCH services may improve health outcomes for urgent conditions. A central government-run database to collect heterogeneous patient data from public-private initiatives will ensure prompt management of emergency referrals generated by mHealth services. We recommend the systematic use of

quantitative surveys to understand health care-seeking behaviors and health outcomes of users, as well as trials on an integrated referral system between call centers and health facilities.

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Authors' Contributions

MA had a key role in the design, conception, data collection, transcription, translation, coding, analysis, and interpretation of data, and was a major contributor in writing the manuscript. CB had a substantial contribution in interpreting the data. CB, AO, and KL were involved in designing the work and critically revising the manuscript for important intellectual content. All authors proofread, approved the manuscript, and are accountable for all aspects of the work.

Conflicts of Interest

None declared.

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Abbreviations

BDT: Bangladeshi taka (currency)

CRM: customer relationship management

GP: general physician

IVR: interactive voice responses

MNCH: maternal, neonatal, child health care

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Chapter 5. Factors contributing to adoption of mHealth messages for maternal and new born healthcare practices

Chapter 5 contains paper 3 that was published by *Global Journal of Health Science*. The paper presents findings from a follow up qualitative exploratory study of survey respondents, described in paper 1, and elaborates the scenarios of delivery and new born care practices in rural households. The study also identified factors contributing to women's intention to adopt mobile phone based educational services. These findings together with findings from paper 1 improve our understanding on what works and what doesn't work for mobile phone based health education services in resource limited settings. The papers confirms why it is immensely important for mHealth implementers to evaluate women's socio-cultural experiences and their access to existing healthcare practices while investigating the effect of mHealth messages on expected behavioural outcomes.

Adoption of Mobile Phone Messages for Delivery and Newborn Care in Bangladesh

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Abstract

In Bangladesh, mobile phones have been adopted as a health communication tool to improve maternal and child healthcare. To understand what works and what doesn't work for mobile phone based messages around delivery, postpartum and newborn care in resource limited settings we interviewed 33 women who enrolled in an educational service that provides twice weekly voice or text messages to pregnant women and mothers of 0-11 month old babies and had participated in a survey. This follow up qualitative exploratory study showed that women appreciated receiving messages around newborn care and nutrition information over pregnancy messages. Women in low- income households faced challenges accessing messages on shared phones while those with low literacy and limited technological knowledge preferred to receive voice messages over text messages. Husband's endorsement of the service improved women's adoption of the messages. Knowledge on additional consultation service and information on how to enroll in the service for later pregnancies was found to be low. Some participants were reluctant to pay for educational messages and avoided the calls. Women's healthcare practices suggested growing awareness on biomedical practices although women from low- income households were more likely to follow traditional unskilled birthing and newborn care practices at cultural influences unless experienced complications. Besides providing contextual messages, a holistic response is required that includes; training local birth attendants, sensitizing female family members who organize the home based deliveries, and establishing a subsidized referral system to improve birth related health outcomes in low- income households.

Keywords: mHealth, delivery, newborn care, Bangladesh

1. Background

Low-income countries account for almost all maternal and neonatal deaths in the world from causes that are preventable by simple, cost-effective interventions (WHO, 2018). Preventive measures include regular antenatal check-ups, recognition of dangerous symptoms and timely interventions, such as delivery with skilled birth attendant or at health facility, essential newborn care and postnatal check-ups from medically trained providers (WHO, 2017). A mobile phone based health service (mHealth) has potential to respond to the unequal distribution of the health workforce in urban and rural areas and inequity in access to Maternal, Neonatal and Child Healthcare services (MNCH) in low income countries (Colaci, Chaudhri, & Vasan, 2016; Langlois et al., 2015; Speciale & Freytsis, 2013). As in many other countries, Bangladesh, the most densely populated country in the world, has adopted mHealth services in the national policy to strengthen the health system, especially for MNCH (MOHFW, 2018). Although Bangladesh's achievement in reducing under-5 child mortality has been remarkable, the decline in neonatal mortality rate (NMR) and infant mortality rate (IMR) has slowed recently; NMR was reported as 28 per 1,000 live births while IMR as 38 per 1,000 live births in 2014 (National Institute of Population Research and Training, 2017). Similarly Maternal Mortality Ratio (MMR) has stalled at 196 per 100,000 live births in 2016 after declining at a rate of 40% between 2001 and 2010 (National Institute of Population Research and Training, 2017).

Mobile phone subscriptions have sky rocketed in Bangladesh; in 2012 total subscribers increased from 86.5 to 97.1 million in a year amongst a population of almost 150 million people (BTRC, 2012). There is a reliable platform for mHealth interventions and increasing mobile phone ownership among women (Khatun, Heywood, Ray, Bhuiya, & Liaw, 2016; Tran et al., 2015). However, there is little evidence on the effectiveness of mobile phone based educational services on delivery, and pre-and postnatal care in Bangladesh. Over the last two decades numerous mobile phone based interventions in Bangladesh did not extend beyond the pilot phase (Ahmed et al., 2014).

The “Aponjon” service, deployed in 2012, is an example of a global public-private initiative endorsed by the Government of Bangladesh that provides national and internationally endorsed guidelines on best practices around pregnancy, delivery and postpartum care. Culturally appropriate messages designed by national and international experts, are disseminated to pregnant women and mothers of 0-11 months old babies (Alam, D'Este, Banwell, & Lokuge, 2017; Rajan et al., 2013). The effectiveness of Aponjon messages in influencing behavioral outcomes has been measured (Alam et al., 2017; Chowdhury, Shiblee, & Jones, 2019). A survey conducted in 2014 on 476 subscriber women showed no or limited effect on delivery and postpartum healthcare practices such as delivery by a skilled birth attendant, initiation of breastfeeding right after birth, delay of bathing of newborn baby and completion of recommended postnatal check-ups (Alam et al., 2017). Factors such as women's higher education and wealth, older age and lower parity were associated with an increase in birthing at health facilities (Alam et al., 2017).

However, little is known about what prevented some women from following the recommended practices delivered through Aponjon's mobile phone messages, especially in low income households.

In order to better understand the adoption of mobile phone messages around maternity, newborn and infant care, a sub-sample of respondents from the aforementioned survey were recruited for in-depth interviews (Alam et al., 2017). This exploratory study aimed at understanding women's perception of message content, barriers to adopt messages and socio-cultural context of women's birthing and childcare practices. Our study provides further in-depth evidence on the adoption of mHealth services, their relationship to MNCH behavioral change in Bangladesh and, more broadly, on the usefulness of mHealth in similar resource-poor settings where the rapid uptake of mobile phone based education interventions is yet to be fully assessed.

2. Methods

2.1 Intervention

Any woman with access to a personal or shared phone is eligible to enroll in the service during any stage of pregnancy or after childbirth. They are enrolled by community health workers, Non-Government Organization (NGO) clinics or service call center (Rajan et al., 2013). Subscriber women receive two messages (voice or text) per week with an optional additional message for their husband or other family members, appropriate to their gestational stage (Rajan et al., 2013). After childbirth pregnant women are upgraded to a “newborn service” by call center agents on confirmation of delivery. The service terminates when the infant reaches his/her first birthday, however, any subscriber can opt out earlier (Alam et al., 2017). There is an additional hotline service where subscribers can consult with medically trained doctors on maternal and newborn health issues at a regular call rate (Alam, Banwell, Olsen, & Lokuge, 2019). The voice messages are in Bangla and are one minute long while each text message typically contains 161 characters in transliterated Bangla format to support a full range of mobile phones (Alam et al., 2017). A subscriber can retrieve missed messages (voice) by dialing the service and following an automated voice-prompted menu. The messaging service is free for low income households and costs USD 0.02 (BDT 2.3) for others (Alam et al., 2017).

Table 1. Sample messages

Sample voice message (Pregnancy)	Sample text message (New born baby)
You are now on the 37th week of your pregnancy. I am your Doctor Apa speaking. Your baby is getting ready for birth. You'll experience labour pain soon. Keep contact with your health care provider. Contact your doctor if you observe any danger signs. Another important information; you'll need to see your health care provider within 24 hours of childbirth for the first visit, then on the third day of delivery for second visit, on seventh day of delivery for the third visit and on 42nd week after delivery for the fourth visit. These visits are important for you and your baby. Are you experiencing water break? I will talk more on delivery symptoms next week.	If you are a working mother, probably you are getting ready to get back to work. You can store breast-milk in a cup before you leave for work. The milk will be okay for the next 8 hours. In your absence, someone can feed the baby breast-milk with a spoon. Remember to inform the caregiver about the feeding procedure and timetable.

2.2 Study Area

Bangladesh is located at the top of the Bay of Bengal and shares borders with India in its' north, west and east and with Myanmar in south-west (Ministry of Health and Family Welfare, 2015). The majority of the population is Muslims (89.3%) with the remainder (10.7%) comprised of Hindus, Buddhists, Christians and other religious groups (DGHS, 2012). Administratively the country is divided into 8 large divisions and 64 districts (BBS, 2019). For this study five districts were selected from the northern (Bogra), south-east (Chittagong, Laxmipur) and southern (Bagerhat and Patuakhali) part of Bangladesh in order to maximise diversity in culture, language and geographical location of participants. All participants in this study were initially recruited to the service by their designated community health workers.

2.3 Interviews

All study participants were subscribers to the "Aponjon" service and had participated in a previous survey in 2014 when their last born child's age was between 3-18 months (Alam et al., 2017). One hundred and ten respondents from the original survey, living in selected study areas were approached. Of these 35 women were able to be re- contacted by phone almost two years after the survey and 33 agreed to be interviewed and two declined.

Approximately 25% of dialed phone numbers were disconnected, and 43% of participants did not answer after two contact attempts. If the phone belonged to a family member who was away from home, an alternative time was arranged to discuss the research with the subscriber woman before taking her consent for the interview. The first author interviewed the 33 women over the phone using either Bangla or a local dialect (for respondents in Chittagong) between December 2015 and January 2016. Interviews, lasting between 15-35 minutes, were recorded with the consent of the participant after an information sheet was read to them. Participants were given their rights to not answer any question and withdraw from the research without any consequences. The study received approval from an International Review Board (IRB) and an IRB exemption from related organizations for conducting the study in Bangladesh.

Information on the participants' socio-economic status such as age, level of education, family expenditure and pregnancy history was collected. Open-ended interview questions were used to explore women's experiences of Aponjon, mobile phones in general, and healthcare seeking behavior for pregnancy, birthing and pre- and postnatal period. Women were asked a range of questions such as: "Can you tell me your experience regarding Aponjon service and messages (who accessed the messages, usefulness of information, barriers to receiving messages)?", "Would you recommend the service to others or re-enroll for next pregnancy, why or why not?", "Can you tell me about your life during pregnancy (check-ups, type of provider, preparedness for delivery, nutrition, vaccination, family custom)?" "Can you tell me about the last birth and previous births (selection of delivery place and birth attendants, complications, people involved in decision making), "Can you tell me what (feed) the baby was given right after birth and the reason behind it?", "Can you tell me when did the baby receive the first bath and who initiated it?", "Can you tell me how you took care of the umbilicus of new born baby and what was the source of your information?", "Did you see anyone for check-up or symptoms within the first 42 days after childbirth? Why or why not?", "Who do you usually contact for your or infant's health?" and "Have your children been immunized?".

Interviews were transcribed verbatim and translated into English by first author. The transcripts were uploaded into Atlas.ti for storage, organization and analysis (Frieze, 2012). Thematic analysis was used to identify pertinent and common experiences across participants. This involved repeated readings of transcripts by first author, and coding to develop themes. The analysis was guided in part by the interview questions related to women's experiences of Aponjon, maternal and newborn care practices and socio-cultural contexts in which the service was received. A number of sub-themes were identified inductively and then organized under three key themes (Braun & Clarke, 2006).

Table 2. Themes and sub-themes

Themes	Sub-themes
1. Perceived benefit of the service	1.1 Useful information
	1.2 Involvement of husbands
2. Perceived barrier	2.1 Access to messages
	2.2 Literacy
	2.3 Service knowledge
	2.4 Willingness to pay
3. Healthcare practices and norms	3.1 Traditional practices
	3.2 Biomedical services

3. Results

Background information of the participants is provided in Table-3. Participants were mostly young mothers aged less than 25 years. Participants exemplified a wide range of educational background ranging from having never attended school to completing secondary education or more. Women were mostly housewives, meaning they were reliant on their husbands and other family members for living and decision making on major expenditures. Almost half of the participants came from poor households (monthly income USD 118.15).

Table 3. Background information of participants

Characteristics	Total N=33
Age	
19-24 years	22
25 years or above	11
Education of women	
Never attended school or primary education incomplete	4
Primary education complete	10
Junior secondary complete	8
Secondary education complete or above	11
Occupation of participant women	
Housewife	28
Healthcare provider	3
Teacher	2

Family monthly income (BDT)	
≤10,000 (USD 118.15)	16
10,001-20,000 (USD 118.15-236.30)	9
20,001 (USD 236.30) or above	8
Number of living kids	
1	16
2	13
3 or more	4
Access to Aponjon messages	
Women accessed messages in her phone	20
Women accessed messages in shared phone	13
Voice or text messages	
Voice messages	32
Text messages	1

3.1 Theme-1: Perceived Benefit of the Service

3.1.1 Useful information

Although half of the participants were enrolled in pregnancy, in general participants were more likely to remember information about their newborn baby's nutrition, development, growth and details on caring than their personal health. Automated mobile phone messages according to women's gestational stages helped new mothers to cope with their journey in motherhood while experienced mothers were reminded of the recommended practices. Often participant women shared the messages with elderly female family members who were also involved in taking care of the baby.

"The service is essential for first time mums like me. I was about to join work after the [maternity] break when I received messages from Aponjon about how to gradually introduce solid food to a baby. You know babies begin to take solids around six month of age. But I didn't know how to introduce solid foods. Aponjon messages informed me to prepare the first solid food- "shuji" [semolina] with a pinch of salt. Aponjon also taught me that baby would take first solids in small proportion and gradually the amount would increase." Participant woman 23

"Well, I did not know a lot of information that I have learnt from Aponjon messages for my second child who is 8 years younger than my first born. Aponjon reminded me what to do in every step which I found quite useful...Aponjon informed me about baby's jaundice symptoms and what to do. My daughter [second one] had symptoms of jaundice, so I used to keep her in the sunlight." Participant woman 2.

Participant women found the messages useful and recommended the service to other pregnant women in their neighborhood or in the same household. Information on danger signs encouraged subscriber women to contact local health facilities frequently. Additionally, women received personalized advice from Aponjon's 24*7 doctor's consultation service (Alam et al., 2019):

"If I came across any problem I talked to the Doctor Apa [doctor at the Aponjon's consultation service] and discussed my child's health with her. She advised me and I did not have to take my child to visit a doctor for small [non-urgent] queries. My child used to vomit after I breastfed...The Doctor Apa told me that I should not breastfeed my daughter lying on the bed. And also asked me to put her on my shoulder and gently rub her back after each feed. So the undigested milk would get out. It was a very good advice." Participant woman 2.

3.1.2 Involvement of husbands

In low- income households where women were less educated and not involved in income generating works, husband's encouragement was essential for women's adoption of the service. Participant women were able to utilize the service better and remembered to follow the recommendations when their husbands were regularly involved in receiving and relaying messages:

"At around 6 months, I started giving my child "khichuri" [smashed rice with lentil and vegetables] beside

breast milk. My husband received messages from Aponjon on how to make khichuri and other stuff for my baby. He used to tell me all this information after returning home from work. I followed those instructions and was benefitted...He asked me to contact the doctors by dialing the short code to discuss child's symptoms [such as fever]. He said they [the doctors] would tell me what to do." Participant woman 17.

"My husband recorded the messages [when he was not at home with his phone], so when he came back [home] I listened to the messages as many times as I wanted. My nonod [sister-in-law] also listened together with me." Participant woman 15.

3.2 Theme-2: Perceived Barriers

3.2.1 Access to Messages

Participant women reported various challenges that they had encountered while accessing the service, mostly due to network issues in their local area, loss of phone, faulty phones, problem with charging of mobile phone battery and frequent change of SIMs; barriers that were reported by users in other resource limited settings (Amoakoh-Coleman et al., 2016; Barron et al., 2018; mWomen, 2012; Obasola, Mabawonku, & Lagunju, 2015; Watson, Sabumei, Mola, & Iedema, 2015). Additionally, messages were often not accessed because participant women had forgotten to keep adequate balance in the phone or did not find the information interesting. However, lack of personal phone and coordination with family members in arranging shared phone sets stood out to be the foremost barrier that prevented participant women from getting regular weekly information (Huq, Azmi, Quaiyum, & Hossain, 2014; Khatun et al., 2017; Poorman, Gazmararian, Elon, & Parker, 2014; Tran et al., 2015). Participant women, who did not own their phones or shared phones with family members, relied heavily on the phone owners to access the messages. Because voice messages were programmed to be sent out on a specific time of specific days of the week according to subscriber women's preference during the time of enrollment, it was essential that the phone owning family member passed on messages to the subscriber women:

"I did not have my own phone [at that time], so I was registered in my husband's phone which stayed with him most of the time. He listened to the messages but never found the time [as he remained busy at work] to relay the information to me." Participant woman 24.

3.2.2 Literacy

Literacy for mHealth can be of two types: the ability to operate mobile phones efficiently and the ability to comprehend voice or text messages. Although Aponjon provides voice and text messages at the same price, most respondents opted to receive voice messages which only required basic literacy to receive the phone call. However, interviews suggested low literate participant women could not follow voice messages and preferred consultation of health workers. On the other hand the transliterated text messages, which had the advantages of being stored and read at leisure period over voice messages, were welcomed by women who received higher education and were able to send or receive text messages on their own (Datta, Ranganathan, & Sivakumar, 2014; Khatun et al., 2016):

"I think for [low-literate] people in the village "uthan boithok" [group counseling organized at someone's courtyard] is better where Shebika [health worker] discusses different topics and issues with a group of people. How many people [can] use the mobile phone tell me? So, it is better if they can gather and talk to the Shebika about their problems." Participant woman 28.

3.2.3 Service Knowledge

Although some participants accessed the Aponjon medical consultation service for urgent or non-urgent symptoms and clarified issues with these doctors, many participants were not aware of such service. Yet some participants were unaware of the schedules of messages every week while some others did not know how to contact the service providers by dialing the short code for service related issues:

"I wanted to enroll for my second baby. But Health worker Apa who enrolled me for my first child did not visit me for the second one. I didn't know how to enroll again." Participant woman 11.

3.2.3 Willingness to Pay

Although subscribers are generally informed about the pricing policy prior to enrollment, we found mixed opinion from the participants. Participants who frequently accessed the messages found the service affordable. On contrary pricing policy of the service may have deterred some participants from accessing the messages:

"The company [Aponjon] took money [call charges] away from me, so I didn't pick up the calls." Participant woman 7.

"I first thought of stopping the service [during pregnancy], because of the service price. But later [after childbirth] I realized that the service charge [2 taka per message] was very nominal considering the information I received. It's all for the benefit of my child, right? Who would give such [useful] information?" Participant woman 10.

3.3 Theme-3: Healthcare Practices and Norms

3.3.1 Traditional Practices

Although Aponjon advises subscribers to organize safe delivery with skilled birth attendants and to follow essential newborn care guidelines, cultural influences may prevent women from adopting recommended practices. It was common for our participants from low income households to report using a mix of biomedical and traditional non- western practices during birth and the postnatal period. Similar to past studies that explored delivery practices among low- income households in Bangladesh, there were a few participants who had deliveries at home with untrained birth attendants; a tradition that had been passed down in families for generations (Choudhury & Ahmed, 2011). Other reasons for a home based delivery were cost of delivery at hospitals, fear of C-sections, convenience and lack of family members to accompany participants to hospital. Before organizing their deliveries at home most participant women confirmed with designated health workers that their pregnancy was normal. Participant women had little autonomy during home based deliveries; mostly deliveries were organized by their mothers or mothers-in- law. Husbands sometimes became involved when there were complications during delivery and a pregnant woman had to be removed to a health facility. Mothers or mothers-in-law usually handpicked the *Dai* (traditional birth attendant) depending on her years of experience and success at delivering live births in the community rather than her professional training. Although participants could not always confirm whether the *Dai* who assisted her during delivery had received any formal training, felt confident in their capabilities.

Essential neonatal practices such as wiping, drying and wrapping the newborn baby, proper cord care, delaying of first bath of the baby for at least 24 hours (delay is recommended up to 72 hours in Bangladesh) and initiation of breastfeeding right after birth (usually within an hour) requires assistance from people involved in the delivery process (National Institute of Population Research and Training, 2016). These practices were overruled because traditional remedies and adherence to cultural rituals were trusted due to the influence of elderly female family members; a finding consistent with previous studies on delivery and newborn care practices in Bangladesh (Darmstadt, Syed, Patel, & Kabir, 2006):

"The Dai [trained] asked my mum to wait 3 days before bathing the baby. But my mum and Chachi [aunt] did not listen and bathed the baby right after birth. Chachi said the baby wasn't looking clean [because of the attached mucus and blood from mother's uterus]." Participant woman 12

"My mum gave the baby "michri pani" [water mixed with palm sugar which is considered good]. We don't give honey [to newborn baby]. I gave both my children breast milk after three days." Participant woman 1

"I put mustard oil with betel leaf around the [umbilical] stump area [to dry up soon]. I preserved the stump in a drawer [because] Murubbi [the elderly people] asked to feed the children stump- washed water to cure stomach cramps." Participant woman 27

Although antenatal care visits helped participants understand their pregnancy progression, participants who had deliveries at home with untrained *Dais*, were less likely to receive postnatal care visits, particularly if they had relocated to their parents' house before delivery and had lost contact with their health worker. Postnatal visits were deemed necessary only when there was a perceived need for maternal or neonatal illnesses. It was common among participants from low income households to adopt traditional sources of care, homeopathy or remedy from the *grammo daktar* (village doctor) for newborn babies, considering no or minimal side effects.

3.3.2 Biomedical Services

In general, there is an increasing normalization of westernized medical care practices in pregnancy, childbirth and postnatal period, irrespective of mobile phone based educational messages. Our participants had access to formal healthcare providers such as community health workers, paramedics or medically trained doctors who provided advice and treatment. Often, previous negative birthing experiences such as a stillbirth, delivery related complications or delay in reaching the hospital encouraged participants to access health facilities in the hope of a better outcome next time. After a facility based delivery, women, who otherwise would follow traditional practices at home guided by an elderly family member, adopted recommended postpartum health practices at doctor's advice:

“Nowadays the doctors advise [after delivery at hospital] not to put anything [mustard oil] on the umbilical stump and gives a medicine [instead] if it does not dry up.” Participant woman 13

“Even if it is a normal delivery, the baby won’t be given a bath right after bath..... Whatever you want to do now, you have to first consult a doctor.” Participant woman 25

Whether the births took place at home or at a health facility, participants confirmed that they were aware of free vaccines at the monthly local health camps due to the house visits from vaccine providers and phone-call reminders from the national immunization program, and had never missed an immunization schedule for their children.

However, cost determined the type of facility women visited for pre- and postnatal cares. While subsidized or free services at public or NGO-run maternal facilities remained a feasible option for participant women from low income households, wealthier or more highly educated women were able to visit gynecologists often and organize delivery at private hospitals.

4. Discussion

Our research has implications for women’s adoption of mHealth services and the position of mHealth within the existing health system and broader socio-cultural context. Participants in our study recognized the relative advantage of signing up to the service and were part of a social network that inspired other potential pregnant women to sign up as well (Rogers, 1983). We found that women responded positively to, and were likely to adopt, some of the health information provided by Aponjon mobile phone messages, particularly those related to newborn nutrition and care of newborn babies that could be performed at a household level. We infer that mHealth messages coupled with nutrition supplements have the potential to improve nutritional deficiency among infants in Bangladesh (GAIN, 2014; National Institute of Population Research and Training, 2016) and we recommend a proper observational study design to understand the effects.

Our findings suggest that traditional birthing practices and post-natal care, such as home-based deliveries by untrained *Dais*, are increasingly being used in conjunction with, or are being replaced by biomedical services and recommendations (National Institute of Population Research and Training, 2017). While Aponjon’s messages have supported this transition to a western health model, many of these practices are taking place independently. There has been continued investment in health infrastructure, medical equipment, capacity building in formal healthcare, improved health systems governance and monitoring, demand-side-financing schemes and an extensive door-to-door health worker campaign strategy by the Government and NGOs (El Arifeen et al., 2013; Ministry of Health and Family Welfare, 2015; MOHFW, 2018). Research elsewhere suggests that mHealth interventions are less likely to show significant improvements in outcome indicators in high-performing health areas (Hategeka, Ruton, & Law, 2019) and that targeted messages may increase awareness and readiness around delivery and special care for premature babies among pregnant women who have an increased risk of preterm births (Olivia Kim et al., 2019).

Therefore, we suggest mHealth interventions will work best with targeted groups who need help most, particularly adolescent women in context of Bangladesh. Teenage pregnancy remains a problem in Bangladesh as one-third of 15-19 year old girls are likely to experience pregnancy before reaching adulthood and are at risk of contributing to a pregnancy related mortality ratio that has doubled between 2010 and 2016 (Islam, Islam, Hasan, & Hossain, 2017; National Institute of Population Research and Training, 2017). Culturally acceptable mHealth messages on contraception and reproductive health that worked in other resource limited settings could reduce teenage pregnancies in Bangladesh (Vahdat, L’Engle, Plourde, Magaria, & Olawo, 2013).

Like other studies (Brinkel, Dako-Gyeke, Kramer, May, & Fobil, 2017; Khatun et al., 2017; Khatun et al., 2016), we found that mobile phone ownership, literacy, technological functionality and involvement of significant others has determined service adoption practices of participants in our study. The operational challenges of providing Bangla text messages encountered by Aponjon is likely to be overcome in coming years by the increasing availability of smart phones that support Bangla fonts and new legislation from Bangladesh Telecommunication Regulatory Commission (BTRC) asking telecom operators to send messages to their clients in Bangla fonts (Tribune, 2016, 2018). Nevertheless, subscribers need training to access SMS. Along with technological support, husband’s endorsement of the service is crucial for availing the phone and support for entire period of child birth. A study in India found that there were improved pre- and postnatal visits and adherence to newborn babies’ delayed bathing among women whose husbands passed on information from the voice messages (Hazra, Khan, & Mondal, 2018). We suggest that husbands should be encouraged to access the service during enrollment, to share information with their wives and to consult the hotline service for delivery

emergencies and neonatal complications, especially in low-income households where women are not confident with using technology (Alam et al., 2019). Also, women should be encouraged to listen to the messages along with elderly female family members who coordinate delivery and neonatal care practices in low income households. Making the service accessible to the household acknowledges that birthing and raising children is a family rather than an individual practice.

Our findings suggest that subscription charges may discourage subscribers who are reluctant to pay for educational messages, although our research on Aponjon counseling line suggests families were willing to pay to consult doctors at the call centers (Alam et al., 2019) meaning that subscribers preferred personal interactions and real-time personal advice which is missing in one-way general messages (Rajan et al., 2013). While cash incentives (Muller et al., 2019) and free-talk times (Lund et al., 2012) for accessing health facilities and healthcare providers may improve delivery and new born indicators in low-income households, more should be done. A referral service linked with local health facilities and organized house-visits by local healthcare providers would improve health outcomes and retention of subscribers (Huq et al., 2014; Jo et al., 2014; Watson et al., 2015).

We identified a gap in the community health workers' recruitment information as most participants were unaware of the consultation service with doctors or how to contact the call center for service upgrades or re-enrollment. Some participants had provided mobile phone numbers of family members to recruiters that they did not access. Since community health workers remain a major medium for reaching and recruiting women in the remotest households to mHealth services, it is important that health workers understand how mobile phones are used by households, and that they inform subscribers clearly about the purpose of the messages, billing method of the service and how to access the messages, the consultation service and the service call center. This requires on-going training and monitoring (Rajan et al., 2013).

Our study is limited by a number of factors. First, we cannot exclude the possibility of recall bias among participants, as they were re-contacted almost two years after they were surveyed in 2014. Second, it was difficult to ascertain how frequently women accessed the messages especially on shared phones; accessing service data on participants' usage could add value to their self-reported experiences. Third, our study lacked experience of SMS subscribers in low-income households as they preferred voice messages over transliterated Bangla text messages.

Offering women the option of Bangla SMS may encourage low-income households to enroll in the text message service thus improving their experience with "missed messages".

5. Conclusion

This exploratory study which documents the experiences of early adopters of a mobile phone based education service around delivery and newborn care practices in Bangladesh can provide valuable lessons for mHealth implementers and policy makers in similar cultural settings. The service could be expanded to include messages on women's health and health tips for well-being of under-5 and older children. For example, there is a growing unaddressed problem of obesity among urban women and the double burden of malnutrition among children in Bangladesh (National Institute of Population Research and Training, 2016). mHealth services, if they are well delivered, monitored and thoroughly evaluated, may contribute to improving a range of health issues in resource poor settings.

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Competing Interests Statement

The authors declare no potential conflicts of interest. The views in the publication are those of the authors only and do not necessarily reflect the views of the institutions involved in this publication.

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Chapter 6. Disparity in women's access to messages and its' effect on adoption of an mHealth service

Paper 4 is presented in Chapter 6. In this paper the findings from a cross-sectional study of the Aponjon service contextualises the necessity of ensuring women's uninterrupted access to messages. Women who shared their phones with family members had different behavioural outcomes and understanding of mHealth services than their counterparts. While other factors also contributed to women's knowledge and healthcare practices during pregnancy, the findings of this paper emphasize the need to review how mobile phones are used in different socio-economic strata before signing women for mHealth services in resource limited settings.

Original Paper

The Effect of Women's Differential Access to Messages on Their Adoption of Mobile Health Services and Pregnancy Behavior in Bangladesh: Retrospective Cross-Sectional Study

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Abstract

Background: Text or voice messages have been used as a popular method for improving women's knowledge on birth preparedness and newborn health care practices worldwide. The Aponjon service in Bangladesh provides twice-weekly messages to female subscribers about their pregnancy and newborn care on mobile phones that they own or share with family members. It is important to understand whether women's singular access to a phone affects their service satisfaction and the adoption of health messages before deploying such interventions in resource-limited settings.

Objective: This study aims to evaluate the effect of women's singular and shared access to mobile phone messages on their service utilization and perceived behavioral change around birth preparedness and pregnancy care.

Methods: In 2014, Aponjon conducted a retrospective cross-sectional survey of 459 female subscribers who received text or voice messages during their pregnancy by themselves (n=253) or with family members (n=206). We performed multivariable regression analyses to investigate the association between pregnant women's differential access to messages and other socioeconomic factors and outcomes of service satisfaction, ability to recall service short code, ability to identify danger signs of pregnancy, preference for skilled delivery, arrangement of a blood donor for delivery and pregnancy complications, maternal nutrition, use of potable drinking water, and washing hands with soap for hygiene.

Results: In the multivariable analysis, women who had singular access to messages had higher odds of reporting high satisfaction (odds ratio [OR] 1.72, 95% CI 1.12-2.63; $P=.01$), recalling the service short code (OR 2.88, 95% CI 1.90-4.36; $P<.001$), consuming nutritious food 5 times a day (OR 1.58, 95% CI 1.04-2.40; $P=.03$), and following the instructions of Aponjon on drinking potable water (OR 1.90, 95% CI 1.17-3.09; $P=.01$) than women who shared access with family members. Women's differential access to messages did not affect their knowledge of danger signs and preparedness around delivery. Adolescent women and women aged 20-24 years had lower odds of planning safe deliveries than older women (aged ≥ 25 years). Secondary education was statistically significantly associated with women's ability to recall the short code and pregnancy danger signs, plan safe delivery, and select blood donors for emergencies. Higher family income was associated with women's satisfaction, recognition of danger signs, and arrangement of blood donors and nutritious diet. Women who received more than 4 antenatal care visits had higher odds of liking the service, preferring skilled delivery, recalling danger signs, and consuming nutritious food.

Conclusions: The capacity of women to independently access mobile phone messages can improve their adoption of mobile health services and some pregnancy health care practices. A holistic approach and equitable support are required to improve access to resources and knowledge of delivery preparedness among low-literate and younger women in low-income households.

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KEYWORDS

mHealth; inequality; access; pregnancy

Introduction

Background

The World Health Organization (WHO) defined mobile health (mHealth) as a medical and public health practice that is supported by mobile devices and other wireless devices [1]. Many developing countries around the world have recognized that mHealth can provide crucial lifesaving information in remote settings where the health workforce is scarce and have adopted appropriate mHealth interventions [1]. Mobile phone reminders and text messages have helped improve facility utilization for maternal and neonatal care in developing countries [2,3]. However, mHealth implementers have had difficulty reaching out to women who had no access to phones [2]. Approximately 21% of women worldwide have no phone, mainly because of cost, husband's disapproval, and lack of technical knowledge on how to operate a phone [4]. Women's non-phone ownership is most prevalent in Africa, the Middle East, and South Asia [5], regions known to contribute heavily to the global burden of maternal and neonatal deaths [6-8].

Bangladesh, a South Asian country with a population of approximately 160 million people in an area of 147,570 km², has made significant progress in reducing the under-5 mortality rate and the maternal mortality ratio (MMR), which used to be one of the highest in the world [9,10]. However, MMR and neonatal mortality rate (NMR) remain at 170 per 100,000 live births and 23 per 1000 live births, respectively, which are far behind the targets set by the millennium development goals [9,10]. Similar to other member countries of the United Nations, Bangladesh needs continued investment and innovative approaches to reduce the MMR to 70 per 100,000 live births and NMR to 12 per 1000 live births, including improving health and well-being of all people of all ages by 2030 under the postmillennium sustainable development agenda [11,12]. mHealth initiatives could boost Bangladesh's progress as mobile phone subscription has increased exponentially since its introduction in the early 90s [13]. Low-income households in rural settings are increasingly subscribing to mobile phones because of competitive pricing among telecom operators and mobile phone manufacturers [13]. Although the gender gap in mobile phone ownership is closing, it still exists. A study in rural Bangladesh revealed that ownership of mobile phones was almost 1.8 times more among men than women, and men were more likely to own a phone at an earlier age [14]. Women in low-income households are expected to share phones with family members more often than men [4,14,15]. Mobile phone acquisition was higher in households where only the husband was literate compared with households where only the wife was literate [13].

Inequity in access to technology such as mobile phones because of social, cultural, and economic differences is broadly known as the *digital divide* [13]. mHealth implementers in resource-limited settings need to address the *digital divide*, as women with shared or no access to phones and limited education may never receive health messages, especially voice messages that cannot be stored and read later like text messages [14-16]. In resource-limited settings where women do not have personal

mobile phones, providing health workers or midwives with mobile phones for improved counseling and referrals has been tested [17,18]. However, this approach does not address the severe scarcity of skilled health workforce in remote areas [19]. As *phone sharing* is a common scenario in low-income households, it is important to understand how *shared access* to mHealth messages impacts women's adoption of recommended maternal and newborn health and well-being practices [15]. Previous studies reported low to moderate changes in maternal facility utilization among women who had *any form of access* to mobile phones compared with women with *no access* [20-22]. There is a dearth of literature evaluating women's *independent* and *shared* access to targeted messages on well-being practices during maternity.

Objectives

To cover the gap in existing knowledge on the impact of the *digital divide* on pregnancy and birth preparedness, we conducted a study of female subscribers enrolled in a mobile phone-based health education messaging service during their pregnancy. The objective of our study was to investigate the association between how women accessed messages and their (1) satisfaction and intention to access the mHealth service and (2) their knowledge and practice around birth preparedness and pregnancy wellness.

Methods

The Intervention

The *Aponjon* (meaning someone very dear or close in Bangla) service was the first national mobile phone-based health education service for pregnant women and mothers of 0- to 11-month-old babies in Bangladesh that was deployed as the first project of the global initiative the Mobile Alliance for Maternal Action in 2012 and had received endorsement from the Bangladeshi government and financial support from the United States Agency for International Development [23,24]. The *Aponjon* service typically provides a range of maternal and newborn well-being information to registered Bangladeshi women according to their gestational stage [23]. Any pregnant woman can enroll in the service at any stage of her pregnancy to receive pregnancy messages and then in the postpartum service for another year after childbirth [23]. Usually during pregnancy or after childbirth, potential subscribers are contacted by community health workers of partner nongovernment organizations and included in the service with their consents [23,25]. Alternatively, potential subscribers can enroll in the service by directly calling the service short code, which has been advertised widely through television commercials, billboards, newspaper advertisements, and leaflets [23,25]. Ideally, it is expected that a pregnant woman will enroll in the service during pregnancy and, at the end of her pregnancy, will be upgraded to the maternal service for another year on successful birth of a child. Subscribers are reminded to contact the service call center by dialing the service short code for a service upgrade and complain or queries.

Pregnant women receive a range of information on birth preparedness, including recognition of danger symptoms of pregnancy, labor and delivery, decision making around delivery

places and skilled birth attendants, arrangement of blood donors for complications during delivery and pregnancy-related emergencies, nutrition during pregnancy, hand washing procedure before eating, food preparation, and toilet and safe drinking water. The service was piloted for a year before rolling out in 2012 [23]. Subscriber women may choose between interactive voice resonance (IVR) and text messages as a service mode [25]. Each IVR message in Bangla is 1 min long, whereas text messages are in transliterated Bangla to support all mobile phone and contain up to 161 characters [25].

Aponjon female subscribers are enrolled in the service on confirmation that they have at least one mobile phone (own or shared) in their house that they can access at a certain time of the day. During enrollment, subscribers are asked to indicate the preferred time and days of the week to receive messages. The idea is that subscribers would have the handset for accessing messages at the specified time [23]. A female subscriber typically receives 2 messages a week from the service and an additional message for her husband or family member on a separate or the same mobile number if she includes them in the service [23,25]. The messages have been designed in accordance with the national and international guidelines on maternal, neonatal, and infant health care by accredited content experts [23,24].

Subscribers are typically charged 2.3 Bangladeshi Taka (BDT; US \$0.03) per message with a *no fees* option for marginalized households [23,24]. Since mid-2013, the service has offered consultations with medically trained doctors through a 24-hour call center for clients [26]. Subscribers can consult doctors on maternal and newborn health issues for as long as they want, while being charged the normal call rate per minute [26]. In 2014, the service had more than one million subscriber bases [25].

Study Area

We analyzed data obtained from a cross-sectional survey as part of routine operations research conducted by Dnet, the implementing agency of Aponjon. The survey was conducted between February and April 2014 in selected subdistricts of Bogura, Bagerhat, Patuakhali, Chittagong, and Laxmipur districts in Bangladesh, which were purposively selected to reflect the remoteness, cultural diversity, geographical dispersion, and maximum acquisition of subscribers [25]. Administratively, Bangladesh is divided into 8 divisions, 64 districts (*zillas*), and 545 subdistricts (*upazillas*) [9,27]. The subdistricts or *upazillas* are further divided into urban and rural areas; rural areas in an *upazilla* consist of union *parishads* (UP), whereas *mouzas* (cluster of villages) make up each UP [28,29]. Urban areas in an *upazilla* are divided into wards and *mahallas* (cluster of households) within wards [28,29]. Bogura is a northern district in Bangladesh, which is also known as the industrial powerhouse of the North Bengal [30]. Bagerhat and Patuakhali are 2 districts in southwestern Bangladesh and lie in the fringe of Bay of Bengal [31,32]. Chittagong (Chattagram) is a district in the southeastern part of Bangladesh, known for the sea port and hill tracts [33], whereas Laxmipur is a district in the southern part of Bangladesh [34]. The average size of households in these districts varied from 3.8 to 5.1 (Bogura:

3.8, Bagerhat: 4.13, Chittagong: 5.1, Laxmipur: 4.71, and Patuakhali: 4.41) in 2011 [30-34]. Among the selected districts, Bagerhat and Chittagong have the highest average literacy rate at 58.98% (male: 59.97% and female: 57.99%) and 58.90% (male: 61.1% and female: 56.7%), respectively [31,33].

Sampling

The survey included subscriber women at different stages of pregnancy. Pregnant women were eligible to participate if they received pregnancy messages for at least two months and did not undergo a planned or unplanned pregnancy termination. Pregnant women who had just given birth to newborn baby but had not upgraded the service for the postpartum period were also eligible for the survey. Adolescent women aged less than 18 years were excluded from the survey.

A sampling frame with details of approximately 2274 potential survey respondents (who matched the inclusion criteria) was prepared from the Aponjon service database. The survey database contained information such as subscriber's name, address, cell phone number, age, date of beginning of last menstruation period, enrollment date, and type of access and socioeconomic information. On the basis of formative research experience, Dnet estimated a priori that a sample size of approximately 400 respondents was required, with an anticipated ratio of shared to independent access of 1:2, to detect a difference in proportions with outcomes of interest between shared and independent access of 15%, with 80% power and a 5% significance level. Assuming availability of pregnant women at home and consent rate of 60%, it was expected that 660 subscribers would need to be contacted for the study.

Owing to the lack of availability of an adequate number of community health workers who could assist field researchers in identifying households of subscribers, only 839 subscribers were potentially available to be contacted from the list. Eligible subscribers were randomly sampled district by district from the existing list until the proposed number of respondents had been recruited. A group of 24 field researchers, 2 field supervisors, and 1 central coordinator conducted the survey. A pair of male and female researchers conducted each interview at the respondent woman's house after ensuring privacy [25]. Each interview lasted approximately 1 hour. Before visiting the respondents at their home, researchers contacted the respondents over the phone to make an appointment. Initially, researchers read aloud information on the survey, confidentiality issues, benefits, and possible risks associated with participating in the survey. Respondents had the right to withdraw from the survey at any time and could refuse to answer any question. Verbal and written consents were received before each interview. Identification of respondents such as name, location, and cell phone number was replaced with IDs to maintain anonymity. The interviews were conducted in Bangla. Eligible respondents who could not be reached over the phone for an appointment or were not at home when field researchers visited or who did not want to participate were excluded from the survey [25]. Mostly, pregnant women who had relocated to have their birth at their parent's house outside the study area could not be interviewed.

Respondents were administered semistructured questionnaires that contained questions regarding pregnancy behavioral outcomes as well as service-related questions such as how women accessed the service, satisfaction with the service, recall of service short code, and perceived knowledge and benefits from the service.

All research instruments and consent forms for this service were reviewed by an international institutional review board (IRB) and received an exemption from IRB review. The authors received approval to analyze the survey data of Aponjon service from Dnet, the implementing agency of Aponjon service, and the Science and Medical Delegated Ethics Review Committee of the Australian National University.

Measures

The explanatory variable *type of access* was derived from the question, “Who accessed messages?,” with responses options being “me,” “me and family member,” or “family member.” We recorded the responses to *women=1* and *women or family member=0*. We hypothesized that women who accessed messages alone were more empowered and would access messages more regularly than women who shared access with family members, which would impact women’s adoption of recommended practices in these 2 groups.

Our outcome of interest, satisfaction of respondents, was measured by asking them to rate the service on a 5-point Likert scale, ranging from 1 (very bad) to 5 (excellent). We recoded *high satisfaction* by categorizing scores 4 and 5 as *high=1* and scores 1 to 3 as *low=0*.

The outcome variable *recalls short code* was determined from a service-related question, “Please tell me the service short code (the number you see flash on your mobile phone when Aponjon messages come).” Respondents who were able to recall the 5 digits correctly were coded as *knows short code=1* and who could not were coded as *does not know short code=0*. We considered this variable to demonstrate women’s familiarity with the service.

We measured the respondents’ knowledge of pregnancy danger signs. They were asked, “Can you tell me the danger signs?” These included high fever, severe headache, blurry vision, convulsions, vaginal bleeding, severe lower abdominal pain, swelling in hands and feet, hypertension, and less fetal movement. We generated a binary variable *able to recall danger signs* defined as *yes=1* if respondents could recall at least two signs and *no=0* for respondents who could not recall.

WHO’s birth preparedness and complication readiness (BPCR) plan recommends that pregnant women and their families are aware of planning the following elements before delivery: the place of birth, the birth attendant who will provide assistance during delivery, the location of the closest facility for delivery and emergency, arrangement of funds for any expenses related to delivery and emergency, supplies and materials necessary to bring to the facility, an identified labor and birth companion, an identified person who will look after the home and other children while pregnant woman is away, arrangement of transport to a facility for delivery and emergency, and the identification of compatible blood donors for delivery and

emergency [35]. The outcome variable regarding birth preparedness around delivery for our study was derived from 3 sequential questions asked to pregnant women. The first question was, “Have you decided where your baby will be born?,” with 2 responses *yes* or *no*, and the second question for women who responded *yes* to first question, “(If decided) where do you want your baby to be born?,” with 2 possible responses *hospital or health facility* and *home*. The third question was, “(For home based delivery) who will deliver your baby?,” with 2 responses *untrained birth attendant/relatives* and *trained birth attendant*. Responses to these 3 questions were grouped into binary responses as *Planned skilled delivery=1* and *Planned untrained birth attendants at home or made no plans yet=0*.

Outcome variable “selected blood donor for delivery or pregnancy emergency” was derived from the question, “Did you select a blood donor for delivery or complications during pregnancy?” Responses such as “yes I did” was coded as *yes=1*, and other responses such as “no,” “I did not know,” “haven’t thought about it,” or “I don’t find it’s necessary” were coded as *no=0*.

Having a balanced diet with essential macro and micronutrients is immensely important for pregnant women. Malnourished mothers are likely to give birth to premature babies with low birth weights who are at risk of dying within the first week of birth [9,36,37]. A maternal nutritional behavior-related binary outcome variable *consumed nutritious food 5 times a day* was derived from the question, “How many times in a day you eat one of these food items-vegetables, fruits, protein (such as milk, fish, meat, chicken, egg)?,” with count responses such as 1, 2, 3, 4, 5, and 6. Responses 5 and above were recoded as *consumed nutritious food 5 times a day=1*, and responses less than 5 were recoded as *no=0*.

Bangladesh, similar to other South Asian countries, has a supply of poor-quality drinking water, which is contaminated with microbial pathogens and pollutants (such as arsenic) that are responsible for diarrheal and other infectious diseases [38]. Aponjon advises female subscribers to ensure a clean source of drinking water and treat the water before drinking. A binary variable “followed Aponjon’s instruction on drinking water” was constructed from 2 questions. The first question was, “What is your source of drinking water?,” with 2 responses “I drink water that has been properly treated with various methods (such as boiling, filter)” and “I drink surface water directly from source (such as tap, pond).” The second question was, “Where did you learn about treating drinking water?,” with 2 response options *Aponjon* and *Other*. The responses of these 2 questions were grouped into *yes=1* and *no=0* for our outcome variable.

Aponjon provides information on washing hands properly before food handling, taking meals, and after cleaning body parts. Women were asked, “How do you clean your hands for hygiene purposes?,” with possible answers such as “only water” and “with soap or disinfectants.” Women who replied “with soap or disinfectants” were asked, “Where did you learn to wash your hands in this way?,” with possible answers “Aponjon,” “Aponjon and others,” and “other sources.” Women who answered “Aponjon” or “Aponjon and others” were classified as “followed Aponjon’s hand-washing procedure=1” and who

answered “other sources” as “followed hand-washing procedure learnt from other sources=0.”

Other covariates considered for this study were respondent women’s age (<20, 20-24, and ≥25 years), education (none or primary, junior secondary, and secondary or above), family income (BDT ≤10,000; 10,0001-20,000; and >20,000), first-time pregnancy (yes or no), place of residence (urban and rural), and districts (A, B, C, D, and E). We labeled district names to maintain anonymity. We also considered the frequency of antenatal care (ANC) visits (>4 ANC visits and ≤4 ANC visits) for all models. All these variables were selected because of their importance in the study or because of their demonstrated association with maternal and newborn health-related outcomes in mHealth interventions in previous research [9,20].

Statistical Analysis

The respondent characteristics are described using frequencies and percentages overall and by differential access groups (*women* and *women or family members*). Chi-squared tests were performed to examine the distribution of sample background characteristics and outcome variables by explanatory variables (who accessed messages).

We undertook multiple multivariable logistic regression analysis to investigate the relationship between *who accessed messages* and the outcomes of interest. Multicollinearity tests were performed using the variance inflation factor (VIF) test to assess the correlation between covariates. A VIF score of greater than 2 was set as a threshold, and variables at this threshold were dropped from the final models. We performed logistic regression

for the following outcomes of interest: *high satisfaction on the service, recalled short code, planned delivery by skilled attendant at home or a hospital, able to recall danger signs, selected a blood donor for delivery or pregnancy complications, consumed nutritious food 5 times a day, followed Aponjon instruction on potable drinking water, and followed Aponjon’s instruction on hand-washing*. Multivariable models were adjusted for women’s age, education, family income, first pregnancy, ANC visits, place of residence, and district (to account for the sampling strategy). The Hosmer-Lemeshow test was used to test the goodness of fit for the models, and a model was considered a good fit when the *P* value was nonsignificant. Statistical significance was determined at a *P* value of less than .05. We used IBM SPSS Statistics for Windows version 24.0 for the analysis. The results are expressed as adjusted odds ratio (OR) with 95% CIs.

Results

Background Information of Respondents

Of the 687 subscribers contacted, approximately 66.8% (459/687) of them who had a successful live birth recently (209/459, 45.5%) or were in different stages of pregnancy (250/459, 54.5%) were interviewed. Socioeconomic characteristics of respondents are described in Table 1. Women’s differential access to messages showed statistically significant differences in women’s educational levels and districts. Approximately 98.9% (454/459) of women received voice messages over text. The outcome variables are described in Table 2.

Table 1. Background characteristics of participants by access to messages (N=459).

Variables	Who accessed messages		P value
	Women (n=253), n (%)	Women or family member (n=206), n (%)	
Age of respondents (years)			.35
<20	41 (16.2)	44 (21.4)	
20-24	127 (50.2)	95 (46.1)	
≥25	85 (33.6)	67 (32.5)	
Educational qualification of women			.005
None or primary education	77 (30.4)	88 (42.7)	
Junior secondary education	90 (35.6)	73 (35.4)	
Secondary school or higher	86 (34.0)	45 (21.9)	
Family monthly income, BDT^a (US \$)			.10
≤10,000 (118.15)	105 (41.5)	100 (48.5)	
10,000-20,000 (118.15-236.30)	95 (37.5)	87 (42.2)	
>20,000 (236.30)	53 (21.0)	19 (9.3)	
First-time pregnancy			.97
Yes	131 (51.8)	107 (51.9)	
No	122 (48.2)	99 (48.1)	
Place of residence			.99
Urban	140 (55.3)	114 (55.3)	
Rural	113 (44.7)	92 (44.7)	
Districts			.03
District A	30 (11.9)	31 (15.0)	
District B	68 (26.9)	39 (18.9)	
District C	65 (25.7)	41 (20.0)	
District D	36 (14.2)	29 (14.1)	
District E	54 (21.3)	66 (32.0)	
Number of antenatal care visits			.42
>4	153 (60.5)	132 (64.1)	
≤4	100 (39.5)	74 (35.9)	

^aBDT: Bangladeshi Taka.

Table 2. Unadjusted outcome variables by type of access.

Outcome variables	Who accessed messages		P value
	Women, n (%)	Women or family member, n (%)	
High satisfaction (N=459)			.004
Yes	181 (71.5)	121 (58.7)	
No	72 (28.5)	85 (41.3)	
Recalled short code (n=458)			<.001
Yes	175 (69.4)	88 (42.7)	
No	77 (30.6)	118 (57.3)	
Able to recall danger signs (N=459)			.19
Yes	149 (58.9)	109 (52.9)	
No	104 (41.1)	97 (47.1)	
Planned skilled delivery (n=248)			.77
Yes	73 (49.7)	52 (51.5)	
No	74 (50.3)	49 (48.5)	
Identified blood donor (n=249)			.03
Yes	34 (22.8)	12 (12.0)	
No	115 (77.2)	88 (88.0)	
Consumed nutritious food 5 times a day (n=454)			.04
Yes	135 (54.4)	92 (44.7)	
No	113 (45.6)	114 (55.3)	
Followed instruction on potable drinking water (n=457)			.005
Yes	79 (31.2)	40 (19.6)	
No	174 (68.8)	164 (80.4)	
Followed Aponjon messages on hand washing (n=453)			.31
Yes	65 (26.1)	45 (22.1)	
No	184 (73.9)	159 (77.9)	

Effect on the Adoption of Mobile Health Services

Whether female subscribers were the sole receivers of the messages had statistically significantly increased their satisfaction with the service (OR 1.72, 95% CI 1.12-2.63; $P=.01$) and ability to recall the service short code correctly (OR 2.88; 95% CI 1.90-4.36; $P<.001$; Table 3).

Multivariable analysis of service satisfaction suggests that besides the *type of access*, women's middle-income (OR 1.96, 95% CI 1.24-3.11; $P=.004$) and higher-income (OR 2.48, 95% CI 1.25-4.93; $P=.009$) background and completion of more than

4 ANC visits (OR 2.86, 95% CI 1.82-4.48; $P<.001$) significantly impacted their satisfaction with the service than their counterparts (Table 3). Similarly, covariates such as completion of secondary education (OR 2.28, 95% CI 1.30-4.02; $P=.004$) and age group (20-24 years) were statistically significantly associated with women's ability to recall the short code correctly (OR 1.81, 95% CI 1.08-3.04; $P=.02$). Women from districts A (OR 3.88, 95% CI 1.50-10.00; $P=.005$), B (OR 2.39, 95% CI 1.17-4.86; $P=.01$), and D (OR 3.19, 95% CI 1.25-8.15; $P=.01$) had higher odds of expressing higher satisfaction than women from district E.

Table 3. Predictors of women's adoption of mobile health service.

Variables	High satisfaction		Recalled short code	
	Adjusted OR ^a (95% CI)	P value	Adjusted OR (95% CI)	P value
Who accessed messages				
Women	1.72 (1.12-2.63)	.01	2.88 (1.90-4.36)	<.001
Women or family member (reference)	1 (N/A ^b)	N/A	1 (N/A)	N/A
Age of respondents (years)				
<20	0.88 (0.43-1.85)	.89	1.01 (0.50-2.03)	.97
20-24	0.84 (0.49-1.43)	.84	1.81 (1.08-3.04)	.02
≥25 (reference)	1 (N/A)	N/A	1 (N/A)	N/A
Educational qualification of women				
No/primary (reference)	1 (N/A)	N/A	1 (N/A)	N/A
Junior secondary	0.96 (0.58-1.59)	.88	1.17 (0.72-1.90)	.51
Secondary or higher	1.08 (0.60-1.92)	.80	2.28 (1.30-4.02)	.004
Family monthly income, BDT^c (US \$)				
≤10,000 (118.15; reference)	1 (N/A)	N/A	1 (N/A)	N/A
10,001-20,000 (118.15-236.30)	1.96 (1.24-3.11)	.004	1.44 (0.92-2.26)	.11
>20,000 (236.30)	2.48 (1.25-4.93)	.009	1.66 (0.86-3.20)	.13
First-time pregnancy				
Yes	1.12 (0.66-1.89)	.66	1.10 (0.65-1.80)	.71
No (reference)	1 (N/A)	N/A	1 (N/A)	N/A
Number of antenatal care visits				
>4	2.86 (1.82-4.48)	<.001	1.17 (0.75-1.82)	.48
≤4 (reference)	1 (N/A)	N/A	1 (N/A)	N/A
Place of residence				
Urban	0.56 (0.29-1.09)	.09	1.34 (0.74-2.45)	.33
Rural (reference)	1 (N/A)	N/A	1 (N/A)	N/A
Districts				
District A	3.88 (1.50-10.00)	.005	1.49 (0.65-3.44)	.35
District B	2.39 (1.17-4.86)	.01	0.99 (0.52-1.93)	.99
District C	1.70 (0.73-3.95)	.16	1.08 (0.48-2.41)	.85
District D	3.19 (1.25-8.15)	.01	1.44 (0.60-3.44)	.41
District E (reference)	1 (N/A)	N/A	1 (N/A)	N/A

^aOR: odds ratio.^bNot applicable.^cBDT: Bangladeshi Taka.

Effect on Readiness for Pregnancy and Delivery Complications

The type of access to messages did not show a statistically significant effect on women's readiness for pregnancy and delivery complications (Table 4). However, completion of secondary education was associated with women's ability to recall danger signs (OR 2.44, 95% CI 1.40-4.26; $P=.001$) and arrange skilled delivery (OR 2.37, 95% CI 1.05-5.32; $P=.02$) and blood donors (OR 5.33, 95% CI 1.74-16.32; $P=.003$).

Similarly, women who received more than 4 ANC visits had higher odds of showing the expected behavioral outcomes (danger signs: OR 1.86, 95% CI 1.21-2.86; $P=.004$; skilled delivery: OR 2.13, 95% CI 1.15-3.96; $P=.02$; and blood donor: OR 3.71, 95% CI 1.52-9.02; $P=.004$) than women who had lower number of ANC visits. In addition, women from higher-income households had higher odds of recalling danger signs (OR 3.15, 95% CI 1.63-6.06; $P=.001$) and selecting blood donors (OR 4.48, 95% CI 1.42-14.08; $P=.01$) than women from the lower-income households. Age was statistically significantly

associated with women's delivery decisions; pregnant women who were aged less than 20 years (OR 0.17, 95% CI 0.06-0.47; $P=.001$) or aged 20 to 24 years (OR 0.31, 95% CI 0.15-0.63; $P=.001$) had lower odds of planning delivery with skilled birth attendant at home or a hospital than women who were aged 25

years or older. District was a confounder for 2 behavioral outcomes; women residing in district B had higher odds of planning skilled delivery (OR 4.59, 95% CI 1.77-11.90; $P=.002$) and arranging blood donors (OR 10.87, 95% CI 2.97-39.78; $P<.001$) than women from district E.

Table 4. Predictors of subscribers' readiness for pregnancy and delivery complications.

Variables	Able to recall danger signs		Planned skilled delivery		Selected blood donor for delivery and emergency	
	Adjusted (OR ^a 95% CI)	P value	Adjusted (OR 95% CI)	P value	Adjusted (OR 95% CI)	P value
Who accessed messages						
Women	1.07 (0.71-1.61)	.71	0.76 (0.42-1.37)	.37	1.62 (0.70-3.75)	.25
Women or family member (reference)	1 (N/A ^b)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Age of respondents (years)						
<20	0.74 (0.37-1.47)	.40	0.17 (0.06-0.47)	.001	1.34 (0.35-5.06)	.66
20-24	0.81 (0.48-1.35)	.43	0.31 (0.15-0.63)	.001	0.87 (0.34-2.21)	.77
≥25 (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Educational qualification of women						
No/primary (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Junior secondary	0.99 (0.62-1.59)	.97	1.34 (0.66-2.71)	.34	1.54 (0.54-4.44)	.41
Secondary or higher	2.44 (1.40-4.26)	.001	2.37 (1.05-5.32)	.02	5.33 (1.74-16.32)	.003
Family monthly income, BDT^c (US \$)						
≤10,000 (118.15; reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
10,001-20,000 (118.15-236.30)	2.08 (1.35-3.21)	.001	0.89 (0.47-1.70)	.74	1.86 (0.72-4.77)	.19
>20,000 (236.30)	3.15 (1.63-6.06)	.001	1.52 (0.62-3.68)	.35	4.48 (1.42-14.08)	.01
First-time pregnancy						
Yes	0.86 (0.52-1.41)	.55	1.61 (0.80-3.20)	.17	1.18 (0.46-3.03)	.72
No (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Number of antenatal care visits						
>4	1.86 (1.21-2.86)	.004	2.13 (1.15-3.96)	.016	3.71 (1.52-9.02)	.004
≤4 (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Place of residence						
Urban	1.00 (0.55-1.80)	.99	0.70 (0.32-1.55)	.38	0.45 (0.16-1.20)	.11
Rural (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Districts						
District A	0.80 (0.36-1.81)	.60	0.82 (0.25-2.66)	.74	2.21 (0.43-11.27)	.33
District B	1.11 (0.58-2.13)	.74	4.59 (1.77-11.90)	.002	10.87 (2.97-39.78)	<.001
District C	1.14 (0.51-2.52)	.74	0.94 (0.30-2.87)	.91	0.45 (0.08-2.46)	.36
District D	1.39 (0.59-3.29)	.44	1.56 (0.43-5.64)	.49	2.02 (0.38-10.62)	.40
District E (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A

^aOR: odds ratio.

^bNot applicable.

^cBDT: Bangladeshi Taka.

Effect on Maternal Wellness Behavior at the Household Level

Women's sole access to mobile phone-based educational messages showed a statistically significant effect on the availability of nutritional elements 5 times a day (OR 1.58, 95% CI 1.04-2.40; $P=.03$) and access to potable drinking water (OR 1.90, 95% CI 1.17-3.09; $P=.01$; [Table 5](#)). Whether women solely accessed phone messages did not show a statistically significant association with their hand washing practices.

Higher family income (OR 2.40, 95% CI 1.25-4.61; $P=.008$) and more than 4 ANC visits (OR 3.46, 95% CI 2.22-5.40; $P<.001$) were other determinants of women's improved food consumption behavior ([Table 5](#)). District was a confounder for pregnant women's self-reported wellness behavioral outcomes at home; women from districts C (hand washing: OR 3.24, 95% CI 1.15-9.12; $P=.02$) and D (nutrition: OR 0.31, 95% CI 0.13-0.74; $P=.008$; drinking water: OR 7.26, 95% CI 2.78-18.9; $P<.001$; and hand washing: OR 10.73, 95% CI 3.75-30.63; $P<.001$) had higher odds of showing improved behavior than women from district E.

Table 5. Predictors of following maternal wellness instructions at the household level.

Variables	Consumed nutritious food 5 or more times per day		Followed Aponjon messages on drinking water		Followed Aponjon messages on hand washing	
	Adjusted OR ^a (95% CI)	P value	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Who accessed messages						
Women	1.58 (1.04-2.40)	.03	1.90 (1.17-3.09)	.01	1.31 (0.80-2.13)	.28
Women or family member (reference)	1 (N/A ^b)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Age of respondents (years)						
<20	1.72 (0.85-3.48)	.13	1.19 (0.54-2.60)	.66	1.03 (0.46-2.34)	.93
20-24	1.11 (0.66-1.86)	.68	0.91 (0.51-1.64)	.77	0.82 (0.44-1.50)	.52
≥25 (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Educational qualification of women						
No or primary (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Junior secondary	1.52 (0.93-2.49)	.09	0.87 (0.49-1.53)	.63	0.82 (0.46-1.48)	.52
Secondary or higher	1.73 (0.99-3.03)	.05	0.80 (0.42-1.55)	.51	0.66 (0.34-1.28)	.22
Family monthly income, BDT^c (US \$)						
≤10,000 (118.15; reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
10,001-20,000 (118.15-236.30)	1.53 (0.98-2.40)	.06	1.25 (0.74-2.09)	.39	1.43 (0.85-2.42)	.17
>20,000 (236.30)	2.40 (1.25-4.61)	.008	0.80 (0.38-1.66)	.55	0.57 (0.24-1.31)	.18
First-time pregnancy						
Yes	0.87 (0.52-1.44)	.60	1.20 (0.68-2.12)	.51	0.95 (0.53-1.71)	.87
No (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Number of antenatal care visits						
>4	3.46 (2.22-5.40)	<.001	0.94 (0.58-1.52)	.80	0.66 (0.40-1.09)	.11
≤4 (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Place of residence						
Urban	1.26 (0.69-2.31)	.44	1.42 (0.73-2.74)	.29	1.59 (0.78-3.21)	.19
Rural (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A
Districts						
District A	0.89 (0.39-2.06)	.79	0.44 (0.13-1.47)	.18	1.49 (0.49-4.52)	.47
District B	0.52 (0.26-1.02)	.06	2.23 (1.01-4.94)	.04	1.74 (0.69-4.38)	.23
District C	0.62 (0.28-1.40)	.26	1.92 (0.75-4.92)	.17	3.24 (1.15-9.12)	.02
District D	0.31 (0.13-0.74)	.008	7.26 (2.78-18.9)	<.001	10.73 (3.75-30.63)	<.001
District E (reference)	1 (N/A)	N/A	1 (N/A)	N/A	1 (N/A)	N/A

^aOR: odds ratio.^bNot applicable.^cBDT: Bangladeshi Taka.

Discussion

Principal Findings

We evaluated the association between women's unequal access to mobile phones and their perception about using mobile phone-based health services for pregnancy and birth

preparedness in their socioeconomic context. Understanding the socioeconomic factors that contribute to women's access to mHealth services has implementation benefits in low-income settings where sharing a single phone among family members is a common phenomenon [4,14,15].

Our findings suggest that women's differential access to targeted messages positively affects their satisfaction and familiarity with the service short code and the adoption of certain recommended practices around pregnancy wellness, such as inclusion of nutritious elements in regular diets and drinking potable water. These findings were consistent when the models were adjusted for all covariates (age, education, income, first pregnancy, ANC frequency, and place of residence) and district. These findings confirm 2 aspects of the adoption of mobile phone-based educational service for pregnancy: (1) *sole and uninterrupted access to messages* provide target women an understanding of the service before they decide to adopt or reject a new innovation (mHealth) [39,40] and (2) women who access messages by themselves are in a better position to evaluate the context, need, complexity, and relative advantage of the information provided by mobile phones than women who occasionally or never access messages [39]. Our findings also suggest that women's age, education, and family income were statistically significantly associated with their mHealth experience. Although national initiatives and investment to improve employment opportunities and secondary school education should continue, mHealth implementers could ensure equity in accessing messages among subscribers by facilitating equitable approaches such as lending mobile phones to women from underprivileged households for the entire service period and program-specific training of clients, especially older women (aged ≥ 25 years) and women who have not completed secondary education, on operating mobile phones and accessing messages at the established times. We recommend additional equitable approaches, such as mHealth-supported cash vouchers for pregnant women and infants [41], to address prevailing food shortages in underprivileged households [42]. Furthermore, mobile phone-based messaging services have the potential to increase awareness of public health problems such as water-borne diseases and arsenic contamination in groundwater [38].

In our study, women's differential access to messages did not affect their choice of skilled birth attendant at home or a hospital, knowledge about the danger signs of pregnancy, and arrangement of blood donors for delivery and complications. Instead, we found, similar to previous studies, higher frequency of ANC visits and women's privileged background to have significantly improved maternal knowledge about the danger signs and adoption of BPCR measures [9,43]. We need to evaluate these findings carefully, as these behavioral outcomes may have been influenced by existing national campaigns and overall improvements in the utilization of maternal and child health care facilities [19,28,44]. For example, the rate of facility-based delivery has almost doubled from 23% in 2010 to 47% in 2016 [45], which could be a result of the government-funded voucher schemes to support marginalized pregnant women to have facility-based deliveries, checkups, tests, and arrangement of transport to facilities at free of cost [44]. Our recent exploratory study suggested that women, in general, were well informed about delivery and postpartum care guidelines by their community health workers, hospital staff, and national media during their regular ANC visits and were rather interested in receiving information on newborn care and nutrition from Aponjon service [46]. The study also suggested

that although women from higher-income households could afford services at private hospitals, home-based deliveries were usually preferred by low-income households for uncomplicated births because of convenience, cost, and fear of C-section and were organized by elderly female family members and local (untrained) birth attendants [46,47].

Our findings are concerning though as younger women, especially who were in their late teens, did not have a plan for delivery with skilled birth attendant or at a facility. The national survey estimates that pregnancy-related mortality ratio among 15- to 19-year-old women has almost doubled from 75 deaths in 2010 to 144 deaths per 100,000 live births in 2016 and that first-time mothers are at increased risk of maternal deaths (215 per 100,000 live births) compared with mothers with live children [45]. Educating a large population of teenaged pregnant women on safe motherhood is challenging for the Bangladeshi government, especially in a situation where one-third of 15- to 19-year-old girls are likely to experience pregnancy before reaching adulthood [9,48]. Hence, the importance of repeat visits and family counseling of community health workers during pregnancy in low-income households, especially for adolescent women who are likely to rely on husbands and mothers-in-laws for delivery decisions, is undeniable [25,43,48,49].

Our research is limited by a number of factors. First, the results would be strengthened by a randomized control trial or pre-post quasi-experimental design rather than a cross-sectional survey. Small differences in the behavioral outcome associated with women's type of access could not be captured because of the power of the study that was designed a priori based on a moderate to large association; the study required a larger sample size for greater generalizability of our findings. Second, the study relied on respondents' self-reported behavioral outcomes rather than their attendance report at facilities or actual habits, and there may be problems with recall bias and overreporting. Third, the study could have benefited from system-generated data on the actual number of messages accessed by these 2 different groups of respondents, as a study in the United States reported a positive association between access to high frequency of messages and abstinence from alcohol consumption during the postpartum period [50].

Way Forward

Nevertheless, our research will be helpful for mHealth implementers who are working to reduce maternal and neonatal deaths in developing countries. Our research confirms that *women's sole access to messages* can change their perception of the service and adoption of maternal wellness messages. We infer from our findings that irrespective of how women access messages, one-way (voice) messages alone may not improve delivery decisions, which are controlled by socioeconomic circumstances of individual families and their personal experiences [46]. Therefore, mHealth implementers working in resource-limited settings need to consider cultural and socioeconomic constraints that limit women's access to mHealth services and all other maternal health care services and should adopt a holistic approach to ensure equity in their service. ANC visits (more than 4) remain an independent factor for women's

knowledge about pregnancy danger signs, birth preparedness, and maternal dietary diversity. mHealth services such as Aponjon may consider introducing mobile phone apps for health workers and a linked referral system to increase their efficiency in identifying high-risk mothers during monthly door-to-door ANC visits, maintaining follow-up visits, minimizing workload, and referring pregnant women to proper facilities [18,51-54]. Future studies should include anthropometric measurement and hospital data to understand the effect of pregnancy messages on birth outcomes [55,56].

Conclusions

Socioeconomic and cultural barriers to mobile phone access by women can be problematic for implementing mHealth services in resource-limited settings. Although the national policy targeting poverty alleviation and women's empowerment requires revisions, stand-alone mHealth implementers need to integrate with local health infrastructure and invest in building women's capacity to access mobile phones. We suggest ongoing research to monitor temporal trends in women's differential access to mobile phone messages in South Asian countries.

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Authors' Contributions

MA played a key role in the design, conception, data collection, coding, analysis, and interpretation of data and was a major contributor in writing the manuscript. MA worked for Dnet before beginning her PhD at ANU and was involved with Aponjon's research. CB and KL were involved in designing the work and critically revising the manuscript for important intellectual content. All authors proofread, approved the manuscript, and are accountable for all aspects of the work.

Conflicts of Interest

None declared.

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Abbreviations

ANC: antenatal care
ANU: Australian National University
BDT: Bangladeshi Taka
BPCR: birth preparedness and complication readiness
IRB: international institutional review board
IVR: interactive voice resonance
mHealth: mobile health
MMR: maternal mortality ratio
NMR: neonatal mortality rate
OR: odds ratio
UP: union parishad
VIF: variance inflation factor
WHO: World Health Organization

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CHAPTER 7. Discussion

In this chapter I will discuss my research findings from four papers that relate to the research questions and conceptual framework of my thesis (explained in chapter-1 and 2). I will discuss the utility of the mixed methods approach that I used in my research. Finally, I will relate my findings to existing maternal and child healthcare practices in resource limited settings and propose recommendations for future work.

7.1 Service adoption, effect on behavioural outcomes and underlying factors

Findings from the first paper (chapter-3) that investigated research question-1, found no or limited association between non-interactive messaging service and delivery and postpartum maternal and new-born care practices. The study also suggests that maternal age, parity and socio-economic conditions contribute towards choice of delivery place and presence of skilled birth attendants at birth (1). Facility-based delivery which has been rapidly increasing in Bangladesh over the last couple of decades due to an exhaustive campaign by the Bangladeshi Government and NGOs, was an independent factor for other postpartum outcomes such as delayed bathing of new-born babies and frequency of postnatal care visits (1). A study in Nepal also reported low level of knowledge and practices around presence of skilled birth attendants during birth, having postnatal care visits within the first week after birth and delaying bathing of new-born babies among women who had a home-based delivery (2). Chowdhury et al. independently evaluated the Aponjon service and suggested that at least 6 months of a 'good pattern of listening and receiving the messages' was required for

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women's knowledge and practices around maternal and new-born healthcare to improve (3). Women were identified as having a 'good pattern of listening and receiving the messages' if they confirmed listening to at least 3 messages in a month. Similarly, exposure to high 'doses' of messages was associated with improved behavioural outcomes such as abstinence from postpartum alcohol consumption among women who were enrolled in the 'Text4Baby' messages service in the United States of America (4). Since the respondents in paper-1 were grouped in the survey depending on when they were recruited to the service (before or after childbirth) rather than their pattern of exposure to the messages (such as how many times a week they were able to hear the full messages without interruption), we cannot ascertain whether subscribers in the study received the required rate of exposure to the service to detect significant changes in delivery and essential new-born care practices. Although the survey collected self-reported information on how many messages each respondent accessed each week (Annex-2), the information may have problems with over-reporting and recall bias and hence was not included in the analysis. Service length and exposure to the messages are one of the many factors that may affect a subscriber's decision on delivery and postpartum behaviour. Other factors such as distance to healthcare centres, frequency of antenatal care visits and quality of counselling during antenatal care visits have impacted women's delivery decisions and birth preparedness in the past (5-7). Hence, it is important to include service-generated data on subscribers' exposure to the messages, length of stay with the service and information on their access to local healthcare practices while evaluating the effect of mHealth messages around childbirth.

From a methodological point of view, the study in paper-1 could have benefitted from a two-arm, parallel clustered randomized controlled design although it was quite impossible to achieve as the Aponjon service rolled out through different media allowing any potential subscriber from any part of the country to enrol in the service at any point of time (8). This would have jeopardized the

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randomization of the study design. Alternatively, a stepped wedge cluster randomized controlled trial with a cross-sectional study design could have been useful. Following this pragmatic study design clusters of Aponjon service (recruited through the community health workers) would receive no intervention in the beginning and subsequently would be exposed to messages at regular intervals after being randomly allocated to cross from the control to the intervention group (9). The crossover between exposed (intervention) and non-exposed (control) group would continue until all clusters were exposed. Usually, the stepped wedge cluster design works well when the intra-cluster correlation is large (9). However, there can be confounding regarding the underlying temporal trend which needs to be adjusted for in the analysis. The stepped wedge design is a practical choice when there are political, logistical and ethical considerations. The stepped wedge design is also a better approach than quasi-experimental designs which are non-randomized before and after studies and are known to be confounded by temporal trends which cannot be adjusted for (9).

In paper-2, research question-2 was investigated through a mixed methods study, to understand the usefulness of the counselling service. The study findings demonstrated some positive outcomes, for example, accessibility by rural people, 24*7 availability of doctors (especially late at night when access to local health facilities is not feasible), cost effective call rates, call triages used by the doctors to identify severity of symptoms, referrals and prescription service. The service was most effective in supporting patients to understand the severity of their symptoms and motivating them to seek care from health facilities. The callers and doctors formed a trusted relationship as callers would consider calling the consultation service for any symptoms before having to visit any health facilities. Trust, convenience and willingness to talk to trained doctors are some of the major factors behind patients' adoption of tele-healthcare service (10, 11). The doctors also promoted awareness on thoughtful medicine use among patients and was appreciated for helping patients to find the right medicine from local pharmacies. This is important as there is a prolonged problem of

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unregulated sale of medicines by unauthorized personnel in Bangladesh (12, 13). The service empowered women to contact the doctors by themselves as well as inspiring husbands to make calls on behalf of their wives and participate in learning new information about mother and newborn baby's health. Paper-2 presents a list of recommendations including linking health facilities with the consultation service for real-time referrals and involving local midwives and community health workers to arrange deliveries and emergency referrals (14, 15). As the consultation service could only be accessed at the normal call rate, it was possible that subscribers from low-income households did not utilize the consultation service. Therefore, a sustainable business model is required to offer the service free of cost to the subscribers.

Paper-3 and paper-4 investigated the underlying factors (research question-3) that may have impacted on women's adoption of mHealth messages around pregnancy, delivery and postpartum healthcare practices. In paper-3, a follow up qualitative exploratory study was conducted to understand women's socio-cultural experiences on the adoption of mHealth messages while in paper-4, the impact of women's 'singular' and 'shared' access to messages on their service experience and pregnancy behaviour was investigated. Findings from these two papers are congruent with other studies in identifying the challenges in accessing mHealth services (16-22). These are: 1) technological challenges at the individual level which includes lack of adequate skills to operate mobile phones and access extended service options such as retrieving messages or dialling the service short code for service related queries or the medical consultation service, 2) lack of adequate education (completion of secondary school) to comprehend voice and transliterated text messages, share the messages with others and follow instructions, 3) programmatic limitations in organizing orientation programmes for subscribers on how to access the service, 4) lack of a dedicated phone that can be accessed by subscriber women without relying on family members and 5) lack of programmatic funds to offer the service free of charge to subscribers. Apart from these

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challenges, young women (<25 years) in particular may not adopt mobile phone instructions around delivery and birth preparedness due to socio-cultural pressure from their husbands and mothers-in-law and a lack of experience. Field reports from the survey suggested (supplementary information-4) that in some areas women were not allowed to meet and greet outsiders, even female community health workers and relied on instructions of elderly male and female family members. Women's sole and uninterrupted access to messages contributed to higher satisfaction with the service, improved knowledge of the service short code and improved diet during pregnancy while satisfied subscribers inspired others to enrol in the service. Co-factors such as women's higher socio-economic status impacted on their frequent and uninterrupted access to messages and also their nutritional uptake. Previous studies suggest that in poor income households women tend to spend their finances on their family and children rather than taking care of their own health (18). These findings suggest that mHealth services that do not address socio-economic issues have a limited effect on maternal healthcare practices in low-income households.

The four papers in this thesis substantiate the conceptual framework (described in Chapter-2) representing how women access the service, adopt the messaging and counselling service and implement this information during pregnancy, delivery and postpartum period. Findings from paper-1, paper-3 and paper-4 confirm socio-cultural background that affects women's access to messages and expected behavioural outcomes. Paper-3 and paper-4 further confirms how women accessing the phone may change their perception about the service. It was established from paper-3 that women had access to local healthcare facilities and healthcare campaigns organized by the local Government and NGOs meaning the mobile phone messages would need to be interesting and contextual to generate interest among women. Paper-2 exemplified the intention to implement the advice and re-accessing the service when the subscribers and their husbands (social influence) found this useful. My findings are congruent with previous research that suggests that subscribers will

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adopt new information only when it is useful, relevant and presents relative advantages over the existing system (23). Additionally, trust is a mediator in the adoption process. A positive outcome related to the service's advice will encourage subscribers to retain the service but if the provider is unable to meet expectations or keep promises made at the time of enrolment, subscribers are likely to discontinue the service (10, 11). Providers should recognise the need to meet subscribers' expectations which are shaped by individual experiences, disposition, preferences and socio-economic background. For example, one participant in my study did not require pregnancy messages because of a non-complicated pregnancy whereas the consultation service was a source of relief for a pregnant woman who had a history of miscarriages. In South Asian households including Bangladesh the health communication process follows a hierarchy depending on the level of birth complications; for example elderly female family members often coordinate the delivery process at home and men are only involved when the delivery becomes complicated and the pregnant woman needs to be removed to a health facility (24-27). As my conceptual framework suggests, implementation of the mHealth service entails consideration of multiple factors to bring about desired behavioural outcomes.

7.2 Use of mixed methods approach in mHealth service evaluation

Mixed methods studies are commonly used when researchers are evaluating mHealth or tele-healthcare services (28-32). While conducting my research I have used data from various sources which gave me an opportunity to look at the operational aspects of the service as well as the experience of the subscribers embedded in their socio-cultural context. As planned, I used an explanatory sequential design to investigate the differences in adoption of mobile phone based messages among subscribers by conducting follow up qualitative interviews with respondents (paper-3) who participated in a survey (paper-1). While the quantitative analysis was able to

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demonstrate the association of exposure to messages with expected behavioural outcomes, the qualitative interviews were instrumental in providing a deeper understanding of the operational challenges of the service, the needs of target women and the landscape of maternal healthcare practices in Bangladesh. Another explanatory sequential design to investigate research question-2 involved descriptive analysis of call centre data and interviews of callers and doctors which provided a full picture of the operations of the call centre such as who were the callers, the use of call triage in risk assessment and referral, the level of advice that can be practically given by a doctor without physically seeing a patient, limitations of the service, and the expectations and perceived benefits by subscribers and their families.

Apart from providing a broader perspective of the mHealth service, the mixed methods approach filled the gap encountered in the sample size and study design. For example, in paper 1 the sample size and power was inadequate to capture small differences in outcomes associated with women's exposure to birth preparedness messages during pregnancy. The weakness in the study design in paper-1 was mitigated in follow up interviews of study respondents in paper-3 and elaborated the findings of paper-1. The explanatory sequential design was an appropriate choice for this study as the objective of the research was to measure the outcomes of the intervention rather than designing the study. Usually an exploratory sequential study design consisting of a qualitative study prior to a quantitative study is conducted to help researchers understand which measures should be evaluated in subsequent studies (28). The mixed methods study design also affirms the conceptual framework in identifying the underlying factors that affect women's access to mobile phone based health services, intention to adopt mHealth services and implementation of healthcare practices.

7.3 Way Forward

Overall, these findings show that mHealth service has transitioned from being 'ready to adopt' to 'being in use' status within the past decade (33). As mentioned earlier, mHealth is not a new concept in Bangladesh and has been piloted in a limited way by different entities since the beginning of the millennium (34). Previous research tested the feasibility of launching large scale services while my research captures a snapshot of usability of a mHealth service that has scaled and is accessible from any part of Bangladesh (17, 35-37). My findings are in agreement with those of previous researchers that mobile phone based messages and associated services can bring about improvements in maternal and new-born care practices and can work as a catalyst towards promoting the wellbeing of mother and children (38-42). My research adds to the growing evidence on voice messaging services in South Asia where investment in mHealth service is encouraged by the Government (20, 43). However, it is difficult to ascertain the impact of mHealth services on specific behaviour changes as most of the outcomes are self-reported and may have been influenced by other on-going interventions. Interpretation of my research regarding the effectiveness of voice messages during pregnancy and childbirth requires special consideration as the surveys were conducted almost six years ago. Evidence from the latest national surveys and policy reports indicate simultaneous improvement of maternal and under-5 child health indicators that has occurred during this period as a result of continuous monitoring and evaluation of health strategies, increased budget and investment in the healthcare system and leadership by the Bangladeshi Government (44, 45).

Secondly, mHealth cannot promise an equitable service unless each subscriber woman has access to their own phone. Evidence shows that women's ownership of a phone is associated with their access to maternal healthcare services (46). In low-income households, phone ownership is subject

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to gender disparity and influenced by women's socio-economic status, education and age (47-49). Also, mobile phone usage is not consistent in low-income households; registered subscribers cannot be traced back when they frequently change their SIMs and when mobile phones are switched off, damaged, lost or stolen (20, 21, 49). It is not financially viable for mHealth implementers to give phone sets to a large number of women (around 40% for Aponjon service) who share phones with family members. We also need to consider the lack of motivation towards accessing mobile messages among women from low-income households who have not yet embraced the western ideal of self-care and self-management during pregnancy and instead consider pregnancy to be a normal phenomenon not requiring intervention (10, 50, 51). Hence, mobile phone messages designed to support self-care and self-management may not be a plausible solution for low-income households.

And lastly, the influence of social media on adoption of maternity and parenting messages among urban educated women is under-researched in developing countries (52, 53). Due to the growth of smartphones and women's empowerment, the barriers to accessing the internet among South Asian women are gradually disappearing; women's participation (mostly in urban and semi-urban areas) in social media blogs and posts has climbed in recent years in Bangladesh (53). A report on monthly social media usage in 2018 claimed that there were 30 million Bangladeshi Facebook users where 93% accessed the site through their mobile phones and 24% of them were females (54). Social media especially Facebook has revolutionized communication across the globe and has provided a platform where women increasingly discuss topics on parenting, pregnancy and postpartum healthcare with peers (52, 55, 56). A study showed that the discussion forum on social media shaped women's ideas on vaccination where there were clearly two groups who wanted to comply with the national requirement and others who were against it (52). As in high-income countries there are multiple online Facebook pages that provide consultation and information on pregnancy,

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delivery and new-born care to Bangladeshi women by specialist doctors. The effect of social media on parenting can be profound thereby requiring further investigation and thorough research. Comprehensive mobile phone apps in high-income countries such as 'Baby Connect' give new mothers the tools to monitor baby's growth, feeding and milestones, compare growth charts, get notification from nannies through web interfaces and exchange information on a real time basis with spouse, nannies or day care centre from their android, iphone or ipad (55). Although such a comprehensive mobile app is yet to launch in Bangladesh, 'Tonic astha' and 'Tonic shurokkha'- two apps developed by the largest telecom operator Grameen Phone provides appointment facilities with specialist doctors and a 24*7 tele-consultation service with doctors to parents with under-5 children (57). In recent years Aponjon service has also developed "Aponjon shogorbha" app for smartphone users (58, 59). Research is warranted to understand the adoption and effect of mobile health apps on Bangladeshi parents and children for future services.

I suggest the following recommendations based on my findings and literature review that need to be considered to implement a mHealth service for maternal, new-born and infant healthcare in resource limited countries like Bangladesh:

1. Contextual and effective content: Because developing countries have undergone intensive health interventions to meet the targets of MDG, mHealth services should aim at collating contextual content and new information. For services like Aponjon that have a differential pricing strategy to ensure service sustainability, it is important that subscribers are interested in the content of the messages and are willing to pay (10, 60). For example, subscribers may be more interested in getting practical information on how to prepare the first solid food for the infant or how to preserve breast milk for a few hours rather than widely campaigned information on exclusive breastfeeding. mHealth service implementers can build on experiences of previous research where messages

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targeted to vulnerable populations (HIV/AIDS mothers) improved expected behaviour (attendance for infant Polymerase Chain Reaction within six weeks after birth) (61).

It is also important that subscribers establish an emotional and trusted relationship with the service which can be attained through culturally-sensitive and locally adaptive messages. Pre-testing the messages before roll out is crucial in this context. For example, Aponjon created two versions of messages for urban and rural subscribers as urban subscribers could not relate themselves to rural settings (58, 62). Similarly, because of client's feedback, the voice persona in voice messages for 'Hello Mama' service in Nigeria is a female doctor for female subscribers while male family members receive messages from a male doctor (58).

2. Capacity building and involvement of local healthcare providers: Involvement of community health workers in rural settings can help explain messages to women with low literacy. Community workers empowered with mobile apps and video materials may provide improved counselling services to subscribers (63). Additionally health workers may discuss symptoms with the doctors of the consultation service and arrange emergency referrals as appropriate (15).

Community health worker-assisted registration service is a useful approach for implementers in resource limited settings for various reasons; first, women in remote settings who otherwise cannot be approached by the implementers can enrol in the service with the aid of their local health workers. Second, it is easier for implementers to gain trust of potential subscribers when the service is offered through a local 'trusted' person (11, 58). Third, community health workers can ensure that only target women (pregnant or mother) and their family members can enrol in the service. It was documented by MAMA country reports that self-enrolment options in Bangladesh (Aponjon service) and South Africa could not confirm identity of subscribers, allowed for false and duplicate subscriptions and enrolment of subscribers who were not pregnant or even females (58).

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Future implementers can take on lessons from Aponjon service in Bangladesh that recruited most (approximately 96%) subscribers to the service through community health workers of partnering NGOs (58, 62). However, the service later experienced a decline in retention rates and acquisition quality which could not be overcome by refresher training and follow-ups with partnering NGOs (58). The community health workers were burdened with multiple responsibilities from their regular NGO jobs and could not maintain quality of their work although Dnet (the implementing agency of Aponjon service) allocated incentives for each successful subscription if the subscriber stayed with the service for at least 2 months and received a minimum of at least eight messages (58). Hence, Dnet gradually decreased involvement of community health workers of partnering NGOs in assisted subscription and deployed their very own “info ladies” (community agents) in select areas (58). Future implementers should consider enough resources to arrange training and refreshers and build a real-time monitoring system of field work activities.

3. Improved referral and prescription service: It is important to set up a proper referral service to respond to delivery and new-born emergencies and to make follow up calls to patients who had been referred due to severe symptoms. Establishing a proper referral service requires integration with national health infrastructure, data syncing and integration and a robust technological platform (43). The Bangladeshi Government has undertaken the mammoth task of integrating heterogeneous data from all the public and private health service implementers in a master database to accommodate linkages between local healthcare providers and facilities (45). The 4th sector plan introduced electronic registration and tracking of pregnant women to ensure effective maternal health services. Data from all public health facilities regarding treatment and services for MNCH, immunization, communicable and non-communicable diseases are regularly now collected in a central Management Information System (MIS) for the purpose of storage, dashboard display, monitoring and decision making. Collaboratively, with international organizations such as WHO and

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the International Centre for Diarrhoeal Disease Research Bangladesh (ICDDR,B), the MIS included geo-spatial mapping technology and collated data from all public facilities to monitor allocation and performance of public healthcare providers in real time. eHealth records or shared health records (SHR), through which patient data can be transferred from one facility to another without troubling the patient to carry their medical files, is currently being piloted in two *upazilla* (sub-district) health complexes and one general hospital. The central MIS provides a platform to gather data from other non-government organizations and monitors a collective approach towards achieving targets set by SDG (45). Budget constraints have been a concern for deploying and scaling all necessary elements for proposed MIS initiatives (64).

Although the central MIS system introduced by the Government is yet to be finalized, call centre and mobile app based private services such as ‘Call a doctor’ that organizes a home-based GP service, diagnostic tests and medical check-ups in selected areas of Dhaka city for urban residents who have access to smartphones, can be adopted in other resource limited countries where the use of smartphones is booming (65). It is possible to track the location of patients and provide them with an emergency transport service with Global Positioning System (GPS) trackers in smartphones (14, 65, 66). mHealth implementers should consider options to send electronic prescriptions to patients via SMS/ MMS after each consultation with doctors so that there is no confusion about spelling and dose of medication and referral places. Similarly, a robust infrastructure would allow patients to access their prescriptions and personal electronic medical records through their mobile phone apps (67).

Telehealth referral and prescription system has been extremely useful during the wake of the coronavirus disease (COVID-19) outbreak, which was declared as a pandemic by WHO on 11 March, 2020 (68, 69). The pathogen, a novel coronavirus known as SARS-COV-2 was first reported to be

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infecting people with pneumonia type respiratory symptoms in Wuhan city of Hubei Province in China, in December 2019 (69). In the beginning of 2020, the virus transmission rapidly engulfed the world within months, infecting millions of people and causing fatalities, and eventually disrupting the way people travelled and conducted their businesses. Countries around the world implemented tough border closures, social distancing measures, self-isolations and quarantines to prevent the daily incidence rates (70). During the pandemic, the hospitals and healthcare system around the world have been overwhelmed with an increased rate of patients with COVID-19 symptoms who required critical intensive care (71, 72). As a response to mitigating support for COVID-19 patients, protecting vulnerable people and ensuring safety of the health workforce, the Australian Government imposed temporary ban on non-urgent elective surgeries and introduced Medicare Benefit Scheme (MBS) supported telehealth consultation and referral system for all Australians including items specific to mental healthcare, perinatal depression, obstetrics and midwifery (73-77). The call centres have potential to manage the triages and referrals in order to maximise efficiency of the emergency units of the major hospitals (78). The Australian Government initiated General Practitioner-led respiratory clinics to screen and manage COVID-19 patients. General Practitioners (GP), specialists and healthcare workers at respiratory clinics have been accessing the telehealth system to update patient's symptoms and history, generate prescriptions and refer patients to other health facilities for further tests and treatment (79, 80). After a remote consultation with patients, the GPs can send the image of the prescriptions to pharmacies via email, fax or text and can organize delivery of prescribed medicines to the patient's home through the pharmacies (81). Although telehealth models, during the recent pandemic period, have seen rapid escalation plans, adjustment in health practices and allocation of budget by the developed countries, similar implementations in developing countries are bottlenecked by a lack of infrastructure, smartphones, network connectivity and proper legislation (82, 83) .

4. Service orientation: For optimal outcomes and access to the service it is essential that subscribers and their family members are well informed about the service i.e. frequency of messages per week, length of the service, how to upgrade the service from pregnancy to new-born service, how to re-enrol to the service, when to expect the messages, how to contact the service provider or 24*7 hotline service and how to record and store voice messages for later use (Annex-3). Earlier research suggested that lack of awareness about existing mHealth services contributed to low uptake of the service (84). Hence, subscribers should receive as much information as possible about how the service works and have a contact number to reach the service provider as needed.

5. Equity: Low socio-economic status can prevent women from accessing healthcare services compared to their wealthier counterparts (85, 86). Field reports suggest subscriber women from low-income households were unable to buy foods as instructed by Aponjon messages (Annex-3). Hence, a demand-side financing strategy such as cash incentives on completion of milestones and subsidized hospital fees and obstetric care service for low-income households should be considered by mHealth implementers to support expected behavioural changes (87, 88).

6. Existing infrastructure and services: mHealth will be at its best when this service is integrated in the national health system (33). mHealth implementers should assess the quality of the service offered by the local health facilities and availability of formal health providers prior to launching the service. For example, if there is a trend of home based delivery in the intervention area, the implementers should consider additional training programmes for local *Dais* and sensitization of family members by group counselling on delivery and postpartum care.

7. Reporting of outcomes: The method of selecting and measuring the outcome indicators is crucial for evaluation of effectiveness of mHealth service. As most developing countries have undergone heavy interventions to meet the targets of the millennium development goals to reduce maternal

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and under-5 child mortality, regular mHealth messages are less likely to bring about significant changes in an intervention group. For example, evaluation of women's knowledge and practice around Tetanus Toxoid (TT) vaccination may not provide a true picture of new information they have learnt from a mHealth service as these vaccines are widely campaigned and administered by community health workers, local health facilities and providers during antenatal care visits (89). Therefore, the outcome indicators should be unique and carefully selected.

The other issue is not having adequate funds for conducting robust research throughout the scaling process. In the case of Aponjon in Bangladesh and MomConnect in South Africa there was no baseline or comparison group because of lack of funds and operational difficulties, hence it was difficult to ascertain the impact of the service on the target population (43, 58). Therefore, planning of a comparison group is essential during the pilot phase.

There are additional issues related to data collection methods. For example, self-reported behaviour such as number of postnatal care visits may give rise to problems with recall bias whereas hospital records or community worker's patient record books provide consistent and valid data. Similarly, anthropometric measurements of a new-born baby can provide valid information about the association of pregnancy messages with birth weights of new-born babies (61, 90).

While reviewing mHealth initiatives in Bangladesh I found a gap in reporting of interventions. It was difficult to ascertain the effect of interventions or how the interventions ended. Hence, It is important that reporting of mHealth interventions on maternal and child health in resource limited settings like Bangladesh to follow the mHealth evidence reporting and assessment (mERA) checklist, which was developed by the WHO mHealth technical evidence review group (MTERG) in 2016 (91). The checklist contains 16 items and is applicable to all study designs unlike other frameworks such as CONSORT- EHEALTH, which are study design specific and focus on methodological rigour (91, 92).

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The mERA checklist does not support the design or implementation of mHealth interventions; rather it is “intended to improve transparency in reporting and promote a critical assessment of mHealth research evidence” (91). The mERA checklist recommends that researchers and practitioners report on 16 criteria; infrastructure (physical), technology platform (description of software and hardware), interoperability/ health information system context (description of integration of mHealth intervention to existing system), intervention delivery (description of service mode), intervention content, usability/content testing (description of formative research), user feedback, access of individual participants (all sorts of barriers and facilitators at individual level), cost assessment, adoption inputs/ programme entry (recruitment strategy), limitations for delivery at scale, contextual adaptability (any tailoring or modification from the pilot), replicability, data security, compliance with national guidelines and regulatory statutes and fidelity of the intervention (explanation of strategy to assess fidelity of the intervention) (91).

8. Funding: Sustainability and financial issues have shortened the lifespan of many mHealth services in the past (93). Although a cost-effectiveness study was beyond the scope of my research, one can predict that Aponjon service like its predecessors would follow the same path if the implementers fail to identify a sustainable business strategy. Bangladesh DNS diagnoses centre discontinued their telemedicine service because of a lack of adequate funds (34). Without continuous support from funding partners mHealth implementers are less likely to maintain the operational cost, conduct rigorous research and adapt with changing technology let alone arrange subsidies for the low-income households. Implementers are likely to encounter challenges when they want to replicate the successes of a controlled pilot to a scale-up context with changed demographics and resources (94). Additionally, scale-up in low-income countries can be difficult as there is a funding gap at community, national and global levels where implementers are required to accommodate diverse clients from both the very poor and the higher socio-economic status with different needs (94).

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As telecommunication giants and corporate bodies are providing similar services at cheaper price or free of cost, it will be unrealistic to design a sustainable business model through revenue generated from subscriptions (58). Hence, a stable on-going funding source is crucial for scale and sustainability of a mHealth service, continued development of technology platforms, research and innovation, capacity building and responding to the needs of the clients (33, 43, 58). Before scale-up it would be realistic for the implementers to spend enough time to let the service mature, to understand the local context and politics, arrange financial support from the local Government, prepare an affordable technology platform and adopt a sustainable business model (94-96). Minimizing the service cost is a commendable strategy to ensure long term sustainability of the service. A good example is the partnership between the Rwandan Ministry of Health and telecom operators which reduced the cost per SMS by ten-fold for a mHealth project disseminating health education messages to improve maternal and child healthcare practices (95, 97). Aponjon service also was able to reduce the cost of voice and text messages when the Bangladeshi Ministry of Health and Family Welfare intervened in the negotiation with the telecom operators (58). It is also important that there is a synergy between the donors and the local Government on how to spend the fund on different items of the service (96).

9. Partnership: Partnership and collaboration between diverse stakeholders (such as patients, providers, corporate, government agencies, donors and researchers) is another undeniable component of integrating mHealth service in the public health system (43, 62, 93, 94, 98). Implementers need to engage with the target community to understand their need and readiness as well as build partnership with partner organizations and donors (94). While identification of partners and negotiation with them can be time consuming, the right partnership may resolve logistical issues and sharing of human resources. For example, the Aponon service experienced delays in reaching some areas through community health workers when negotiation with partner NGOs

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required longer time than expected. Again, the difference in capacity and interest of telecom operators had delayed their integration in the service which in turn had delayed reaching out to a large subscriber base in Bangladesh. Therefore, mHealth implementers should consider the time, communication skills and resources before scaling the service.

10. Technology platform: A robust technology platform with well-planned architecture and in-house expertise is a prerequisite for the success of any mHealth service (58). Because any change in service modality can be costly, it is important that the platform is well researched and well planned before implementation. For example, Aponjon service included the specification of preferred time slots for the service which was initially not planned and incurred higher cost for the platform (58). Service modality can add complexity in the system. For example, MAMA South Africa service used multiple message channels with multiple partners which resulted in delay in fixing errors as the root of the problems that originated in different sources remained unidentified (58).

The choice of service mode can increase the cost. For example MomConnect, the flagship programme of the South African National Department of Health that provides free text messages to pregnant women, received financial support from international donors and received generous discounts from all the major telecom operators in the country on SMS cost, yet faced challenges with long-term sustainability as monthly mobile phone inventory cost alone accounted for about three quarters (USD 60000 per month) of total running cost (20).

Choice of technology vendor is also crucial. In developing countries often aggregators are selected who have a common platform with the telecom operators. In the case of MAMA programmes in four countries (Bangladesh, India, Nigeria and South Africa), only South Africa had the required technology expertise to build and control their own platform. Other countries including Bangladesh faced challenges with their vendors on multiple issues (such as real-time monitoring of community

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health worker's customer acquisition activities) and later assembled an internal team to implement their requirement (58). Since building the technology platform from scratch requires huge investment, implementers should strengthen their in-house capacity and do their research before appointing the vendor.

7.4 Conclusion

Although this research is limited by the availability of Aponjon data and does not contain information on the service business model, it presents evidence on the effectiveness of the first voice messaging service in Bangladesh around behavioural outcomes around pregnancy, delivery and postpartum practices. I have adopted a theoretical framework and have followed the mERA checklist wherever possible in the composition of each paper (91). Despite the lack of a formal control group and a small sample size in the survey due to operational limitations, the survey results aligned with independent evaluations. Other studies also found little to no association between unidirectional messages and maternal healthcare practices (43, 60).

The subscriber women interviewed in my research were mostly from rural areas due to the subscriber acquisition strategy of Aponjon through community health workers. Hence, my research does not include the experiences of urban women who are likely to be more technically skilled and able to make decisions around healthcare for themselves and their children (99). I argue that mHealth services will not generate much improvement in low-income households where complex socio-cultural dispositions shape women's choice on healthcare. I suggest that self-care and self-management services through the use of mobile phones should only be offered to women who have completed secondary education while women with low literacy should continue to be visited by health workers with improved counselling material and referral services. The 24*7 consultation with doctors may be more effective in providing real-time advice to parents although Bangla text

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messages could be a low-cost communication channel between provider and subscribers in Bangladesh. The consultation or telemedicine services should be subsidized for low-income households and should include plans for outgoing follow up calls on treatment plans and referrals and sending of scanned prescriptions to patients. mHealth implementers could also collaborate with pharmaceutical companies and local pharmacies, coordinate sending prescriptions (via email or text messages) to designated pharmacists and deliver medicines to patients' homes at affordable prices (81).

During my 5.5 years (part-time) PhD journey many novel ideas around mHealth service have emerged, although only a few have scaled up at the national level (20). Understanding the operational challenges and funding constraints that mHealth implementers are likely to encounter, I question whether all mHealth services should be provided at the national level. Instead, I propose that mHealth implementers should collaborate with state authorities or Government projects to provide vertical support in neglected geographic areas instead of exhausting their resources by scaling-up. There should also be proper regulatory guidelines from the Government to keep the service tariff at an affordable price. The objective of a mHealth service or any health intervention should be to create a healthy population collectively rather than competing with contenders. The recent COVID-19 pandemic has established the need for remote consultation and triage referral services when physical visits to GPs and local health facilities are not possible. Governments and policy makers around the world have felt the pressure to strengthen the telehealth infrastructure during the time of the pandemic and have allocated budget to establish new call centres and electronic referral and record system, train health professionals on how to provide remote health services to clients through phone or online services and provide subsidized remote healthcare services to citizens (100). It is expected that many who were not interested in telehealthcare services in pre-COVID period would sign up for such services. The changing dynamic in health

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infrastructure and service delivery brings opportunities for mHealth implementers to review the needs of their clients, adopt new strategies to strengthen their platform and collaborate with the Government. I conclude my thesis, with the hope to watch the novel telehealthcare initiatives expand and strengthen in the coming years.

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Annex-1: Definitions and terms

In this thesis I have used definitions and terms as following:

Classification of countries: All (189) World Bank member countries and all other economies with population more than 30,000 were classified by the World Bank atlas method into economic groups according to gross national income (GNI) per capita in 2017 (1). The groups are: low income (\$995 or less), lower middle income (\$996-3895), upper middle income (\$3896-12,055) and high income (\$12,056 or more) countries. According to this list most countries in South Asia such as Bangladesh, Bhutan, Pakistan, India and Sri Lanka fall under the lower middle income group; while two countries Afghanistan and Nepal to low income and the Maldives alone to the upper middle income group (1).

Maternal mortality: According to the World Health Organization (WHO) “maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes”. Maternal mortality ratio (MMR) is calculated as maternal deaths per 100,000 live births in a specific area (2).

mHealth: The WHO identified mHealth as a component of eHealth (3); while eHealth includes a spectrum of information communication technologies (ICT) such as computers, telephones and wireless communication in health services mHealth is considered a subset that operates through mobile phones (3, 4). The Global eHealth observatory of WHO defined mHealth or mobile health as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”(3).

Millennium Development Goals:

Millennium Development goals (MDG) was a set of measurable goals and indicators declared by the secretary general of the United Nations in 2001, to assess economic, education, health, equity and sustainable development progression among 189 member states between the period of 1990-2015. “Roadmap towards the implementation of the United Nations Millennium Declaration” presented by the secretary general in the general assembly in 2001, presented a framework of 8 goals, 18 targets and 48 indicators to measure progress towards the MDGs which was expanded to 21 targets and 60 indicators in 2008. The eight goals (goal 1-eradicate extreme poverty and hunger, goal 2- achieve universal primary education, goal 3- promote gender equality and empower women, goal 4- reduce child mortality, goal 5- improve maternal health, goal 6-combat HIV/AIDS, malaria and other diseases, goal 7- ensure environmental sustainability and goal 8- develop a global partnership for development) and indicators were the results of on-going discussions and recommendations in the 1990s by the UN system, the World Bank, the International Monetary Fund (IMF), the Development Assistant committee (DAC) of the Organisation for Economic Cooperation and Development (OECD), which were assembled under the office of the UN secretary general into a common framework (5).

Achieving MDG 4 (reduce child mortality) and MDG 5 (improve maternal health through MDG5A and MDG5B) was vital for countries like Bangladesh and Sub-Saharan countries which were burdened with high child and maternal deaths. MDG4 targeted to reduce under-5 child mortality by two-thirds between 1990-2015 by lowering under-5 and infant mortality rate and improving coverage of measles vaccination among infants. MDG5A targeted to reduce maternal mortality ratio by three quarters by improving proportions of delivery attended by skilled birth attendant. MDG5B aimed at ensuring universal coverage to reproductive health by improving contraceptive prevalence rate,

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adoption of family planning method and antenatal care coverage and reducing adolescent birth rate (5).

Neonatal, perinatal, infant and under-5 child mortality: Neonatal deaths are deaths of new born within the first 28 days after birth and perinatal deaths include deaths in the first week of life and foetal deaths (stillbirth). Neonatal deaths are also divided into two stages; death within the first week of birth is considered early neonatal death and death after first week of live and before 28 days is considered late neonatal death. New born babies older than 28 days and younger than one year of age are called infants (6).

Neonatal mortality rate (NMR) is calculated as the number of neonatal deaths divided by the number of live births in a specified area multiplied by 1000. Infant mortality rate (IMR) is calculated as the number of death of infants divided by the number of live births in a specified area multiplied by 1,000 (7).

Sustainable Development Goal 3 (SDG 3):

Moving forward from the millennium development goals (MDG) in 2015 the United Nations (UN) has set seventeen sustainable development goals (SDG) to be met by 2030. The objective of SDG 3 is to ensure healthy lives and promote well-beings for all at all ages. Among other objectives SDG 3 aims to reduce the global maternal mortality ratio to less than 70 deaths per 100,000 live births, neonatal mortality rate to 12 per 1000 live births and under-5 mortality to 25 per 1,000 live births by 2030 (8).

Annex-2: Chapter-3

The following table (Table 1) provides additional background information of respondents of paper 1.

Women's length of the service may improve their knowledge on the service. For example, more (62%) women in the exposed group reported of receiving two messages a week than women in the non-exposed group (46%).

Table 1. Additional background information of respondents

Variables	Exposed (n=210) N (%)	Non-exposed (n=266) N (%)
Specified time slot to receive calls or SMS		
8 a.m.-12 p.m.	65 (31%)	78 (29%)
12-4 p.m.	46 (22%)	62 (23%)
4-8 p.m.	57 (27%)	78 (29%)
8-11 p.m.	38 (18%)	46 (17%)
Missing	4 (2%)	2 (2%)
No. of messages accessed by respondent women per week		
0	14 (7%)	58 (22%)
1	65 (31%)	84 (32%)
2	131 (62%)	124 (46%)
Occupation of respondent women		
Housewife	198 (94%)	254 (95%)
Student	5 (2%)	4 (1%)
Paid job	7 (4%)	8 (3%)
Education of husbands		
None or primary	36 (17%)	61 (23%)
Junior Secondary	116(55%)	115 (43%)
Secondary or higher	56 (27%)	87 (33%)
Don't know	2 (1%)	3 (1%)

The survey of 476 mothers captured information on women's perceived knowledge and behavioural change during postpartum period from Aponjon messages (Table 2). Aponjon boosted women's confidence in taking care of new born baby. Subscriber women indicated talking to Aponjon doctors

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for any query or emergency. Although the rate of vaccination (BCG) was high for infants, less than a third of women complied with the guidelines to exclusively breastfeed for 6 months.

Table 2. Perceived benefit from Aponjon postpartum messages (N=476)

Variables	N (%)
Knowledge	
Learnt about lactating mother's diet	154 (32.3%)
Learnt that oil or unauthenticated material should not be put on umbilical stump/belly button of new born	140 (29.4%)
Learnt that healthy baby will be active and play	102 (21.4%)
Learnt about infant's age appropriate nutrition and meals	287 (60.3%)
Learnt how to communicate with baby	195 (40.9%)
Learnt that healthy baby pees 6-8 times a day	116 (24.4%)
Learnt about vaccination schedule	204 (42.8%)
Learnt about baby's growth and development	300 (63.0%)
Gained confidence in taking care of baby	416 (87.3%)
Received support from family members	129 (27.1%)
Learnt about cleanliness	244 (51.2%)
Behaviour	
Administered BCG vaccine	465 (98.3%)
Infant exclusively breastfed up to six months	107 (23.9%)
Talks with Aponjon doctor for advice	37 (7.77%)

Annex-3: Chapters-3 & 5

The special notes in the survey data provide important insights from the field researchers on what they encountered during interviews. The survey database of Aponjon was semi-structured so that field researchers could record notes at the end of each interview. The observations are relevant to operational challenges of mHealth service:

- a) **Mobile network and operators:** In paper-3 respondents talked about problems with the mobile network in their community. Problems with the mobile network were widely mentioned by survey respondents of Kahalu, Nandigram and Dhupchachia villages in Bogura district where most of them inhabited mud houses. Most of the respondents complained that they received no mobile signals once they entered their mud houses. However, field researchers observed that the problem with the mobile network persisted



- throughout the villages irrespective of the mud houses. Sometimes mobile operators had down time in their service which also affected timely delivery of Aponjon service.
- b) **Socio-cultural influence:** The Purdah system (a religious system which requires women to cover themselves with a veil or curtain from unauthorized personnel) (9) and elderly family members' influence barred women from accessing mobile phone based health service in some parts of Laxmipur. Here women were not allowed to meet outsiders (even female field

researchers) without the consent of their mother-in-law or superior male family members.

Although the health worker who recruited the subscribers helped to locate the houses, field researchers were not welcomed and were not permitted to interview some women.

Apart from religious seclusion, severe river erosion that has caused loss of houses and agricultural lands may have diverted women's attention from lesser important issues in life such as receiving health education messages. And there were also some elderly female family members who did not allow their daughters-in-law or sons to follow Aponjon's instructions.

- c) **Training:** Involvement of community health workers of different NGOs in recruiting subscribers for mHealth services requires thorough planning, human resources, partnership management strategy, budget, training and monitoring. Field researchers for Aponjon survey' 2014 found that many subscribers, who were recruited through health workers, were not informed about the price of the service at the time of enrolment and were upset when their mobile balances dropped after receiving messages. Therefore, many decided not to receive the calls (voice messages). Some health workers promised their subscribers a free service although the decision of fees waiver was determined by system generated algorithms based on socio-economic factors (such as household income, occupation of the household head and role of subscriber women in household income) and was unaffected by man-made decisions. Hence, when the subscribers did not get the free service because they did not meet the prerequisites, they were frustrated.

As well as the price, subscribers were not informed about the purpose, frequency and timing of the messages in some instances. Some subscribers did not pick up the calls initially because they were unaware of the service short code although they liked the messages

when they accidentally picked up the call. Some commented that they would have received the messages from the beginning if the health worker had told them about the benefit of the messages. Some health workers also did not instruct subscribers to keep a minimum balance in their phone to receive the calls. Some were receiving text messages although they were unable to read transliterated text messages. There was also a lack of effort from health workers in confirming that the mobile phone numbers were actually accessible by target women. For example, many subscribers provided the phone numbers of their husbands or male members who resided in the city for work and visited home occasionally. Enrolment of subscribers by health workers may have caused recruitment bias as the service was only offered to women who were registered clients of designated NGOs. There was also confusion about the incentives for community health workers which may have impacted their field activity.

Therefore, partnership strategy and sound coordination between mHealth implementers and partner NGOs are required for arranging adequate training, refreshers and monitoring of health workers' recruitment activity.

- d) Problem with following messages:** The field researchers of Aponjon survey noted that in some low income households women were unable to comply with messages such as buying and eating nutritious food due to their financial circumstances. Besides, some women thought that they were not required to follow mobile phone messages as they received similar information from health workers. It was also apparent that health workers put more emphasis on pregnancy check –ups and birth preparedness activities. Hence women and their husbands were more interested in new born care messages because they were unfamiliar.

- e) **Service mode:** Aponjon's service mode was problematic. There were subscribers who opted for voice messages because there was no option for Bangla text messages. They complained that voice messages could not be stored and retrieved like text messages for future references.

The above field insights should be considered by any mHealth implementers who want to deploy educational services in remote settings.

Annex-4: Chapter-6

The following criteria exemplified factors that may have impacted how women accessed messages.

For example, most (36%) women who shared phones had chosen a time at night (8 -11 p.m.) to access messages because this is the time when male members return home after work and can lend the phone to subscriber women. In contrast, most (31%) women who accessed phones by themselves preferred a time in the morning (8-11 a.m.) when they were less busy with household chores.

Table: Background information of respondents pertaining to how they access messages

Variables	Singular access (n=253)	Shared access (n=206)
Voice or text message		
Voice	250 (99%)	204 (99%)
Text	3 (1%)	2 (1%)
Specified time slot to voice or text messages		
8 a.m.-12 p.m.	78 (31%)	45 (22%)
12-4 p.m.	51 (20%)	28 (14%)
4-8 p.m.	64 (25%)	57 (27%)
8-11 p.m.	58 (23%)	75 (36%)
Missing	2 (1%)	1 (1%)
Ownership of phone		
Respondents woman	229 (90%)	59 (29%)
Family member	24 (10%)	147 (71%)
Respondent woman's occupation		
Housewife	230 (91%)	199 (96%)
Student	8(3%)	6 (3%)
Paid employment	15 (6%)	1 (1%)
Education of husband		
None or Primary education	94 (37%)	110 (53%)
Junior Secondary Education	64 (25%)	40 (19%)
Secondary education or above	94 (37%)	55 (27%)
Not known	1 (1%)	1 (1%)

Annex

This table also confirms the socio-economic disparity that contributes to how women access messages. Women who had their own phone engaged in income generating work and had received junior secondary or secondary education were more likely to receive messages on their own than women who did not own their phone, did not work outside home and had no or primary education.

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Annex-5: Questionnaire for Chapter-3

Aponjon Sample survey questionnaire
2014

New mother

Interview ID: NM_____ (3 digits)

Location _____

Written consent for interview, photograph and audio recording:

Hi, my name is _____ and I am involved in a mobile phone based service research study called Aponjon (a brand service under the initiative of Mobile Alliance for Maternal Action). This research is initiated by USAID and implemented by Dnet with support of outreach partners BRAC, Save the Children USA, NHSDP, Infolady, Ministry of Health and Family welfare (Government of Bangladesh) and PM's Access to Information services programme.

You are selected as a participant of this study as you are either pregnant or mother of an infant and had been registered for mobile based service for the last couple of months. I will ask you to participate in a survey that would include questions about how you feel about the service, what changes the service made/may make in your life, feedbacks regarding the service and compliance with the payment process of the service. The length of the survey will be about one hour.

There should be little or no risk involved in participating in this research. If any of the questions make you feel uncomfortable, you do not have to answer them. Your participation is voluntary, and you can leave the survey or withdraw from the study at any time without any consequences to you. We will audio record the survey so that we can have a good record of what everyone says. We will transcribe (write down) the information from the recording and erase the recording after writing the final draft.

We may also ask to take photos of you. The pictures may be published in reports and journal articles but would never include your name or name of this venue. Photos may be posted online in reports or the project website. After we take the photographs, you may view them and request that they not be used.

The information from this study may be used in the future for other studies on similar topics. You will not benefit directly from participating in this research. If you wish to participate in this research we have some gift items from this service as a token of your valuable time to the survey.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. The information will be kept in a secure location where only the researchers in this study will have access. We will replace your name with a code. Data from this study will be kept indefinitely.

Here is my card with my name, contact information, name of the research organization responsible for the research. Please feel free to contact me in future if you have any question related to the survey. You might also check out your right to participate in the survey, in that case I can provide you with the contact details to USAID.

Do you have any questions about this research? Yes/No (Tick as appropriate)

Are you willing to participate in the survey? Yes/No (Tick as appropriate)

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Do you give us permission to take photographs of you? Yes/No (Tick as appropriate)

Thank you for your cooperation.

Signature & Name of interviewee

Signature & Name of interviewer

Date:

Time of interview: Start

End:

Annex

1. Interviewer's ID:

Background information

	Questions	Answers	Instructions for field researcher
2.	Respondent's Name: (Masked in the database)	Write here	
3.	Respondent's Registration ID (Masked in the database)	Write here	
4.	Type of respondent	☐ New mother (2)	
5.	Cell number of respondent (Masked in the database)	Write here	
6.	Type of Aponjon messages received	☐ Text messages (1) ☐ Recorded voice messages (0)	
7.	If receives recorded messages, then when is the time they receive messages?	☐ Between 8 am -12 pm (1) ☐ Between 12-4 pm (2) ☐ Between 4-8 pm (3) ☐ Between 8-11 pm (4)	
8.	What is the payment method for the service?	☐ The service is free of charge (1) ☐ Pays the regular service price (0)	
9.	Date of birth of baby	Write here (dd/mm/yyyy)	
10.	Address of respondent	Division District: Sub-district/Upazilla: Union: Village:	
11.	Education level of new mother	☐ Never attended school (1) ☐ Primary education incomplete (2) ☐ Primary education complete (3) ☐ Junior secondary (level 8) complete (4) ☐ Secondary education complete (5)	

		○ Higher Secondary incomplete(6) ○ Higher education complete (7) ○ Higher than HSC/More than 12 years of education (8) ○ Others _____(66)	
12.	Education level of new mother's husband	○ Never attended school (1) ○ Primary education incomplete (2) ○ Primary education complete (3) ○ Junior secondary (level 8) complete (4) ○ Secondary education complete (5) ○ Higher Secondary incomplete(6) ○ Higher education complete (7) ○ Higher than HSC/More than 12 years of education (8) ○ Others _____(66)	
13.	Occupation of new mother	○ Housewife (1) ○ student (2) ○ Day laborer (3) ○ Farm (4) ○ Fisher woman (5) ○ Driver –car/heavy vehicle (6) ○ Small businessman (owner of local shop etc.) (7) ○ Business man (8) ○ Govt. employees (9) ○ Private service holder(10) ○ NGO worker (11) ○ Garments worker (12) ○ Others _____(66)	
14.	Occupation of new mother's husband	○ Unemployed (1) ○ Student (2) ○ Day laborer (3) ○ Farmer (4) ○ Fisherman(5) ○ Rickshaw puller (6) ○ Driver- CNG (7) ○ Driver –Car/ Heavy vehicle (8) ○ Small business man (9) ○ Businessman (10) ○ Govt. employee (11) ○ Private service holder (12) ○ NGO worker (13) ○ Overseas worker (14) ○ Others _____(66)	

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15.	Monthly family income (BDT)	○ Below 5000 (1) ○ 5001-10000 (2) ○ 10001-20000 (3) ○ 20001-50000 (4) ○ 50001-100000 (5) ○ 100000 or above (6)	
16.	Sanitary latrine present at residence?	○ Yes (1) ○ No (0)	
17.	Age of baby	○ Below 28 at days (1) ○ Below 3 months (2) ○ Below 6 months (3) ○ Below 9 months (4) ○ Below 12 months (5) ○ Above 12 months (6)	
18.	Age of new mother	○ Below 15 years (1) ○ 15-19 years (2) ○ 20-24 years (3) ○ 25-29 years (4) ○ 30-34 years (5) ○ 35 and above (6)	
19.	How many children does respondent have?	○ 1 (1) ○ 2 (2) ○ 3 (3) ○ 4 (4) ○ More than 4 (5)	
20.	What is the age difference between the last issue and this one (in days, months or years)?	Write here:	
21.	Content version received	○ Urban version(1) ○ Rural version (2)	
22.	Aponjon service was registered for	○ New mother alone (1) ○ New mother and husband (2) ○ New mother and other family member (3) ○ Only husband (4) ○ Only other family member (other than husband) (5) ○ Others_____ (66)	
23.	Reason for interviewing this guardian	○ They received messages during pregnancy and now receiving for new mother and baby (1) ○ They are receiving messages for new mother (2) ○ They used to receive messages for new mother, but as the baby	

Annex

		crossed first birthday, not receiving messages anymore (3) ○ Others _____ (66)	
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Aponjon service related

	Questions	Answer	Instructions for field researcher
24.	Who enrolled you in this service?	○ Health worker (1) ○ From hospital (2) ○ Brand promoter (3) ○ New mother (4) ○ Respondent (guardian) called or texted to 16227 (5) ○ Others _____ (66)	
25.	Before enrollment, how did you find out this service?	○ From health worker (1) ○ From an Aponjon subscriber (2) ○ From hospital (3) ○ From Blue star clinics (4) ○ From a brand promoter (5) ○ Husband (6) ○ From TV (7) ○ From billboard (8) ○ From newspaper advertisements (9) ○ From SMS in my phone (10) ○ I received calls about this service (11) ○ From leaflet (12) ○ I don't know (98) ○ Others _____ (66)	
26.	Do you currently receive Aponjon messages?	○ Yes (1) ○ No (2) ○ Received it previously, but not anymore (3) ○ Others _____ (66)	
27.	On whose phone you receive messages?	○ New mother receives messages on her own phone (1) ○ New mother's husband's phone (2) ○ Other family member's phone (3) ○ Neighbour's (4) ○ Others _____ (66)	
28.	How many messages you receive weekly now?	○ 0 (1) ○ 1 (2) ○ 2 (3) ○ 3 (4) ○ More than 3 (5) ○ Never received any messages (6)	

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		○ I received messages but did not notice when it came as I was not aware I was enrolled in the service (7) ○ I don't receive the messages as it drops phone balance(8) ○ Others __ (66)	
29.	Who receives messages?	○ New mother herself (1) ○ Some one else other than new mother (who owns the phone) (2) ○ New mother or some one from the house (shared family phone) (3)	
30.	Do you encounter any problem to receive the messages?	○ Yes (1) ○ No (2) ○ Don't know (98) ○ Others ____ (66)	If No, skip to question no. 32
31.	If yes, what kind of problem did you encounter?	○ The service is pricy (1) ○ I can't listen to the messages myself as the call comes when the cell phone is not with me (2) ○ Don't receive messages anymore due to loss pf phoneset/ sim card (3) ○ I can't read the transliterated text messages (4) ○ In the recorded voice messages, the messages are said with hurry , difficult to get the information (5) ○ The baby did not survive, but still receiving messages which is annoying (6) ○ There is nothing new in this information (7) ○ The weekly messages are not according to new mother's current gestational state (8) ○ I can't hear anything after receiving the phone call (problem due to zero balance in phone) (9) ○ I can't hear after receiving the phone call (mobile network is weak in that area) (10) ○ Others _____ (66)	
32.	Can you remember the	○ Could tell the full shortcode (1)	

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	short code which provides you the messages?	○ Could tell the shortcode partially (2) ○ Could not tell the shorcode(3)	
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Knowledge and practice on delivery and new born care

	Questions	Answer	Instructions for field researchers
33.	Where was the baby born?	○ Hospital/clinic/ health facilities (1) ○ Home (2)	If born at hospital/clinic/health facilities than skip to Q-37
34.	(If home) Who assisted the delivery?	○ Trained birth attendant (1) ○ Untrained birth attendant (Mother, mother-in-law, neighbour etc.) (2) ○ Others____(66)	For deliveries at home
35.	What equipment did the birth attendant use during delivery?	○ Safe delivery kit (1) ○ Clean blade, rubber, scissors (2) ○ Anything that was available during that time (3) ○ Others____(66)	For deliveries at home
36.	How did you know about using safe delivery kit	○ Only Aponjon (1) ○ Aponjon and other sources (2) ○ Other sources (3) ○ Don't know (98) ○ Others____(66)	For deliveries at home
37.	After delivery, did new mother go receive physical check-up?	○ Yes (1) ○ No (2)	If answer is "No" go to question no-45
38.	Reason for the physical check-up	○ For mother's health (1) ○ For baby's health (2) ○ Others____(66)	
39.	Who advised you to go for physical visits?	○ I knew about this (1) ○ Husband (2) ○ Elderly family member (3) ○ Health worker (4) ○ Aponjon message (5) ○ Others____(66)	

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40.	Within the first 42 days after delivery how many visits were done?	☐ 1 (1) ☐ 2(2) ☐ 3(3) ☐ More than 3 (4)	
41.	Time of first PNC	☐ Within _____ days	Write N/A where applicable
42.	Time of second PNC	☐ Within _____ days	Write N/A where applicable
43.	Time of third PNC	☐ Within _____ days	Write N/A where applicable
44.	Time of fourth PNC	☐ Within _____ days	Write N/A where applicable
45.	When was the baby's first bath given?	☐ Right after birth (1) ☐ Within the first day (2) ☐ Within the 2 nd day (3) ☐ Within the 3 rd day (4) ☐ Within the 7 th day (5) ☐ Others _____(66)	
46.	What was the baby fed right after birth?	☐ Colostrum (1) ☐ Honey (2) ☐ Sweetened water (3) ☐ Formula feeding (4) ☐ Was provided saline/oxygen due to complications (5) ☐ Others _____(66)	
47.	(If colostrum was fed) Source of knowledge on colostrum feeding	☐ Only Aponjon (1) ☐ Aponjon and other sources (2) ☐ Other sources (3) ☐ Don't know (98) ☐ Others____(66)	
48.	(Ask if baby is 5 or 5+ months old) What do you feed the baby?	☐ Breast milk (1) ☐ Family food beside breast milk (2) ☐ Others____(66)	
49.	Which food you took most after your baby was born?	Write here	
50.	Which food you avoided after the delivery of your baby?	Write here	Write N/A when appropriate

Annex

51.	Reason for avoiding this food	Write here	Write N/A when appropriate
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New born and infant's immunization

	Questions	Answer	Instructions for field researcher
52.	Has the baby received any shots (vaccination)?	○ Yes (1) ○ No (2) ○ Not applicable (99)	If No, skip to Q-55
53.	(If yes), Name the vaccines that was provided to the baby (multiple answers)	▪ BCG ▪ Pentavalent ▪ DPT ▪ Polio ▪ Measles ▪ MMR ▪ Rota virus ▪ Hepatitis ▪ Others_____	▪ Mark means (1=yes) No mark (0=no)
54.	Knowledge source behind vaccination	○ Only Aponjon (1) ○ Aponjon and other sources (2) ○ Other sources (3) ○ Don't know (98) ○ Others____(66)	Skip to Q-56
55.	If vaccination was not done, what was the reason behind it?	○ The baby was feverish/ caught cold ○ Immunization centre is too far from home ○ Baby was too small, felt scared ○ Afraid that body temperature would rise as a consequence of immunization ○ Doesn't know where to go for immunization ○ Didn't know the immunization schedule ○ Others _____(66)	

Annex

Family planning:

	Question	Answer	Instructions for field researcher
56.	Did you uptake any family planning methods yet?	○ Yes (1) ○ No (0) ○ Others___(66)	
57.	Can you tell me the birth gap that should be maintained before you conceive another baby?	○ Any time/ When God permits (1) ○ 1 year (2) ○ 2 years (3) ○ 3 years (4) ○ Depends on my husband (5) ○ I am not planning for any more kids (6) ○ Don't know (98) ○ Others ___ (66)	

Pure drinking water

	Question	Answer	Instructions for field researchers
58.	Where do you get the pure drinking water from?	○ Potable water (boiled/ safe tubewell/filter) (1) ○ Open water(pond, river, tap etc.) (0)	If the answer is "open water", then skip to Q-60
59.	Where did you learn about potable drinking water?	○ Only from Aponjon (1) ○ Aponjon and other sources(2) ○ Other sources (3) ○ Don't know (98) ○ Others_____(66)	

Hand washing practice:

	Question	Answer	Instructions for field researchers
60.	When do you wash hands everyday? (multiple answers)	▪ Before saying prayers ▪ After waking up in the morning ▪ Before meal ▪ After meal ▪ After defeacation ▪ During bath	✓ Mark means (1=yes) No mark (0=no)

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		▪ Before preparing food ▪ While washing or cooking ingredients ▪ Others__	
61.	How do you wash your hands usually?	○ With water (1) ○ Water and soap (2) ○ Water, soap , sometimes antiseptics (3) ○ Others_____(66)	
62.	Where did you learn about hand washing practice?	○ Only Aponjon (1) ○ Aponjon and other sources (2) ○ Other sources(3) ○ Don't know (98) ○ Others_____(66)	

Measurement of satisfaction and feedback to the service

	Question	Answer	Instructions for field researchers
63.	Are you benefitted by Aponjon service?	○ Yes (1) ○ No (0) ○ Others_____(66)	If No, skip to Q-65
64.	If yes , Can you explain how? (Multiple answers)	▪ Timely vaccination ▪ Take proper and ample food ▪ Planned for delivery ▪ Tested blood group/ identified donor ▪ Take care of hygiene ▪ Call to Aponjon helpline and consult with doctor ▪ Received help from family members ▪ Can take care of baby ▪ Learned about baby's development and growth ▪ Others_____	✓ Mark means (1=yes) No mark (0=no)
65.	What new information did you learn from Aponjon? (Multiple answer)	▪ Nothing ▪ Making eye contact with baby ▪ Observing baby's urination 6-7 times a day which indicates baby's development ▪ If baby moves and plays, it is a sign of good health ▪ Vaccination schedule ▪ Growth milestone: baby's shoulders getting strong	✓ Mark means (1=yes) No mark (0=no)

Annex

		▪ How to take care of umbilicus ▪ Nutrition of lactating mother ▪ Nutrition of baby ▪ Others ____ (66)	
66.	Are you satisfied with Aponjon?	○ Yes (1) ○ No (2) ○ Others ____ (66)	If yes, skip to Q-68
67.	If you are not satisfied, what is the reason behind this? (Multiple answers)	▪ I know all the information ▪ Do not receive messages regularly ▪ Messages come at an odd time ▪ Service is pricy ▪ Could not connect to doctor at counselling line by dialling 16227 ▪ Others ____	✓ Mark means (1=yes) No mark (0=no)
68.	What else do you want from Aponjon service?	Write here	
69.	Score this service between 1-5 (1= lowest performance/very bad, 5= highest performance/Excellent)	○ 1 (1) ○ 2 (2) ○ 3 (3) ○ 4 (4) ○ 5 (5)	

70. Special note (to be filled out as part of filed observation by researchers)

Aponjon sample survey questionnaire
(Bangla)
2014

মাতা (Mother)

Interview ID: M _____ (3 digits)

Location _____

লিখিত সম্মতিপত্র (সাক্ষাৎকার, অডিও রেকর্ডিং এবং ছবি তুলবার জন্য)

সালাম নিবেন। আমার নাম_____। আমি বর্তমানে “আপনজন” নামক মোবাইল ফোন ভিত্তিক স্বাস্থ্যতথ্য সেবার গবেষণার কাজ করছি। আমাদের এই উদ্যোগটি ইউএসএআইডির সূচনা অর্থায়নে ডি.নেট বাস্তবায়ন করেছে। ব্র্যাক, সেভ দ্যা চিলড্রেন (ইউএসএ), সূর্যের হাসি, ডি.নেটের তথ্যকল্যাণী এবং বাংলাদেশ সরকারের স্বাস্থ্য ও পরিবার পরিকল্পনা মন্ত্রণালয়, তথ্য মন্ত্রণালয় এবং প্রধানমন্ত্রীর কার্যালয়ের এক্সেস টু ইনফরমেশন প্রোগ্রাম এই কাজের সহযোগী।

আপনাকে এই গবেষণায় অন্তর্ভুক্ত হতে অনুরোধ করবার কারণ আপনি গর্ভবতী অথবা মা, যার বাচ্চার বয়স এক বছরের নীচে এবং আপনি আপনজন স্বাস্থ্য পরামর্শ পেতে নিবন্ধন করেছিলেন। আমি আপনাকে এই গবেষণায় যে বিষয়গুলো জিজ্ঞাসা করবো সেগুলো হচ্ছে এই সেবা নিয়ে আপনার মতামত, আপনার দৈনন্দিন জীবনে এই তথ্য কোন ভূমিকা রাখতে পারছে কিনা, সেবাটির মূল্য ইত্যাদি নিয়ে আপনার পরামর্শগুলো আমি জানতে চাইবো। সাক্ষাৎকারটি আনুমানিক এক ঘণ্টা হতে পারে।

আপনি এই সমীক্ষায় অংশগ্রহণ করলে সেটা প্রাথমিকভাবে আপনার গোপনীয়তার উপর একটি হস্তক্ষেপ বলে আপনার মনে হতে পারে। এই সমীক্ষায় অংশগ্রহণে আপনার ক্ষতির সম্ভাবনা নেই। যদি আপনি কোন প্রশ্নের উত্তর দিতে না চান, তাহলে আপনাকে সেগুলোর উত্তর দিতে হবে না। আপনার অংশগ্রহণ স্বেচ্ছামূলক, এবং আপনি যে কোনো সময়ে সাক্ষাৎকার বন্ধ করে দিতে পারেন এবং/অথবা নিজেকে এই সমীক্ষা থেকে প্রত্যাহার করে নিতে পারেন, এর ফলে আপনার কোনো সমস্যা হবে না। কোনো পরিস্থিতিতে আপনাকে এই সমীক্ষা থেকে প্রত্যাহার করার প্রয়োজন হলে আমি তা করতে পারি।

আমরা আপনার দেওয়া সাক্ষাৎকারটি রেকর্ড করতে চাই কারণ এটা আপনার দেওয়া মতামতকে আরোও ভালভাবে বিশ্লেষণ করতে আমাদের সাহায্য করবে। রেকর্ডগুলো ট্রান্সক্রিপশনের পর আর সংরক্ষণ করা হবেনা। আপনার যদি সমস্যা না থাকে তাহলে আমরা আপনার ছবি তুলতে চাই যেটা আমাদের অনলাইন বা অন্যান্য রিপোর্ট এ প্রকাশ হতে পারে। আপনি ইচ্ছে করলে ছবিগুলো দেখে বলতে পারেন সেগুলো দেয়া যায় কিনা।

এই সমীক্ষার তথ্যসমূহ ভবিষ্যতে একই বিষয়ে অন্যান্য সমীক্ষার জন্য, নীতিনির্ধারনী সিদ্ধান্তকে জানানোর জন্য এবং অন্যান্য প্রয়োজনীয় মূল্যায়ন সমীক্ষায় ব্যবহার করা হতে পারে। আপনি এই গবেষণা থেকে সরাসরিভাবে লাভবান হবেন না। যদি আপনি এই গবেষণায় অংশগ্রহণ করতে রাজী থাকেন তাহলে আপনার এই মূল্যবান সময়ের জন্য আমরা কিছু উপহারের ব্যবস্থা রেখেছি।

এই সমীক্ষার সময় সংগৃহীত যেকোনো তথ্য যা আপনাকে সনাক্ত করতে পারে সেগুলো গোপন থাকবে এবং শুধু আপনার অনুমতিক্রমে তা প্রকাশ করা হবে। তথ্যগুলো একটি সুরক্ষিত স্থানে সংরক্ষণ করা হবে যেখানে শুধু এই সমীক্ষার গবেষকদের প্রবেশাধিকার থাকবে। আপনার নাম- পরিচয়ের বদলে একটি কোড ব্যবহার করা হবে। এই সমীক্ষা থেকে পাওয়া তথ্য আপনার পরিচয়সহ অনিদিষ্টকালের জন্য সংরক্ষণ করা হবে।

Annex

এই কার্ডটিতে দায়িত্বপ্রাপ্ত ব্যক্তির নাম, যোগাযোগ নম্বর, সংশ্লিষ্ট গবেষণা প্রতিষ্ঠানের নাম দেয়া আছে। আমাদের এই সেবা সংক্রান্ত যে কোন প্রশ্ন করতে দ্বিধা করবেন না। আপনি ইচ্ছা করলে এই সেবায় যোগদানের ব্যাপারে আপনার অধিকার যাচাই করতে পারেন, সেক্ষেত্রে আমি আপনাকে ইউ এস এ আইডির যোগাযোগ নম্বর দিতে পারি।

আপনার কি এই গবেষণা/সেবা নিয়ে কোন প্রশ্ন আছে?

☐হ্যাঁ ☐না

আপনি কি এই গবেষণায় অংশগ্রহণ করতে চান?

☐হ্যাঁ ☐না

আপনি কি ছবি তুলতে রাজি আছেন?

☐হ্যাঁ ☐না

সম্মতি থাকলে সাক্ষাৎকার গ্রহণ করুন_____

টিক (✓) ব্যবহার করুন

অথবা

সম্মতি না থাকলে সাক্ষাৎকার গ্রহণ বন্ধ করুন_____

টিক (✓) ব্যবহার করুন

আপনার সহযোগিতার জন্য আপনাকে অনেক ধন্যবাদ।

সাক্ষাৎকার প্রদানকারীর নাম ও স্বাক্ষর

তারিখ:

সাক্ষাৎকার গ্রহণকারীর নাম ও স্বাক্ষর

তারিখ:

১। সাক্ষাৎকার গ্রহণকারীর আই ডি/Interviewer's ID:

সাক্ষাতকারপ্রদানকারীর তথ্যঃ

	প্রশ্ন	উত্তর
২।	সাক্ষাৎকার প্রদানকারীর নাম: /Respondent's Name:	
৩।	সাক্ষাৎকার প্রদানকারীর নিবন্ধন আই ডি/ Respondent's Registration ID	
৪।	সাক্ষাতকারপ্রদানকারীর ধরন (একটি উত্তর)	○ শিশুর মা (2)
৫।	সাক্ষাতকারপ্রদানকারীর মোবাইল নম্বর(যে নম্বরে আপনজন ম্যাসেজ পায়)	
৬।	সেবা যেভাবে পায়	○ এস এম এস (1) ○ কল (0)
৭।	কলের ক্ষেত্রে যেসময়ে কল পাওয়ার কথা (সিস্টেম থেকে)	○ সকালে (৮- ১২টা) (1) ○ দুপুরে (১২- ৪টা) (2) ○ বিকালে (৪- ৮টা) (3) ○ রাতে (৮- ১১টা) (4)
৮।	সেবা গ্রহণকারীর সেবার মূল্য পরিশোধ সঙ্ক্রান্ত(সিস্টেম থেকে)	○ তিনি ফ্রি পান (1) ○ তিনি সেবার মূল্য পরিশোধ করেন (0)
৯।	বাচ্চার জন্মের তারিখ (সিস্টেম থেকে)	
১০।	উত্তরদাতার ঠিকানা	বিভাগঃ জেলাঃ উপজেলাঃ ইউনিয়নঃ গ্রাম/মহল্লাঃ
১১।	মায়ের শিক্ষাগত যোগ্যতা	○ কখনো পড়েনি (1) ○ প্রাইমারী শিক্ষা অসমাপ্ত (2) ○ প্রাইমারী শিক্ষা সমাপ্ত / ক্লাস ফাইভের বেশি(3) ○ নিম্ন মাধ্যমিক সমাপ্ত (4) ○ মাধ্যমিক শিক্ষা সমাপ্ত / কলেজে পড়েনি(5) ○ উচ্চ মাধ্যমিক শিক্ষা অসমাপ্ত/কলেজ ফাস্ট ইয়ার (6)

		○ উচ্চ মাধ্যমিক শিক্ষা সমাপ্ত (7) ○ উচ্চ মাধ্যমিক উর্ধ্ব/ অনার্স বা ডিগ্রী শেষ করেনি (8) ○ অন্যান্য _____ (66)
১২।	স্বামীর শিক্ষাগত যোগ্যতা	○ কখনো পড়েনি (1) ○ প্রাইমারী শিক্ষা অসমাপ্ত (2) ○ প্রাইমারী শিক্ষা সমাপ্ত / ক্লাস ফাইভের বেশি(3) ○ নিম্ন মাধ্যমিক সমাপ্ত (4) ○ মাধ্যমিক শিক্ষা সমাপ্ত / কলেজে পড়েনি(5) ○ উচ্চ মাধ্যমিক শিক্ষা অসমাপ্ত/কলেজ ফাস্ট ইয়ার (6) ○ উচ্চ মাধ্যমিক শিক্ষা সমাপ্ত (7) ○ উচ্চ মাধ্যমিক উর্ধ্ব/ অনার্স বা ডিগ্রী শেষ করেনি (8) ○ অন্যান্য _____ (66)
১৩।	মায়ের পেশা	○ গৃহস্বী (1) ○ ছাত্র (2) ○ দিন মজুর (কুলি, ফেরিওয়ালা, মাটি কাটা শ্রমিক ইত্যাদি) (3) ○ কৃষক (4) ○ জেলে (5) ○ চালক - কার/ভারী যানবাহন (6) ○ ক্ষুদ্র ব্যবসায়ী (দোকানের মালিক ইত্যাদি) (7) ○ ব্যবসায়ী (8) ○ সরকারী চাকুরীজীবী (9) ○ বেসরকারী চাকুরীজীবী (10) ○ এনজিও কর্মী (11) ○ গার্মেন্টস কর্মী (12) ○ অন্যান্য _____ (66)
১৪।	স্বামীর পেশা	○ বেকার (1) ○ ছাত্র (2) ○ দিন মজুর (কুলি, ফেরিওয়ালা ইত্যাদি) (3) ○ কৃষক (4) ○ জেলে (5) ○ চালক- রিকশা (6) ○ চালক- সি এন জি (7) ○ চালক- কার/ভারী যানবাহন (8) ○ ক্ষুদ্র ব্যবসায়ী (দোকানের মালিক ইত্যাদি) (9) ○ ব্যবসায়ী (10) ○ সরকারী চাকুরীজীবী (11) ○ বেসরকারী চাকুরীজীবী (12) ○ এনজিও কর্মী (13) ○ প্রবাসী (14) ○ অন্যান্য _____ (66)
১৫।	পারিবারিক মোট আয় (টাকা)	○ ৫০০০ টাকার নিচে (1) ○ ৫০০১- ১০০০০ (2)

		○ ১০০০১- ২০০০০ (3) ○ ২০০০১- ৫০০০০ (4) ○ ৫০০০১- ১০০০০০ (5) ○ ১০০০০০ টাকার উর্ধে (6)
১৬।	বাড়িতে পাকা পায়খানা আছে?	○ হ্যাঁ (1) ○ না (2)
১৭।	শিশুর বয়স	○ ২৮ দিনের নীচে (1) ○ ৩ মাসের নীচে (2) ○ ৬ মাসের নীচে (3) ○ ৯ মাসের নীচে (4) ○ ১২ মাসের নীচে (5) ○ ১২ মাস উর্ধ (6)
১৮।	শিশুর মায়ের বয়স	○ ১৫ এর নীচে (1) ○ ১৫- ১৯ বছর (2) ○ ২০ - ২৪ বছর (3) ○ ২৫ - ২৯ বছর (4) ○ ৩০ - ৩৪ বছর (5) ○ ৩৫ বছরের উর্ধ (6)
১৯।	আপনার কয়টি সন্তান	○ ১ (1) ○ ২ (2) ○ ৩ (3) ○ ৪ (4) ○ ৪ এর উর্ধ (5)
২০।	আগের সন্তানের সাথে এই সন্তানের তফাত কত?	লিখুন _____ বছর
২১।	আপনজনের যে ভাঙ্গন টি তারা পান (সিস্টেম থেকে)	○ আরবান (1) ○ রুরাল (2)
২২।	আপনজন সেবাটি যারা যারা পায়	○ মা একা (1) ○ মা এবং স্বামী (2) ○ মা এবং অন্য কোন অভিভাবক (3) ○ শুধু স্বামী (4) ○ শুধু অভিভাবক (5) ○ অন্যান্য _____ (66)
২৩।	এই মাকে আমি জরিপে অন্তর্ভুক্ত করেছি কারণ	○ তিনি গর্ভবতী হিসেবে সেবা পেতেন এবং মা হিসেবে সেবা পাচ্ছেন (1) ○ তিনি নতুন মা হিসেবে সেবা পেয়েছেন (2) ○ তিনি মা হিসেবে সেবা পেতেন, কিন্তু বাচ্চার বয়স এক বছর হওয়ায় এখন আর সেবা পাচ্ছেন না (3) ○ অন্যান্য _____ (66)

আপনজন ম্যাসেজ শোনা সংক্রান্তঃ

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
২৪।	আপনাকে এ সেবায় নিবন্ধন করল কে?	○ স্বাস্থ্যকর্মী (1) ○ হাসপাতাল থেকে (2) ○ আমার স্বামী নিজেই (3) ○ আমি নিজেই এস এম এস/ফোন করে(4) ○ অন্যান্য_____ (66)	
২৫।	নিবন্ধনের আগে সেবাটি সম্পর্কে কার থেকে জেনেছেন?	○ স্বাস্থ্যকর্মী (1) ○ আপনজনের গ্রাহকের কাছ থেকে (2) ○ হাসপাতাল থেকে (3) ○ স্বামী (4) ○ টিভি থেকে (5) ○ পত্রিকা বিজ্ঞাপন থেকে (6) ○ আমার ফোনে এস এম এস আসছে (7) ○ আমাকে ফোন করে জানিয়েছে (8) ○ লিফলেট থেকে (9) ○ আমি জানতাম না কে নিবন্ধন করেছে (98) ○ অন্যান্য_____ (66)	
২৬।	আপনার /আপনাদের কাছে আপনজন ম্যাসেজ আসে?	○ হ্যাঁ (1) ○ না (2) ○ আগে আসত , এখন আসেনা (3) ○ অন্যান্য_____ (66)	
২৭।	আপনি যে ফোনে ম্যাসেজ পান/পেতেন সেটি কার?	○ আমার (1) ○ আমার স্বামীর (2) ○ বাড়ির অন্য সদস্যের (3) ○ প্রতিবেশীর (4) ○ অন্যান্য_____ (66)	
২৮।	বর্তমানে সপ্তাহে কয়টি ম্যাসেজ পান?	○ ০ (1) ○ ১ (2) ○ ২ (3) ○ ৩ (4) ○ ৩ এর অধিক (5) ○ কখনো কোন ম্যাসেজ পাইনি (6) ○ আমি জানতাম না ম্যাসেজগুলো কিসের, তাই খেয়াল করি নাই (7) ○ টাকা কাটা যাবার ভয়ে ফোন ধরি না(8) ○ অন্যান্য____ (66)	

Annex

২৯।	ম্যাসেজ কে রিসিভ করে?	○ আমি (1) ○ আমি ছাড়া অন্য কেউ (ফোন যার কাছে থাকে) (2) ○ আমি এবং পরিবারের অন্য কেউ (3)	
৩০।	ম্যাসেজ শুনা বা পাওয়া নিয়ে কোন অসুবিধা হয়?	○ হ্যাঁ (1) ○ না (2) ○ জানিনা (98) ○ অন্যান্য____(66)	If No, skip to question no. 32
৩১।	হ্যাঁ হলে, কী ধরনের সমস্যা হয়েছে? (একাধিক উত্তর)	○ বেশী টাকা কাটে (1) ○ যেসময়ে ফোন আমার কাছে থাকে না, সেসময়ে ম্যাসেজ আসে তাই ম্যাসেজ শুনতে পারিনা (2) ○ আমার ফোন নষ্ট / হারিয়ে গিয়েছে তাই ম্যাসেজ শুনতে / পড়তে পারিনা (3) ○ আমি এস এম এস পাই, এটা পড়তে অসুবিধা হয় (4) ○ ম্যাসেজ এত তাড়াতাড়ি বলে বুঝতে অসুবিধা হয় (5) ○ আমার বাচ্চা নষ্ট হয়ে গেছে, তাও ম্যাসেজ পাই (6) ○ ম্যাসেজে যা বলে তার সবই জানি, তাই ফোন ধরিনা (7) ○ আমি ভুল সময় (সপ্তাহ/মাসের) ম্যাসেজ পাচ্ছি (8) ○ ফোন ধরার পর কিছু শোনা যায়না (ব্যালেন্স না থাকার কারণে) (9) ○ ফোন ধরার পর কিছু শোনা যায়না (এলাকায় নেটওয়ার্কের সমস্যা) ○ অন্যান্য_____ (66)	✓ Mark means (1=yes) No mark (0=no)
৩২।	কোন নম্বর থেকে আপনার ফোনে ম্যাসেজ আসে?	○ উত্তরদাতা সম্পূর্ণভাবে বলতে পেরেছে (1) ○ উত্তরদাতা অসম্পূর্ণভাবে বলতে পেরেছে (2) ○ উত্তরদাতা একেবারেই বলতে পারে নাই(3)	

ডেলিভারী সংক্রান্ত

	প্রশ্ন	উত্তর	মার্কপার্মায়ে গবেষকের জন্য নির্দেশ
৩৩।	আপনার বাচ্চার ডেলিভারী কোথায় হয়েছিল?	○ হাসপাতাল/ক্লিনিক/স্বাস্থ্যকেন্দ্রে (1) ○ বাসায় (2)	(উত্তর হাসপাতাল/ক্লিনিক/স্বাস্থ্যকেন্দ্রে হলে) সরাসরি Q- ৩৭ এ চলে যান।
৩৪।	(উত্তর বাসায় হলে) কে	○ প্রশিক্ষিত দাই (1)	বাসায় ডেলিভারীর জন্য

	প্রসব করিয়েছেন?	○ অপ্রশিক্ষিত দাই(মা, শ্বাশুড়ী, প্রতিবেশী, আত্মীয়) (2) ○ অন্যান্য_____ (66)	
৩৫।	বাড়িতে প্রসবের সময় ধাত্রী কি কি ব্যবহার করেছিল? (একটি উত্তর)	○ সেফ ডেলিভারী কিট (1) ○ পরিষ্কার ব্লেড, রাবার, কাঁচি (2) ○ হাতের কাছে পাওয়া অপরিষ্কার যন্ত্রপাতি (3) ○ অন্যান্য_____ (66)	বাসায় ডেলিভারীর জন্য
৩৬।	সেফ ডেলিভারী কিট ব্যবহার করে থাকলে সেটা সম্পর্কে আপনি কিভাবে জেনেছেন? (একটি উত্তর)	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য_____ (66)	বাসায় ডেলিভারীর জন্য
৩৭।	বাচ্চা হবার পর স্বাস্থ্যকেন্দ্রে চেক আপ করাতে গিয়েছিলেন?	○ হ্যাঁ (1) ○ না (2)	না হলে, প্রশ্ন ৪৫- এ চলে যান
৩৮।	কেন গিয়েছিলেন?	○ বাচ্চার স্বাস্থ্য পরীক্ষা করাতে (1) ○ মায়ের স্বাস্থ্য পরীক্ষা করাতে (2) ○ অন্যান্য_____ (66)	বাচ্চার জন্ম পরবর্তী চেক আপের ক্ষেত্রে প্রযোজ্য
৩৯।	কার পরামর্শে গিয়েছিলেন?	○ নিজের মনে হয়েছে (1) ○ স্বামীর (2) ○ বাড়ীর মুরুব্বীর (3) ○ স্বাস্থ্যকর্মীর (4) ○ আপনজন সেবার ম্যাসেজে তাই বলে (5) ○ অন্যান্য_____ (66)	বাচ্চার জন্ম পরবর্তী চেক আপের ক্ষেত্রে প্রযোজ্য
৪০।	বাচ্চার জন্মের ৪২ দিনের মধ্যে কয়বার স্বাস্থ্যকেন্দ্রে গিয়েছেন?	○ ১ (1) ○ ২ (2) ○ ৩ (3) ○ ৩ এর বেশী (4)	বাচ্চার জন্ম পরবর্তী চেক আপের ক্ষেত্রে প্রযোজ্য
৪১।	১ম ভিজিট করা হয়েছে	১ম ভিজিট _____ দিনের মধ্যে	প্রযোজ্য না হলে লিখতে হবে প্রযোজ্য নয়
৪২।	২য় ভিজিট করা হয়েছে	২য় ভিজিট _____ দিনের মধ্যে	প্রযোজ্য না হলে লিখতে হবে প্রযোজ্য নয়
৪৩।	৩য় ভিজিট করা হয়েছে	৩য় ভিজিট _____ দিনের মধ্যে	প্রযোজ্য না হলে লিখতে হবে প্রযোজ্য নয়
৪৪।	৪র্থ ভিজিট করা হয়েছে	৪র্থ ভিজিট _____ দিনের মধ্যে	প্রযোজ্য না হলে লিখতে হবে প্রযোজ্য নয়

৪৫।	ডেলিভারীর পরে বাচ্চাকে গোসল দিয়েছেন কখন?	○ হওয়ার সাথে সাথে (1) ○ হওয়ার ১ দিনের মধ্যে (2) ○ হওয়ার ২ দিনের মধ্যে (3) ○ হওয়ার ৩ দিনের মধ্যে (4) ○ হওয়ার ৭ দিনের মধ্যে (5) ○ অন্যান্য _____ (66)	সবাইকে এ প্রশ্ন করতে হবে
৪৬।	হওয়ার পর বাচ্চাকে কি খেতে দিয়েছেন?	○ মায়ের বুকের শালদুধ (1) ○ মধু (2) ○ মিছরি পানি (3) ○ টিনের দুধ (4) ○ স্যালাইন/অক্সিজেন পুশ করা হয়েছে (5) ○ অন্যান্য _____ (66)	সবাইকে এ প্রশ্ন করতে হবে। বুকের শালদুধ খাইয়ে থাকলে পরের প্রশ্ন ৪৭- এ যান।
৪৭।	(বাচ্চাকে বুকের দুধ খাইয়ে থাকলে) আপনি এটা সম্পর্কে জেনেছেন কিভাবে? (একটি উত্তর)	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য _____ (66)	বাচ্চার বয়স ৫ মাসের কম হলে প্রশ্ন ৪৮ এ যান
৪৮।	বাচ্চার বয়স পাঁচ মাস বা তার বেশি হলে জিজ্ঞেস করুন, বাচ্চাকে কি খাবার দিচ্ছেন এখন?	○ শুধু বুকের দুধ (1) ○ বুকের দুধের পাশাপাশি পারিবারিক খাবার (2) ○ অন্যান্য _____ (66)	
৪৯।	বাচ্চা হবার পর আপনি (মা) কোন কোন খাবার বেশি খেয়েছেন?	লিখুন _____	
৫০।	বাচ্চা হবার পর আপনি কোন কোন খাবার খেতেন না?	লিখুন _____	প্রযোজ্য না হলে লিখুন “প্রযোজ্য নয়”
৫১।	কেন এসব খাবার খেতেন না?	লিখুন _____	প্রযোজ্য না হলে লিখুন “প্রযোজ্য নয়”

বাচ্চার যত্ন সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫২।	বাচ্চাকে টীকা	○ হ্যাঁ (1)	না হলে, সরাসরি প্রশ্ন- ৫৫ এ চলে যান।

	দিয়েছেন?	○ না (2) ○ প্রযোজ্য নয় (99)	
৫৩।	হ্যাঁ হলে কি কি টীকা দিয়েছেন? (একাধিক উত্তর)	▪ বিসিজি ▪ পেণ্টাভ্যালেন্ট ▪ ডিপিটি ▪ পোলিও ▪ হাম ▪ এম এম আর ▪ রোটাইরাস ▪ হেপাটাইটিস ▪ অন্যান্য_____	কার্ড দেখতে চাইবে গবেষণাকারী এবং সে অনুসারে টিক দেবে। কার্ড না থাকলে ভালমত প্রশ্ন করে বুঝে নেবে। সাধারণতঃ • বিসিজি- জন্মের পর পর দেয়া যায় • পেণ্টাভ্যালেন্ট/ডিপিটি/পোলিও- ৬ মাস থেকে • রোটাইরাস- ৬ সপ্তাহ থেকে ৩ মাসের মধ্যে • এম এম আর/হাম- ৯ মাস পেণ্টাভ্যালেন্ট দিলে ডিপিটি আর আলাদা করে দিতে হয় না। পোলিও ডোজ মুখে খাওয়ায়। অন্য গুলো হাতে দেয়। ডিপিটি ইঞ্জেকশন পায়ে দেয়, ব্যথা করে, অনেক সময় জ্বর আসে। ✓ Mark means (1=yes) No mark (0=no)
৫৪।	আপনি টিকাগুলো সম্পর্কে জেনেছেন কীভাবে? (একটি উত্তর)	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য_____ (66)	যারা টীকা দিয়েছে তাদের জন্য প্রযোজ্য
৫৫।	না দিলে, টীকা না দেবার কারণ কি? (একটি উত্তর)	○ বাচ্চার জ্বর /কাশি ছিল, তাই দেয়া হয়নি (1) ○ টিকাকেন্দ্র অনেক দূরে তাই দেয়া হয়নি (2) ○ বাচ্চা খুব ছোট, তাই ভয় পাচ্ছিলাম (3) ○ টীকা দিলে শুনেছি বাচ্চার জ্বর আসে তাই (4) ○ কোথায় টীকা দিতে যাব তাই দেয়া হয়নি (5) ○ আমি জানতাম না কবে থেকে টীকা দিতে হবে (6) ○ অন্যান্য_____ (66)	

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পরিবার পরিকল্পনা সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫৬।	আপনি কি কোন পরিবার পরিকল্পনা পদ্ধতি গ্রহণ করেছেন? (একটি উত্তর)	○ হ্যাঁ (1) ○ না (0) ○ অন্যান্য _____ (66)	
৫৭।	আপনার পরবর্তী সন্তান হবে নেয়া ঠিক হতে পারে বলে আপনি মনে করেন? (একটি উত্তর)	○ যেকোন সময়/আল্লাহ জানে (1) ○ এই শিশু এবং পরবর্তীটির মধ্যে ১ বছর পার্থক্য থাকা উচিত (2) ○ এই শিশু এবং পরবর্তীটির মধ্যে ২ বছর পার্থক্য থাকা উচিত (3) ○ এই শিশু এবং পরবর্তীটির মধ্যে ৩ বছর পার্থক্য থাকা উচিত (4) ○ আমার স্বামীর উপর নির্ভর করে (5) ○ আমি আর সন্তান নেবনা (6) ○ জানিনা (98) ○ অন্যান্য _____ (66)	

পানি পান করা সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫৮।	আপনাদের বাড়িতে খাওয়ার পানি কোথা থেকে আসে?	○ বিশুদ্ধ পানি (ফুটিয়ে, নিরাপদ টিউব অয়েল, ফিটকিরি দিয়ে, অথবা ফিলটার ব্যবহার করে) (1) ○ অবিশুদ্ধ পানি(পানি সরাসরি খায় তা যেখান থেকেই আসুক না কেন) (2)	বিশুদ্ধ পানি খেলে পরের প্রশ্ন (৫৯) এ যান।
৫৯।	পানি বিশুদ্ধ করে খেলে, আপনি এ পদ্ধতি জেনেছেন কিভাবে? (একাধিক উত্তর)	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য _____ (66)	

হাত ধোয়া সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৬০।	আপনি কি কি কারণে সারাদিন হাত ধুয়ে থাকেন?	▪ প্রার্থনা করার পূর্বে ▪ সকালে ঘুম থেকে উঠে	✓ Mark means

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	(একাধিক উত্তর)	■ খাবার খাওয়ার আগে ■ খাবার খাওয়ার পরে ■ মল-মূত্র ত্যাগ করার পরে ■ গোসলের সময় ■ রান্না করার আগে ■ তরকারি ধোয়ার সময় ■ অন্যান্য_____	(1=yes) No mark (0=no)
৬১।	সাধারণত হাত ধোয়ার জন্য আপনি কি কি ব্যবহার করেন?	○ শুধু পানি (1) ○ পানি আর সাবান (2) ○ পানি, সাবান , অনেক সময় ডেটল (3) ○ লিকুইড সোপ এবং সাবান (4) ○ অন্যান্য_____ (66)	
৬২।	হাত ধোয়ার এই পদ্ধতি সম্পর্কে আপনি কোথায় জেনেছেন? (একটি উত্তর)	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য_____ (66)	

সম্প্রতি এবং অন্যান্য

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৬৩।	আপনজন সেবার কারণে আপনার কোন উপকার হয়েছে?	○ হ্যাঁ (1) ○ না (0) ○ অন্যান্য_____ (66)	হ্যাঁ হলে প্রশ্ন ৬৪ - এ যান
৬৪।	হ্যাঁ হলে , কি ভাবে? (একাধিক উত্তর)	■ সময়মত টিকা দিতে যাই ■ বেশি বেশি খাই ■ পরিবারের সকলে সাহায্য করে ■ ডেলিভারী নিয়ে পরিকল্পনা করেছি ■ ব্লাড গ্রুপ /ডোনার ঠিক করেছি ■ পরিষ্কার- পরিচ্ছন্ন থাকি ■ শরীর খারাপ লাগলে আপনজন ডাক্তারের সাথে কথা বলি ■ বাচ্চার যত্ন নিতে পারি ■ বাচ্চার বৃদ্ধি সম্পর্কে জানছি ■ আপনজন ডাক্তারের সাথে কথা বলে আমার লাভ হয়েছে ■ অন্যান্য_____	✓ Mark means (1=yes) No mark (0=no)
৬৫।	আপনজন সেবা থেকে আপনি নতুন কি জানতে পেরেছেন? (একাধিক উত্তর)	■ কিছুই না ■ বাচ্চার চোখে চোখ রাখা ■ বাচ্চার দিনে ৬- ৭ বার প্রস্রাব করা	✓ Mark means

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		স্বাভাবিক ▪ বাচ্চার নড়াচড়া স্বাভাবিক ▪ টীকা দেবার সময়সূচী ▪ বাচ্চার ঘাড় শক্ত হওয়া ▪ নাভির যত্ন ▪ প্রসূতি মায়ের খাওয়া দাওয়া ▪ বাচ্চার খাওয়া দাওয়া ▪ অন্যান্য_____	(1=yes) No mark (2=no)
৬৬।	আপনজন সেবা নিয়ে কি আপনি সন্তুষ্ট?	○ হ্যাঁ (1) ○ না (0) ○ অন্যান্য_____ (66)	না হলে, প্রশ্ন ৬৭ এ যান।
৬৭।	সন্তুষ্ট না হলে, তার কারণ কি?	▪ তথ্যগুলো সব জানা ▪ নিয়মিত ম্যাসেজ আসেনা ▪ অসময়ে ম্যাসেজ আসে ▪ সেবামূল্য বেশী ▪ ১৬২২৭ এ ফোন করে ডাক্তারের সাথে কথা বলতে ব্যর্থ হয়েছি ▪ ১৬২২৭ এ ফোন করে ডাক্তারের সাথে কথা বলে লাভ হয়নি ▪ অন্যান্য_____	✓ Mark means (1=yes) No mark (0=no)
৬৮।	আপনজন সেবা থেকে আপনি আর কি কি পেতে চান?	লিখুন _____	
৬৯।	সেবাটিকে ১- ৫ এর মধ্যে কত নম্বর দেবেন?(১=সর্বনিম্ন, ৫ = সর্বোচ্চ)	○ ১ (1) ○ ২ (2) ○ ৩ (3) ○ ৪ (4) ○ ৫ (5)	

৭০। বিশেষ নোট



Annex-6: Questionnaires for Chapter-4

Research protocol:

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh.

Primary Investigator: Mafruha Alam

PhD Candidate

Research School of Population Health

Australian National University



Information sheet, consent and interview guidelines for Aponjon counselling line user

Participant Information Sheet

Hello. My name is Mafruha Alam. I am doing a research on mobile phone based health services in Bangladesh as a part of my PhD at Research School of Population Health, Australian National University in Australia. I would like to invite you to participate in this research as you have used Dnet's 'Aponjon' counselling service for a pregnant woman or for a child aged under one year. I would like to ask you some questions regarding your access to 'Aponjon' service, experience with the health services in Bangladesh in general and your suggestions/ recommendation around point-of-care for maternal and child health services.

Project Title:

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh



General Outline of the Project:

- **Description and Methodology:**

I am trying to understand how a mobile phone communication strategy is impacting maternal and child health care behaviours in Bangladesh. The project will evaluate accessibility to mobile phones by women, health care cost optimization by families, change in perception or involvement of family members in taking care of mother and new born baby, increased accessibility to specialized health care advice from hotline counselling service when there is an emergency and overall position of mHealth in existing health infrastructure. I will be using mixed methods for my PhD.

- **Participants:**

Around 12-15 participants will be interviewed on phone for this qualitative research. Participants who used Aponjon counselling line within the last 6 months will be interviewed. Participants will be randomly recruited from call list of Aponjon counselling service.

- **Use of Data and Feedback:**

The collected data from this in depth interview will be recorded, transcribed and translated before analysis. The recording and transcription will be stored in a password-protected computer of ANU for at least five years after the submission of PhD thesis or from the date of any publication of journal article. After then the recording and data will be destroyed. Results of the analysis will be published in journal articles and in the PhD thesis. The publications will never disclose the names or any other identification of the participants. A summary of results of the research will be available on Dnet's website (www.dnet.org.bd) and Aponjon's newsletter.

Participant Involvement:

- **Voluntary Participation & Withdrawal:**

Participation in this research is voluntary. You may refuse to answer any question if you feel uncomfortable. You may without negative consequences, decline to take part or withdraw from the research in future without providing any explanation at any time until the work is prepared for publication. In that case, your data will be destroyed and not used.

- **Interview and Audio-recording**

The interview will take about an hour. You will be asked questions regarding your experience with Aponjon counselling line and some related questions regarding your experience with maternal and child health seeking practice in Bangladesh. For example, "How you came to know about Aponjon counselling line?", "How often you contacted the counselling service?", "How often you visit your local GP for maternal and child health issues?" etc. I will need to audio-record your interview for the purpose of the research. The audio-recording will remain with ANU which can be accessed only by a password by the



principal investigator. A transcription of the record will be made, unfortunately as this will be done overseas I cannot give you a copy of it. There will be no remuneration to take part in this research. I understand that you would consider taking part in the research as your experience regarding the mobile phone health services is important for other future mothers/parents in Bangladesh.

The interview will be done over phone. Participant will be randomly called from caller list and then will be read out the participation information sheet. Their verbal consent will be taken before beginning the interview.

- **Risk**

Though our intension is to understand how teleconsultation service is playing a role in maternal and child health care through these interviews, you may feel uncomfortable or distressed to share your personal experience around health seeking practice in Bangladesh. If this is the case, we recommend you withdraw and contact one of the helpline from the list given at the end of this sheet or your local GP or health care provider.

- **Benefit**

It is unlikely that you will personally benefit from this research, however, we can anticipate that the research findings will help Dnet and the mHealth services in Bangladesh to improve their service towards future mothers.

Confidentiality

Though we will try to maintain confidentiality of your information as much as possible, we would advise you to refrain from sharing very sensitive or defamatory information with us. We will not publish any data that identifies you. Your identification will be replaced by a code during data analysis. Only the principal investigator will have access to the code and data. During the interview you will not be called by your name. The final results will be published as “pregnant woman” or “new mother” or by pseudonyms.

Ethics approval:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager

The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au



Contact information

If you have any further queries regarding this particular research you can contact the principal investigator overseas, Mafruha Alam by email : mafruha.alam@anu.edu.au or cell :01XXXXXXX (Bangladeshi cell phone number will be included)

For support for mental health and distress, contact National Mental Health Institute and Hospital, Sher e Bangla, Dhaka. Tel: +8801730333789

Regarding maternal and child health, contact the local Upazilla mobile health service as appropriate:

Chittagong Upazilla health complex: 01730324443 (Anowara), 01730324451 (Patiya)

Bagerhat district hospital: 01730324793

Laxmipur district hospital: 01730324773

Bogra district sadar: 01730324803

Regarding enquiry on Aponjon service, please call 16227.



ORAL CONSENT SCRIPT for Participants

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh

I have read to you the Information Sheet about the research project. Was this information clear? Do you have any questions about the project?

Do you agree to participate in this project? Yes/No

Do you agree for this interview to be audio-recorded? Yes/No

When I prepare the research outputs, I can attribute information to you in two ways: with pseudonym, or I can use NO attribution and hold your information confidentially.

- Would you like to be referred to using a pseudonym (false name)? (Yes/No)
- Would you prefer that your information be not attributed to anyone at all? (Yes/No)

May we start the interview now?

Signature of interviewer:

Date:

Interview started at:

Ended at:

SES and background information of respondents who used counselling line:

Serial No.	Questions	Answers
1.	Name of respondent	
2.	Age (in years and months)	
3.	Cell number	
4.	Type of caller (Single answer)	☐ Pregnant woman ☐ New mother ☐ Pregnant woman's husband ☐ Pregnant woman's family member/relative ☐ New born baby's father ☐ New mother's family member/relative
5.	Education of respondent (in years)	
6.	Education of respondent woman's husband (in years)	
7.	Occupation of husband	
8.	Number of family members	
9.	No. of earners in the family	
10.	Respondent woman lives in (single answer)	☐ Single Family ☐ Joint family
11.	No. of earners in the family	
12.	No. of live children	
13.	No. children died before reaching their 5 th birthday	
14.	The reasons of children's death	
15.	History of miscarriages	☐ Yes ☐ No
16.	Estimated family monthly income (BDT)	
17.	No. of mobile phones in the house	
18.	Use of mobile phone by respondent women	☐ She never accessed mobile phones ☐ Only receives calls ☐ She receives and makes calls ☐ She receives and makes calls, and sends



		text messages ☐ Others_____
19.	Does respondent woman own a personal mobile phone set	☐ Yes ☐ No
20.	Who receives messages? (Single answer)	☐ Always pregnant woman/new mother ☐ Sometimes woman, sometimes family members ☐ Always family member/husband ☐ Others_____
21.	Who registered them for Aponjon? (Single answer)	☐ Health worker ☐ Self (text) ☐ Brand promoter ☐ Aponjon Call center agent ☐ Other_____
22.	Receives messages for	☐ Pregnancy ☐ New-born and mother
23.	Gestation age/age of new born baby	
24.	Residence	☐ District ☐ Upazilla ☐ Union/Thana
25.	Reason for making a call/calls to counselling line (Multiple answer)	☐ For woman's health ☐ For baby's health

Interview checklist

Questions	Write summary of answers
Some questions regarding health and practice at home: Is it a first born? Where was the baby born (home/hospital)? What was the baby fed after	

delivery? When was the first bath given to the baby? How many ANC's did pregnant mother have? Where did she have them? Were there any complications during delivery or pregnancy? How much the baby weighed at birth? How much the baby weighs now? Vaccination information of mother and baby	
Can you tell me why you made calls to the counselling line? (Symptoms, advice, referral, emergency, etc.)	
Do you remember what the doctor suggested you? Can you recall?	
How did you find the advice? (Was it useful for taking decision, did the respondent require a second opinion for another doctor, was telephone advice clear to follow etc.)	
Why did you not see your GP? (Convenience, time, cost, distance, appointment etc.)	
Other than Aponjon counselling line, have	



you ever used any other tele counselling service for health? If yes, how was your experience with that service?	
Do you follow Aponjon messages? If yes, are they enough to take care of mother and child?	
What is your overall evaluation of the service you get from Aponjon (message and counselling)? What is your perception about the pricing policy of the service? How would you rate the service from 1-5 (1 for lowest, 5 for highest)	
Do you have any suggestion how you can get an improved health service in Bangladesh?	



আপনজন হটলাইন সেবাগ্রহণকারীদের জন্য তথ্য, অনুমতি এবং সম্ভাব্য প্রশ্নপত্র

সাক্ষাতকারপ্রদানকারীর জন্য তথ্য

সালাম। আমার নাম মাফরুহা আলম। আমি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির অন্তর্ভুক্ত জনস্বাস্থ্য বিষয়ক গবেষণা বিভাগে বাংলাদেশের মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার উপর পিএইচডি করছি। আপনি যেহেতু ডিনেট পরিচালিত আপনজন স্বাস্থ্যসেবার হটলাইনসেবাসমূহ আপনার গর্ভাবস্থা অথবা নবজাতক শিশুর লালন-পালনের জন্য ব্যবহার করেছেন তাই আমার গবেষণার জন্য আপনার সাক্ষাতকার গ্রহণ করতে আগ্রহ প্রকাশ করছি। আমি আপনার কাছে আপনজন সেবা সম্পর্কে এবং বাংলাদেশের বিদ্যমান মাতৃ ও শিশু স্বাস্থ্যসেবা সম্পর্কে আপনার মতামত জানতে চাইব।

প্রকল্প শিরোনামঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

প্রকল্পচিত্রঃ

বর্ণনা ও পদ্ধতিঃ

আমার গবেষণার মাধ্যমে আমি বাংলাদেশের মা ও শিশু স্বাস্থ্যভিত্তিক সেবায় মোবাইল ফোনের ভূমিকা বুঝতে চাইছি। এই প্রকল্পের মাধ্যমে আমরা মোবাইল স্বাস্থ্যক্ষেত্রে মহিলাদের প্রবেশগম্যতা, পরিবার সমূহের স্বাস্থ্য সংক্রান্ত ব্যয়, পরিবারের সদস্যদের এধরনের সেবায় এবং মা ও শিশু স্বাস্থ্যে সক্রিয় অংশগ্রহণ, জরুরী প্রয়োজনে মা ও শিশু সংক্রান্ত কারণে হটলাইন সেবায় ফোন করে পরামর্শ গ্রহণ এবং বাংলাদেশের স্বাস্থ্যক্ষেত্রে মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার অবস্থান সম্পর্কে ধারণা করতে চাই। এ গবেষণায় আমি মিশ্র পদ্ধতি অবলম্বন করব।

অংশগ্রহণকারীঃ

বিগত ছয়মাসে আপনজনের হটলাইন ব্যবহার করেছে এমন সেবাগ্রহণকারীদের মধ্য হতে ১২- ১৫ জনের সাক্ষাতকার গ্রহণ করা হবে।

ডাটা ব্যবহারবিধি ও গবেষণালব্ধ অনূসিদ্ধান্তঃ

এই সাক্ষাতকারসমূহ গবেষণার সুবিধার্থে রেকর্ড, অনুলিখন এবং বিশ্লেষণ করা হবে। এই ডাটা থিসিস বা জর্নাল আর্টিকলে প্রকাশের তারিখ হতে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির কম্পিউটারে পাসওয়ার্ড দিয়ে ন্যূনতম পক্ষে পাঁচ বছর সংরক্ষণ করা হবে। এবং তারপর প্রয়োজনে ডাটা ধ্বংস করে ফেলা হবে। এই ডাটায় কখনো কোন সাক্ষাতকারপ্রদানকারীর প্রকৃত নাম প্রকাশ করা হবেনা। গবেষণালব্ধ ফল ডিনেটের ওয়েবসাইটে এবং আপনজন নিউজলেটারে প্রকাশ করা হবে।



সাক্ষাতকারপ্রদানকারীদের অংশগ্রহণঃ

সাক্ষাতকার দেয়ায় কোন বাধ্যবাধকতা নেই। আপনি স্বেচ্ছায় স্বতঃপ্রণোদিত হয়ে অংশগ্রহণ করতে চাইলেই আপনার সাক্ষাতকার গ্রহণ করা হবে। সাক্ষাতকারের সময় যেকোন প্রশ্ন আপনি ইচ্ছা করলে উত্তর দেয়া থেকে বিরত থাকতে পারেন। সাক্ষাতকার দেবার পরে গবেষণাটি প্রকাশের আগে আপনার যদি মনে হয় আপনি এই গবেষণা থেকে নিজেকে প্রত্যাহার করতে চান, তবে আপনি তা গবেষককে জানানোর মাধ্যমে কোন সমস্যা ব্যতিরেকেই করতে পারেন। সেক্ষেত্রে আপনার ডাটা আর ব্যবহার করা হবে না এবং ডাটা নষ্ট করে ফেলা হবে।

সাক্ষাতকার এবং অডিও রেকর্ডিং

পুরো সাক্ষাতকারটি সম্পন্ন হতে প্রায় ১ ঘণ্টা লাগবে। সাক্ষাতকারটিতে অংশগ্রহণের আগে আমি আপনাকে নিম্নোক্ত বিষয়সমূহ ভেবে দেখার জন্য ১০মিনিট সময় নিতে অনুরোধ করব। আমি আপনজন সেবা, মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবা এবং মাও শিশু সেবা নিয়ে আপনার মতামত জানতে চাইব। যেমন আমি জানতে চাইবঃ “আপনজন সেবার হটলাইন সেবা প্রসঙ্গে জেনেছেন কিভাবে?” “আপনার পারিবারিক ডাক্তারের কাছে আপনারা মা ও শিশু স্বাস্থ্য বিষয়ে জানতে চান কিনা?” ইত্যাদি। আপনার সাক্ষাতকারটি গবেষণার সুবিধার্থে আমি রেকর্ড করতে চাই। অডিও রেকর্ডিংটি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটিতে সংরক্ষিত থাকবে যাতে শুধুমাত্র প্রধান গবেষকের প্রবেশাধিকার থাকবে। অডিওটির গবেষণার সময় অনুলিখন করা হবে, কিন্তু যেহেতু তা বিদেশে সম্পন্ন হবে তা আপনার সাথে শেয়ার করা সম্ভব হবে না। এই গবেষণায় অংশগ্রহণের জন্য কোন উপহার বা সম্মানীর ব্যবস্থা নেই। বাংলাদেশের মায়েদের স্বাস্থ্যের উন্নতিতে আপনার মূল্যবান মতামত সহায়ক হবে এবং বৃহত্তর স্বার্থে আপনি এই গবেষণায় অংশগ্রহণ করবেন বলে আমরা আশা করি।

সাক্ষাতকারগুলি সাধারণত সেবাগ্রহণকারীর বাসায় বা যেখানে তাঁরা মুখোমুখি কথা বলতে সহজবোধ করেন সেখানে নেয়া হবে। সাক্ষাতকারগ্রহণের সময় নিশ্চিত করা হবে কেউ যাতে সাক্ষাতকার প্রদানকারীর আলাপে বিঘ্ন না ঘটায় এবং তিনি যা বলছেন তা যাতে গবেষকের সাথে গোপন ও নিরাপদ থাকে। সময়ের অভাবে যদি সাক্ষাতকারপ্রদানকারীর বাড়িতে সাক্ষাতকার গ্রহণ সম্ভব না হয় তবে তা সাক্ষাতকারপ্রদানকারীর অনুমতি সাপেক্ষে ফোনে সম্পন্ন করা হবে।

ঝুঁকি

এই গবেষণার প্রতিপাদ্য বিষয় মা ও শিশু স্বাস্থ্যে মোবাইল ফোনের ব্যবহার সম্পর্কে জানা। আপনার এই বিষয়ে ব্যক্তিগত অভিজ্ঞতা থাকতে পারে যা আপনার মনোবেদনার কারণ। এমতাবস্থায় আপনি ইচ্ছা করলে গবেষণায় অংশগ্রহণ করা থেকে বিরত থাকতে পারেন অথবা প্রয়োজনে পরিচিত চিকিতসক বা এই পত্রের শেষে যে হেল্পলাইনগুলোর তালিকা আছে তাদের একটিতে যোগাযোগ করে এই গবেষণায় অংশ নিতে পারেন।

গোপনীয়তা

আপনার সকল তথ্য আমাদের সাথে নিরাপদ থাকবে, আমরা সর্বোচ্চ চেষ্টা করব তার গোপনীয়তা বজায় রাখার জন্য। তারপরও আপনাকে সংবেদনশীল ও ক্ষতিকারক তথ্য সরবরাহ করা থেকে বিরত থাকার জন্য অনুরোধ করব। আপনার পরিচয় যাতে প্রকাশ না পায় সেজন্য আমরা সচেষ্ট থাকব। আপনার নাম ও পরিচয় একটি কোড দ্বারা স্থানান্তর করা হবে। শুধুমাত্র এই গবেষণার প্রধান গবেষক আপনার কোড এবং তথ্যে প্রবেশাধিকার পাবে। আপনাকে সাক্ষাতকারের সময় নাম ধরে ডাকা হবেনা। আপনার তথ্যগুলো অন্যদের তথ্যের সাথে “গর্ভবতী মহিলা” বা “মা” বা “অভিভাবক” বা একটি কল্পিত নাম দিয়ে প্রকাশ করা হবে।



সুবিধা

এই গবেষণায় অংশগ্রহণের মাধ্যমে আপনি সরাসরি কোন সুযোগ-সুবিধা পাবেননা। তবে আপনার এই অংশগ্রহণের মাধ্যমে ডিনেটের আপনজন সেবার মান উন্নয়ন সম্ভব হবে এবং বাংলাদেশের মায়েরা যারা মোবাইল ফোনের মাধ্যমে সেবাগ্রহণ করবেন তাঁরা উপকৃত হবেন।

গবেষণার নীতিঃ

এই গবেষণাটির নীতিগতভাবে অনুমোদন করেছে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির হিউম্যান রিসার্চ এথিক্স কমিটি। এই গবেষণার নীতির ব্যাপারে প্রশ্ন থাকলে আপনি নিম্নোক্ত ঠিকানায় যোগাযোগ করতে পারেনঃ

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যোগাযোগঃ

আপনার এই গবেষণার বিষয়ে কোন প্রশ্ন থাকলে আপনি তা সরাসরি প্রধান গবেষক মাফরুহা আলমকে যোগাযোগের মাধ্যমে করতে পারেন নিম্নোক্ত ঠিকানায় ইমেইল বা ফোন করেঃ

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ফোনঃ ০১৬২৮৩২৫৭৯৬



মৌখিক সম্মতিপত্রঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

আমি আপনাকে গবেষণাটি সম্পর্কে বলেছি। আপনার কাছে তথ্যগুলো স্পষ্ট মনে হয়েছে? আপনি কি গবেষণাটি নিয়ে আর কিছু জানতে চান?

আপনি কি এই গবেষণায় অংশগ্রহণ করতে ইচ্ছুক? হ্যাঁ/ না

আপনি কি সাক্ষাতকারটি রেকর্ড করতে সম্মত ? হ্যাঁ/না

আপনার তথ্য আমি গবেষণায় দুই ভাবে উপস্থাপন করতে পারিঃ ছদ্মনামে অথবা কোন পরিচয়েই উল্লেখ না করে।

আপনি কি চান আপনাকে গবেষণায় ছদ্মনামে ডাকা হোক ? হ্যাঁ/না

আপনি কি চান আপনাকে কোন ধরনের পরিচয়ে উল্লেখ না করা হোক ? হ্যাঁ/না

আমি কি এখন আপনার সাক্ষাতকার নিতে পারি? হ্যাঁ/ না

সাক্ষাতকারগ্রহণকারীর স্বাক্ষরঃ

তারিখঃ



সাক্ষাতকারপ্রদানকারীর প্রাথমিক তথ্যঃ

	প্রশ্ন	উত্তর	নির্দেশাবলী
১।	নাম		
২।	বয়স		
৩।	মোবাইল ফোন নম্বরঃ		
৪।	কল করেছিল যেঃ	১) গর্ভবতী ২) নবজাতকের মা ৩) গর্ভবতীর স্বামী ৪) গর্ভবতীর পরিবারের অন্য সদস্য ৫) নবজাতকের পিতা ৬) নবজাতকের পরিবারের অন্য সদস্য	
৫।	গর্ভবতী বা মায়ের শিক্ষাগত যোগ্যতা		
৬।	স্বামীর শিক্ষাগত যোগ্যতা		
৭।	গর্ভবতী বা মায়ের পেশা		
৮।	স্বামীর পেশা		
৯।	বাড়ীর সদস্য সংখ্যা		
১০।	গর্ভবতী বা মা থাকে	১) একক পরিবারে ২) যৌথ পরিবারে	
১১।	বাড়ীতে উপার্জনকারীর সংখ্যা		
১২।	জীবিত সন্তান সংখ্যা		
১৩।	পাঁচ বছরের নীচে সন্তান মৃত্যু সংখ্যা		
১৪।	সন্তানদের মৃত্যুর কারণসমূহ		
১৫।	বাচ্চা নষ্ট হবার ঘটনা আছে কি?	১) হ্যাঁ ২) না	
১৬।	পারিবারিক মাসিক খরচ (টাকা)		
১৭।	বাড়ীতে কতগুলো মোবাইল ফোন আছে		
১৮।	গর্ভবতী বা মায়ের মোবাইল ফোন ব্যবহার	১) একদমই ব্যবহার করেন না ২) শুধু ফোন ধরেন ৩) ফোন ধরেন এবং করেন ৪) ফোন ধরেন, করেন এবং ম্যাসেজ পাঠান ৬) অন্যান্য _____	



১৯।	গর্ভবতী বা মায়ের ব্যক্তিগত মোবাইলফোন আছে কিনা	১) হ্যাঁ ২) না	
২০।	আপনজন ম্যাসেজ কে রিসিভ করেন?	১) সবসময় মহিলা ২) সবসময় অন্য কেউ ৩) মহিলা অথবা অন্য কেউ	
২১।	আপনজন সেবায় নিবন্ধিত হয়েছেন যেভাবে	১) স্বাস্থ্যকর্মী ২) নিজে ম্যাসেজ করে ৩) ব্র্যান্ড প্রমোটার ৪) আপনজন কলসেন্টার ৫) অন্যান্য _____	
২২।	ম্যাসেজ পানঃ	১) গর্ভবতীর জন্য ২) নবজাতকের জন্য	
২৩।	গর্ভের বয়স/ নবজাতকের বয়স		
২৪।	ঠিকানাঃ	জেলাঃ উপজেলাঃ ইউনিয়ন/থানাঃ	
২৫।	যেকারণে কল করা হয়েছিল আপনজন হট লাইনে		

সম্ভাব্য প্রশ্নসমূহঃ

প্রশ্ন	উত্তর
গবেষক গর্ভবতী নারী বা শিশুর মায়ের গর্ভকালীন এবং শিশুর যত্ন সংক্রান্ত প্রশ্ন করবেন (জন্ম, গোসল, নাভির যত্ন, টিকা, শিশু মৃত্যুর অভিজ্ঞতা ইত্যাদি)	
আপনজন হটলাইন সেবা সম্পর্কে জানলেন কিভাবে? সেবাটি কিপ্রকারে ব্যবহার করেন।	
আপনজন সেবার পরামর্শ পাওয়ার পরের ঘটনার ক্রমিকতা একটু বলুন।	
আপনজন ছাড়া আর কোন মোবাইল স্বাস্থ্যসেবা ব্যবহার করেছেন? তা সম্পর্কে একটু বলুন।	
আপনার এলাকায় সরাসরি ডাক্তার দেখানোর ব্যবস্থা আছে কিনা। এতে কেমন ব্যয় হতে পারে।	
মোবাইল ফোন স্বাস্থ্যসেবার মূল্য সম্পর্কে আপনার কি মনে হয়?	
মা ও শিশু স্বাস্থ্যসেবায় মোবাইল ফোন কি ভূমিকা রাখতে পারে বলে আপনি মনে করেন?	



Information sheet, consent and key-informant interview guidelines for doctors of Aponjon counselling line

Participant Information Sheet

Hello. My name is Mafruha Alam. I am doing a research on mobile phone based health services in Bangladesh as a part of my PhD at Research School of Population Health, Australian National University in Australia. I would like to invite you to participate in this research as you are a medically trained doctor and have counselled to-be and new parents over mobile phones who had been registered to receive mobile based health services “Aponjon”. I would like to ask you some questions regarding your opinion on position of mHealth in the context of maternal and child health care seeking practices in Bangladesh.

Project Title:

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh.

General Outline of the Project:

- **Description and Methodology:**

I am trying to understand how a mobile phone communication strategy is impacting maternal and child health care behaviours in Bangladesh. The project will evaluate accessibility to mobile phones by women, health care cost optimization by families, change in perception or involvement of family members in taking care of mother and new born baby, increased accessibility to specialized health care advice from hotline counselling



service when there is an emergency and overall position of mHealth in existing health infrastructure. I will be using mixed methods for my PhD.

- **Participants:**

Around 8-10 medically trained doctors who provide counselling over telephone to mobile based health service subscribers will be interviewed for this qualitative research.

- **Use of Data and Feedback:**

The collected data from this in depth interview will be recorded, transcribed and translated before analysis. The recording and transcription will be stored in a password- protected computer of ANU for at least five years after the submission of PhD thesis or publication of journal article. After then the recording and data will be destroyed. Results of the analysis will be published in journal articles and in the PhD thesis. The publications will never disclose the names or any other identification of the participants. A summary of results or link to the publications will be available on Dnet's website (www.dnet.org.bd)

Participant Involvement:

- **Voluntary Participation & Withdrawal:**

Participation in this research is voluntary. You may refuse to answer any question if you feel uncomfortable. You may without negative consequences, decline to take part or withdraw from the research in future without providing any explanation at any time until the work is prepared for publication. In that case, your data will be destroyed and not used.

- **Interview and Audio-recording**

The interview will take about an hour. You will be asked about your professional opinion regarding tele-consultation service and overall health system in Bangladesh. For example, you will be asked "How do you find mHealth service in addressing the needs of maternal and child health care services in Bangladesh?" or "What is the motivation behind to-be and new parents to call to tele-consultation services?" etc. I will need to audio-record your interview for the purpose of the research. The audio-recording will remain with ANU which can be accessed only by a password by the principal investigator. A transcription of the record will be made; unfortunately as this will be done overseas I cannot give you a copy of it. There will be no remuneration to take part in this research. I understand that you would consider taking part in the research as your experience regarding the mobile phone health services is important for improving health system in Bangladesh. If you have any questions you can ask me, I'll try to clarify your queries. I also need a written consent on your participation, which is a mandatory portion of the interview. You can keep this information sheet with you.



- **Risk**

Though our main objective of the interview is to understand position of mHealth (tele-consultation service) in the existing maternal and child health care system, as an employee of 'Aponjon' you might feel distressed or uncomfortable to talk in length about mHealth system. If this is the case, we recommend you withdraw and contact one of the helpline from the list given at the end of this sheet or your local GP or health care provider.

- **Benefit**

It is unlikely that you will personally benefit from this research. However, we can anticipate that the research findings will help Dnet and the mHealth services in Bangladesh improve their service towards future mothers.

Confidentiality

Though we will try to maintain confidentiality of your information as much as possible, we would advise you to refrain from sharing very sensitive or defamatory information with us. We will not publish any data that identifies you. Your identification will be replaced by a code during data analysis. Only the principal investigator will have access to the code and data. During the interview you will not be called by your name. The final results will be published as a "pseudonym" or "the doctor" or "no attribution" whichever you choose.

Ethics approval:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

Contact information

If you have any further queries regarding this particular research you can contact the principal investigator overseas, Mafruha Alam by email : mafruha.alam@anu.edu.au or cell : 01XXXXXXX (Bangladeshi cell phone number will be included)

For support for mental health and distress, contact National Mental Health Institute and Hospital, Sher e Bangla, Dhaka. Tel: +8801730333789



WRITTEN CONSENT for Doctors

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh

I have read and understood the information sheet you have given to me about the research project, and I have had any questions and concerns about the project (listed here)

addressed to my satisfaction.

I agree to participate in the project.

YES ☐ NO ☐

I agree to this interview being audio-recorded

YES ☐ NO ☐

I agree to be identified in the following way within research outputs:

Pseudonym

YES ☐ NO ☐

No attribution

YES ☐ NO ☐

Signature of participant doctor:

Date:

Signature of Interviewer:

Date:



Background information of respondent

Questions	Response	
Name		
Age (years)		
Sex	☐ Male ☐ Female	
Cell number		
Medical qualification	Write here	
Medical degree completed from	Write here	
Medical degree received (year)		
Current employer(s)	Write here	
Area of specialization in Medical practice		
Weekly hours at Aponjon counselling line	Write here	

Interview guideline:

Questions	Summary of Answers
Could you tell me how you came to work at the counselling line? How many calls you have to take every day? How long the calls are in average? When do you work (day/night)?	
Who are the callers mostly? Women or husbands? Parents to be or parents? First time parents or experienced parents? When women call do they have husband or family	

member beside the phone? What happens when the husbands call? Are they assisted by their wives?	
Could you tell me how many hours you spend at other health facilities? Are those health facilities private or public?	
What kind of suggestion/prescription you usually provide over telephone? Have you ever referred any Aponjon user to anywhere? Do you know what happened next?	
In your opinion, what is the expectation of Aponjon users when they call to counselling line?	
What do you think about the quality of service in out-door of public hospitals, private hospitals and over the telephone?	
In your opinion, how do you find a service like Aponjon in maternal and child health services in Bangladesh? Do you have any suggestions to make the effort more useful?	



আপনজন হটলাইন ডাক্তারদের জন্য তথ্য, অনুমতি এবং সম্ভাব্য প্রশ্নপত্র

সাক্ষাতকারপ্রদানকারীর জন্য তথ্য

সালাম। আমার নাম মাফরুহা আলম। আমি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির অন্তর্ভুক্ত জনস্বাস্থ্য বিষয়ক গবেষণা বিভাগে বাংলাদেশের মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার উপর পিএইচডি করছি। আপনি যেহেতু ডিনেট পরিচালিত আপনজন স্বাস্থ্যসেবার হটলাইনসেবাসে প্রশিক্ষিত ডাক্তার হিসেবে দায়িত্ব পালন করেন এবং গর্ভবতী বা এক বছরের নিম্ন শিশুদের স্বাস্থ্য বিষয়ক পরামর্শ প্রদান করে থাকেন তাই আমার গবেষণার জন্য আপনার সাক্ষাতকার গ্রহণ করতে আগ্রহ প্রকাশ করছি। আমি আপনার কাছে আপনজন সেবা, মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবা এবং বাংলাদেশের বিদ্যমান মাতৃ ও শিশু স্বাস্থ্যসেবা সম্পর্কে আপনার মতামত জানতে চাইব।

প্রকল্প শিরোনামঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

প্রকল্পচিত্রঃ

বর্ণনা ও পদ্ধতিঃ

আমার গবেষণার মাধ্যমে আমি বাংলাদেশের মা ও শিশু স্বাস্থ্যভিত্তিক সেবায় মোবাইল ফোনের ভূমিকা বুঝতে চাইছি। এই প্রকল্পের মাধ্যমে আমরা মোবাইল স্বাস্থ্যক্ষেত্রে মহিলাদের প্রবেশগম্যতা, পরিবার সমূহের স্বাস্থ্য সংক্রান্ত ব্যয়, পরিবারের সদস্যদের এধরনের সেবায় এবং মা ও শিশু স্বাস্থ্যে সক্রিয় অংশগ্রহণ, জরুরী প্রয়োজনে মা ও শিশু সংক্রান্ত কারণে হটলাইন সেবায় ফোন করে পরামর্শ গ্রহণ এবং বাংলাদেশের স্বাস্থ্যক্ষেত্রে মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার অবস্থান সম্পর্কে ধারণা করতে চাই। এ গবেষণায় আমি মিশ্র পদ্ধতি অবলম্বন করব।

অংশগ্রহণকারীঃ

আপনজনের হটলাইন সেবায় কর্মরত ৮- ১০ জন চিকিতসকের সাক্ষাতকার গ্রহণ করা হবে।

ডাটা ব্যবহারবিধি ও গবেষণালব্ধ অনসিদ্ধান্তঃ

এই সাক্ষাতকারসমূহ গবেষণার সুবিধার্থে রেকর্ড, অনুলিখন এবং বিশ্লেষণ করা হবে। এই ডাটা থিসিস বা জর্নাল আর্টিকলে প্রকাশের তারিখ হতে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির কম্পিউটারে পাসওয়ার্ড দিয়ে ন্যূনতম পক্ষে পাঁচ বছর সংরক্ষণ করা হবে। এবং তারপর প্রয়োজনে ডাটা ধ্বংস করে ফেলা হবে। এই ডাটায় কখনো কোন সাক্ষাতকারপ্রদানকারীর প্রকৃত নাম প্রকাশ করা হবেনা। গবেষণালব্ধ ফল ডিনেটের ওয়েবসাইটে এবং আপনজন নিউজলেটারে প্রকাশ করা হবে।



সাক্ষাতকারপ্রদানকারীদের অংশগ্রহণঃ

সাক্ষাতকার দেয়ায় কোন বাধ্যবাধকতা নেই। আপনি স্বেচ্ছায় স্বতঃপ্রণোদিত হয়ে অংশগ্রহণ করতে চাইলেই আপনার সাক্ষাতকার গ্রহণ করা হবে। সাক্ষাতকারের সময় যেকোন প্রশ্ন আপনি ইচ্ছা করলে উত্তর দেয়া থেকে বিরত থাকতে পারেন। সাক্ষাতকার দেবার পরে গবেষণাটি প্রকাশের আগে আপনার যদি মনে হয় আপনি এই গবেষণা থেকে নিজেকে প্রত্যাহার করতে চান, তবে আপনি তা গবেষককে জানানোর মাধ্যমে কোন সমস্যা ব্যতিরেকেই করতে পারেন। সেক্ষেত্রে আপনার ডাটা আর ব্যবহার করা হবে না এবং ডাটা নষ্ট করে ফেলা হবে।

সাক্ষাতকার এবং অডিও রেকর্ডিং

পুরো সাক্ষাতকারটি সম্পন্ন হতে প্রায় ১ ঘণ্টা লাগবে। সাক্ষাতকারটিতে অংশগ্রহণের আগে আমি আপনাকে নিম্নোক্ত বিষয়সমূহ ভেবে দেখার জন্য ১০মিনিট সময় নিতে অনুরোধ করব। আমি আপনজন সেবা, মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবা এবং মাও শিশু সেবা নিয়ে আপনার মতামত জানতে চাইব। যেমন আমি জানতে চাইবঃ “আপনার মতে আপনজন সেবার ইটলাইনে গর্ভবতী বা নবজাতকের পরিবার কেন ফোন করেন?” বা “মোবাইল স্বাস্থ্যসেবা মা ও শিশু স্বাস্থ্যে বাংলাদেশে কি ভূমিকা রাখছে বলে আপনি মনে করেন?” ইত্যাদি। আপনার সাক্ষাতকারটি গবেষণার সুবিধার্থে আমি রেকর্ড করতে চাই। অডিও রেকর্ডিংটি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটিতে সংরক্ষিত থাকবে যাতে শুধুমাত্র প্রধান গবেষকের প্রবেশাধিকার থাকবে। অডিওটির গবেষণার সময় অনুলিখন করা হবে, কিন্তু যেহেতু তা বিদেশে সম্পন্ন হবে তা আপনার সাথে শেয়ার করা সম্ভব হবে না। এই গবেষণায় অংশগ্রহণের জন্য কোন উপহার বা সম্মানীর ব্যবস্থা নেই। বাংলাদেশের মায়েদের স্বাস্থ্যের উন্নতিতে আপনার মূল্যবান মতামত সহায়ক হবে এবং বৃহত্তর স্বার্থে আপনি এই গবেষণায় অংশগ্রহণ করবেন বলে আমরা আশা করি। আপনার যদি সম্মতি থাকে সাক্ষাতকার প্রদানে তবে আপনার কাছ থেকে লিখিত সম্মতি নেয়া হবে। আপনি এই তথ্য পত্রটি আপনার কাছে রাখতে পারেন। আপনার কোন প্রশ্ন থাকলে আপনি আমাকে তা করতে পারেন, আমি আপনাকে যথাসাধ্য উত্তর দেবার চেষ্টা করব।

ঝুঁকি

এই গবেষণার প্রতিপাদ্য বিষয় মা ও শিশু স্বাস্থ্য মোবাইল ফোনের ব্যবহার সম্পর্কে জানা। আপনজন সেবায় কর্মরত আছেন বিধায় মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবা নিয়ে আপনি কথা বলতে স্বাচ্ছন্দ্যবোধ নাও করতে পারেন। অনেক প্রশ্ন আপনার মনোবেদনার কারণ হতে পারে। এমতাবস্থায় আপনি ইচ্ছা করলে গবেষণায় অংশগ্রহণ করা থেকে বিরত থাকতে পারেন অথবা প্রয়োজনে পরিচিত চিকিতসক বা এই পত্রের শেষে যে হেল্পলাইনগুলোর তালিকা আছে তাদের একটিতে যোগাযোগ করে এই গবেষণায় অংশ নিতে পারেন।

গোপনীয়তা

আপনার সকল তথ্য আমাদের সাথে নিরাপদ থাকবে, আমরা সর্বোচ্চ চেষ্টা করব তার গোপনীয়তা বজায় রাখার জন্য। তারপরও আপনাকে সংবেদনশীল ও ক্ষতিকারক তথ্য সরবরাহ করা থেকে বিরত থাকার জন্য অনুরোধ করব। আপনার পরিচয় যাতে প্রকাশ না পায় সেজন্য আমরা সচেষ্ট থাকব। আপনার নাম ও পরিচয় একটি কোড দ্বারা স্থানান্তর করা হবে। শুধুমাত্র এই গবেষণার প্রধান গবেষক আপনার কোড এবং তথ্যে প্রবেশাধিকার পাবে। আপনাকে সাক্ষাতকারের সময় নাম ধরে ডাকা হবেনা। আপনার তথ্যগুলো অন্যদের তথ্যের সাথে “কল্পিত নাম” বা “চিকিতসক” বা “কোন উল্লেখ ব্যতীত” প্রকাশ করা হবে।



সুবিধা

এই গবেষণায় অংশগ্রহণের মাধ্যমে আপনি সরাসরি কোন সুযোগ-সুবিধা পাবেননা। তবে আপনার এই অংশগ্রহণের মাধ্যমে ডিনেটের আপনজন সেবার মান উন্নয়ন সম্ভব হবে এবং বাংলাদেশের মায়েরা যারা মোবাইল ফোনের মাধ্যমে সেবাগ্রহণ করবেন তাঁরা উপকৃত হবেন।

গবেষণার নীতিঃ

এই গবেষণাটির নীতিগতভাবে অনুমোদন করেছে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির হিউম্যান রিসার্চ এথিক্স কমিটি। এই গবেষণার নীতির ব্যাপারে প্রশ্ন থাকলে আপনি নিম্নোক্ত ঠিকানায় যোগাযোগ করতে পারেনঃ

Ethics Manager

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যোগাযোগঃ

আপনার এই গবেষণার বিষয়ে কোন প্রশ্ন থাকলে আপনি তা সরাসরি প্রধান গবেষক মাফরুহা আলমকে যোগাযোগের মাধ্যমে করতে পারেন নিম্নোক্ত ঠিকানায় ইমেইল বা ফোন করেঃ

ইমেইলঃ mafuaha.alam@anu.edu.au

ফোনঃ ০১৬২৮৩২৫৭৯৬



লিখিত সম্মতিপত্রঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

আমি গবেষণাটি সম্পর্কে প্রদত্ত তথ্যপত্র পড়েছি। আমার আপনার (সাক্ষাতকার গ্রহণকারীর) কাছে নিম্নোক্ত প্রশ্নগুলো ছিল যা আপনি উত্তর দিয়েছেন এবং আমাকে সন্তুষ্ট করতে পেরেছেন। প্রশ্নগুলো ছিলঃ

আমি সাক্ষাতকার দিতে সম্মত আছি হ্যাঁ/না

আমি সাক্ষাতকারটি রেকর্ড করতে সম্মত আছি হ্যাঁ/না

আমি নিম্নোক্তভাবে গবেষণায় উল্লিখিত হতে চাইঃ

ছদ্মনামে হ্যাঁ/না

কোন নামেই উল্লেখিত না হয়ে হ্যাঁ/না

আমি কি এখন আপনার সাক্ষাতকার নিতে পারি? হ্যাঁ/ না

সাক্ষাতকারপ্রদানকারীর স্বাক্ষরঃ

তারিখঃ

সাক্ষাতকারগ্রহণকারীর স্বাক্ষরঃ

তারিখঃ



সাধারণ তথ্যঃ

প্রশ্ন	উত্তর	
নাম		
বয়স		
জেন্ডার	☐ নারী ☐ পুরুষ	
মোবাইল নম্বর		
মেডিক্যাল যোগ্যতা		
মেডিক্যাল কলেজের নাম		
মেডিক্যাল পাশ করেছেন কবে?		
আপনি কোথায় কোথায় প্রাক্তিস করেন?		
আপনজনে সাপ্তাহিক কত ঘণ্টা কাজ করেন?		

সম্ভাব্য প্রশ্নঃ

প্রশ্ন	উত্তর
আপনি আপনজনে কিভাবে কাজ করতে এলেন?	
আপনি দিনে কতটা কল গ্রহণ করেন? প্রতিটা কল কতক্ষণ থাকে? আপনি কোন শিফট (দিন/রাতে) কাজ করেন?	
কারা ফোন করে? মহিলা নাকি তার স্বামী? প্রথম বাচ্চার বাবা- মা? গর্ভবতী নাকি বাচ্চার বাবা- মা?	
স্বামীরা যখন ফোন করে তখন স্ত্রী ফোনের পাশে থাকে?	
আপনি সচরাচর ফোনে (আপনজন) কি ধরনের পরামর্শ দিয়ে থাকেন? পরামর্শ কি তাঁরা মেনে চলতে পারেন?	
কখনো কাউকে কোথাও রেফার করেছেন? আপনি কি জানেন এরপর রোগীর পরিবার কি ব্যবস্থা নিয়েছে?	
মোবাইল ফোন স্বাস্থ্যসেবা যারা ব্যবহার করেন তাঁদের প্রত্যাশা কি আপনি কি বলতে পারেন?	
একটি হাসপাতালের আউটডোর আর মোবাইল ফোনের স্বাস্থ্যসেবা –এ দুটোর মধ্যে মানগত কি পার্থক্য আছে বলে আপনি মনে করেন?	



বাংলাদেশের প্রেক্ষাপটে মোবাইল ফোনে মা ও শিশু স্বাস্থ্যসেবার অবস্থান কিরকম বলে আপনি মনে করেন?	
আপনার কি কোন মন্তব্য আছে মা ও শিশু স্বাস্থ্য বা মোবাইল ফোনে স্বাস্থ্যসেবা নিয়ে?	

Annex-7: Questionnaires for Chapter-5

Information sheet, consent and interview
guidelines for recontacted survey women



Participant Information Sheet

Hello. My name is Mafruha Alam. I am doing a research on mobile phone based health services in Bangladesh as a part of my PhD at Research School of Population Health, Australian National University in Australia. I wish to invite you to participate in this research as you have received Dnet's 'Aponjon' service messages for your pregnancy or for your child aged under one year and were interviewed during survey in 2014. I would like to ask you some questions regarding your experience to 'Aponjon' service and your personal experience regarding your pregnancy and childbirth.

Project Title:

The impact of mobile phone based health promotion services on maternal and child health care behaviour in resource-limited countries: lessons from a case study in Bangladesh.

General Outline of the Project:

- **Description and Methodology:**

I am trying to understand how a mobile phone communication strategy is impacting maternal and child health care behaviours in Bangladesh. The project will evaluate accessibility to mobile phones by women, health care cost optimization by families, change in perception or involvement of family members in taking care of mother and new born baby, increased accessibility to specialized health care advice from hotline counselling service when there is an emergency and overall position of mHealth in existing health infrastructure. I will be using mixed methods for my PhD.

- **Participants:**

Around 20-24 participants will be interviewed in-person for this qualitative research. Participants who received Aponjon service and had been interviewed during a sample survey in 2014 will be recontacted to understand their experience in detail.

- **Use of Data and Feedback:**

The collected data from this in depth interview will be recorded, transcribed and translated before analysis. The recording and transcription will be stored in a password-protected computer of ANU for at least five years after the submission of PhD thesis or from the date of any publication of journal article. Once the data is no longer required it will be destroyed. Results of the analysis will be published in journal articles and in the PhD thesis. The publications will never disclose the names or any other identification of the participants. A summary of results of the research will be available on Dnet's website and newsletter of Aponjon.

Participant Involvement:

- **Voluntary Participation & Withdrawal:**

Participation in this research is voluntary. You may refuse to answer any question if you feel uncomfortable. You may without negative consequences, decline to take part or withdraw from the research in future without providing any explanation at any time until the work is prepared for publication. In that case, your data will be destroyed and not used.



- **Interview and Audio-recording**

The whole interview will take about an hour. Please consider 10 minutes to think about the following facts before you want to consent for the interview. You will be asked questions regarding your experience with child-bearing, delivery, care of new born baby, your health and experience with Aponjon service. For example you will be asked “Where did your last delivery take place? Do you remember what happened before and after your delivery?” etc. I will need to audio-record your interview for the purpose of the research. The audio-recording will remain with ANU which can be accessed only by a password by the principal investigator. A transcription of the record will be made, unfortunately as this will be done overseas I cannot give you a copy of it. There will be no remuneration to take part in this research. I understand that you would consider taking part in the research as your experience regarding use of the mobile phone health services is important for other future mothers in Bangladesh.

About 20-24 women will be contacted from already surveyed participants in 2014. The interviews will be held at participant’s house or a place where participants feel comfortable to talk face-to-face. The interviewer will ensure that privacy and confidentiality is maintained throughout the interview and that no third party presence intimidates the participant. In case, visiting the participant in their residential places is time-consuming the interviews will be done over phone depending on availability and consent of the participant.

- **Risk**

Usually women feel enthusiastic to talk about their pregnancies and child- birth. However, previous history of stillbirth, experience of maternity blues or child death might place you in distress or discomfort. If this is the case, we recommend you withdraw and contact one of the helpline from the list given at the end of this sheet or your local GP or health care provider.

- **Benefit**

It is unlikely that you will personally benefit from this research, however, we can anticipate that the research findings will help Dnet and the mHealth services in Bangladesh to improve their service towards future mothers.

Confidentiality

Though we will try to maintain confidentiality of your information as much as possible, we would advise you to refrain from sharing very sensitive or defamatory information with us. We will not publish any data that identifies you. Your identification will be replaced by a code during data analysis. Only the principal investigator will have access to the code and data. During the interview you will not be called by your name. The final results will be published as “pregnant woman” or “new mother” or by pseudonyms.

Ethics approval:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:



Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

Contact information

If you have any further queries regarding this particular research you can contact the principal investigator overseas, Mafruha Alam by email : mafruha.alam@anu.edu.au or cell :01XXXXXXXX (Bangladeshi cell phone number will be included)

For support for mental health and distress, contact National Mental Health Institute and Hospital, Sher e Bangla, Dhaka. Tel: +8801730333789

Regarding maternal and child health, contact the local Upazilla mobile health service as appropriate:

Chittagong Upazilla health complex: 01730324443 (Anowara), 01730324451 (Patiya)
Bagerhat district hospital: 01730324793
Laxmipur district hospital: 01730324773
Bogra district sadar: 01730324803

Regarding enquiry on Aponjon service, please call 16227.



ORAL CONSENT SCRIPT for re-contacted survey women

**The impact of mobile phone based health promotion services on maternal and
childhealth care behaviour in resource-limited countries: lessons from a case study in
Bangladesh**

I have read to you the Information Sheet about the research project. Was this
information clear? Do you have any questions about the project?

Do you agree to participate in this project? Yes/No

Do you agree for this interview to be audio-recorded? Yes/No

When I prepare the research outputs, I can attribute information to you in two ways:
by pseudonym, or I can use NO attribution and hold your information confidentially.

- Would you like to be referred to using a pseudonym (false name)? (Yes/No)
- Would you prefer that your information be not attributed to anyone at all?
(Yes/No)

May we start the interview now?

Signature of the interviewer:

Date:

Interview started at:

Ended at:

Interview checklist for women who used Aponjon messaging service:

SES questions for women:

	Questions	Answers	Instructions
1.	Name of woman		
2.	Age (years)		
3.	Education of women (years)		
4.	Education of husband (years)		
5.	Occupation of woman	Write here:	
6.	Occupation of husband	Write here:	
7.	Number of family members in the household		
8.	Woman lives in	☐ Joint family with in-laws ☐ Nuclear family (with husband and children)	Use tick (✓) for the appropriate answer
9.	Head of household	☐ Husband ☐ Father-in-law ☐ Mother-in-law ☐ Woman herself ☐ Brother-in-law ☐ Sister-in-law ☐ Other _____	Use tick (✓) for the appropriate answer
10.	Total no. of children live born to women		
11.	No. of children died before 5 th birthday		
12.	Reason for their deaths	Write here	
13.	Incident of abortion/miscarriage	☐ Yes ☐ No	Use tick (✓) for the appropriate answer
14.	Length of married life (years)		
15.	House material	☐ Brick built one storey, roof-tin ☐ Brick built, roof-brick ☐ Built with tin and timber ☐ Built with clay, straw	Use tick (✓) for the appropriate answer

		○ Modern apartments/concrete material ○ Other _____	
16.	Presence of equipment in the household (Multiple answer)	▪ TV ▪ Refrigerator ▪ Ceiling fan ▪ Air conditioner ▪ Other _____	
17.	Family monthly expenditure (Taka)		
18.	No. of mobile phones in the household		
19.	Woman's ability with mobile phone	○ None ○ Can receive call only ○ Can make a call and receive call ○ Can make a call, receive calls and text ○ Other _____	Use tick (✓) for the appropriate answer
20.	Does woman have a personal mobile set which she uses only?	○ Yes ○ No	Use tick (✓) for the appropriate answer
21.	Who accessed Aponjon messages	○ Woman herself always ○ Woman by chance (family phone), mostly other family member	Use tick (✓) for the appropriate answer
22.	Cell number that is used for Aponjon service	Write here	

Interview checklist for new mothers

Open ended questions	Purpose
Tell me about your experiences with Aponjon service (who accessed, usefulness and barriers, likes or dislikes)	
Would you re-enrol or recommend the service to anyone? Why or why not?	
Is this your first child? Tell me about your children, when they were born	Experience of previous pregnancy, miscarriage, gap between the last issue and the current infant
What is the age of your infant?	Age of baby
Tell me about the delivery places of your	Delivery experience

children	
Tell me about the whole delivery process of the infant (e.g. length of the labour, who did what, what was used during delivery, presence of birth attendant, any complications etc.) What happened during previous deliveries?	Delivery experience
What was the birth weight of your baby? Do you remember what the baby was fed right after birth?	Essential new born care
After the baby was expelled from your womb, what happened? (cleaning, wrapping, bathing) Do you remember about the first bath, first haircut of the baby? When and who initiated the first bath? How did you care for the belly button/umbilicus of the baby? What was the source of information? Did you see anyone for check-ups or symptoms within the first 42 days of delivery? Why or why not?	Essential new born care
How was your life when you were pregnant? (e.g. daily activities, nutrition, meals, health service consultation etc.) Did you see anyone for health check- up during that time? (no. of ANC's, type of provider etc.) Did you receive any TT vaccines? How many? Where? Did you find any change between the previous and current pregnancy?	Pregnancy experience
Did you ever consult anyone for your or your infant's health/ sickness? What was the reason? Tell me how you contacted someone (health professional/quack).	Women's access to health service, knowledge on danger signs, health care seeking pattern in that household, barriers to health care



What kind of medication/ support you received? Did you follow the whole procedure? If not what prevented you?	
If you conceive again, what things will you try to follow during your pregnancy and care of new born baby?	

২০১৪ সালে জরিপকৃতদের পুনঃ সাক্ষাতকারের জন্য তথ্য পত্র, অনুমতি এবং সাক্ষাতকার নির্দেশাবলী

সাক্ষাতকারপ্রদানকারীর জন্য তথ্য

সালাম। আমার নাম মাফরুহা আলম। আমি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির অন্তর্ভুক্ত জনস্বাস্থ্য বিষয়ক গবেষণা বিভাগে বাংলাদেশের মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার উপর পিএইচডি করছি। আপনি যেহেতু ডিনেট পরিচালিত আপনজন স্বাস্থ্যসেবার সেবাসমূহ আপনার গর্ভাবস্থা অথবা নবজাতক শিশুর লালন-পালনের জন্য পেয়েছেন এবং ২০১৪ সালে আপনজনের জরিপে অংশগ্রহণ করেছেন, তাই আমার গবেষণার জন্য আপনার সাক্ষাতকার গ্রহণ করতে আগ্রহ প্রকাশ করছি। আমি আপনার কাছে আপনজন সেবা সম্পর্কে এবং আপনার গর্ভকালীন এবং সন্তান জন্ম সংক্রান্ত কিছু বিষয়ে আপনার অভিজ্ঞতা জানতে চাইব।

প্রকল্প শিরোনামঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

প্রকল্পচিত্রঃ

বর্ণনা ও পদ্ধতিঃ

আমার গবেষণার মাধ্যমে আমি বাংলাদেশের মা ও শিশু স্বাস্থ্যভিত্তিক সেবায় মোবাইল ফোনের ভূমিকা বুঝতে চাইছি। এই প্রকল্পের মাধ্যমে আমরা মোবাইল স্বাস্থ্যক্ষেত্রে মহিলাদের প্রবেশগম্যতা, পরিবার সমূহের স্বাস্থ্য সংক্রান্ত ব্যয়, পরিবারের সদস্যদের এধরনের সেবায় এবং মা ও শিশু স্বাস্থ্যে সক্রিয় অংশগ্রহণ, জরুরী প্রয়োজনে মা ও শিশু সংক্রান্ত কারণে হটলাইন সেবায় ফোন করে পরামর্শ গ্রহণ এবং বাংলাদেশের স্বাস্থ্যক্ষেত্রে মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবার অবস্থান সম্পর্কে ধারণা করতে চাই। এ গবেষণায় আমি মিশ্র পদ্ধতি অবলম্বন করব।

অংশগ্রহণকারীঃ

২০১৪ সালে ডিনেটের আপনজন সেবাগ্রহণকারী যারা জরিপে অংশ গ্রহণ করেছিলেন তাদের মধ্যে ২০- ২৪ জনের সাক্ষাতকার গ্রহণ করা হবে।

ডাটা ব্যবহারবিধি ও গবেষণালব্ধ অনসিদ্ধান্তঃ

এই সাক্ষাতকারসমূহ গবেষণার সুবিধার্থে রেকর্ড, অনুলিখন এবং বিশ্লেষণ করা হবে। এই ডাটা থিসিস বা জর্নাল আর্টিকলে প্রকাশের তারিখ হতে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির কম্পিউটারে পাসওয়ার্ড দিয়ে ন্যূনতম পক্ষে পাঁচ বছর সংরক্ষণ করা হবে। এবং তারপর প্রয়োজনে ডাটা ধ্বংস করে ফেলা হবে। এই ডাটায় কখনো কোন



সাক্ষাতকারপ্রদানকারীর প্রকৃত নাম প্রকাশ করা হবেনা। গবেষণালব্ধ ফল ডিনেটের ওয়েবসাইটে এবং আপনজন নিউজলেটারে প্রকাশ করা হবে।

সাক্ষাতকারপ্রদানকারীদের অংশগ্রহণঃ

সাক্ষাতকার দেয়ায় কোন বাধ্যবাধকতা নেই। আপনি স্বেচ্ছায় স্বতঃপ্রণোদিত হয়ে অংশগ্রহণ করতে চাইলেই আপনার সাক্ষাতকার গ্রহণ করা হবে। সাক্ষাতকারের সময় যেকোন প্রশ্ন আপনি ইচ্ছা করলে উত্তর দেয়া থেকে বিরত থাকতে পারেন। সাক্ষাতকার দেবার পরে গবেষণাটি প্রকাশের আগে আপনার যদি মনে হয় আপনি এই গবেষণা থেকে নিজেকে প্রত্যাহার করতে চান, তবে আপনি তা গবেষককে জানানোর মাধ্যমে কোন সমস্যা ব্যতিরেকেই করতে পারেন। সেক্ষেত্রে আপনার ডাটা আর ব্যবহার করা হবে না এবং ডাটা নষ্ট করে ফেলা হবে।

সাক্ষাতকার এবং অডিও রেকর্ডিং

পুরো সাক্ষাতকারটি সম্পন্ন হতে প্রায় ১ ঘণ্টা লাগবে। সাক্ষাতকারটিতে অংশগ্রহণের আগে আমি আপনাকে নিম্নোক্ত বিষয়সমূহ ভেবে দেখার জন্য ১০মিনিট সময় নিতে অনুরোধ করব। আপনাকে আপনার স্বাস্থ্য, আপনার সন্তান/সন্তানদের জন্মস্থান, শিশুর পরিচর্যা, আপনজন সেবা ব্যবহার ও মোবাইল ফোন ভিত্তিক স্বাস্থ্যসেবা নিয়ে আপনার মতামত জানতে চাইব। যেমন আমি জানতে চাইবঃ “আপনার সর্বকনিষ্ঠ শিশুটি কোথায় জন্মেছে?” “সন্তান জন্মের আগে এবং পরে কি কি হয়েছিল?” “আপনজন সেবা সম্পর্কে আপনার অভিজ্ঞতা কি?” ইত্যাদি। আপনার সাক্ষাতকারটি গবেষণার সুবিধার্থে আমি রেকর্ড করতে চাই। অডিও রেকর্ডিংটি অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটিতে সংরক্ষিত থাকবে যাতে শুধুমাত্র প্রধান গবেষকের প্রবেশাধিকার থাকবে। অডিওটির গবেষণার সময় অনুলিখন করা হবে, কিন্তু যেহেতু তা বিদেশে সম্পন্ন হবে তা আপনার সাথে শেয়ার করা সম্ভব হবে না। এই গবেষণায় অংশগ্রহণের জন্য কোন উপহার বা সম্মানীর ব্যবস্থা নেই। বাংলাদেশের মায়েদের স্বাস্থ্যের উন্নতিতে আপনার মূল্যবান মতামত সহায়ক হবে এবং বৃহত্তর স্বার্থে আপনি এই গবেষণায় অংশগ্রহণ করবেন বলে আমরা আশা করি।

২০- ২৪ জন আপনজন সেবাগ্রহণকারীর সাক্ষাতকার নেয়া হবে। সাক্ষাতকারগুলি সাধারণত সেবাগ্রহণকারীর বাসায় বা যেখানে তাঁরা মুখোমুখি কথা বলতে সহজবোধ করেন সেখানে নেয়া হবে। সাক্ষাতকারগ্রহণের সময় নিশ্চিত করা হবে কেউ যাতে সাক্ষাতকার প্রদানকারীর আলাপে বিঘ্ন না ঘটায় এবং তিনি যা বলছেন তা যাতে গবেষকের সাথে গোপন ও নিরাপদ থাকে। সময়ের অভাবে যদি সাক্ষাতকার প্রদানকারীর বাড়িতে সাক্ষাতকার গ্রহণ সম্ভব না হয় তবে তা সাক্ষাতকারপ্রদানকারীর অনুমতি সাপেক্ষে ফোনে সম্পন্ন করা হবে।

ঝুঁকি

আমাদের পূর্ব অভিজ্ঞতা অনুযায়ী, মায়েরা সাধারণত তাঁদের সন্তান লালন- পালন বা জন্মের আগে- পরের গল্প বলতে ভালবাসেন। তবে, যেসব মায়ের সন্তান জন্ম নিয়ে কষ্টের অভিজ্ঞতা আছে (যেমন- নবজাতকের মৃত্যু, মাতৃত্ব জনিত অসুস্থতা ইত্যাদি) তাঁরা এসব অভিজ্ঞতার কথা বলতে মনোবেদনায় ভুগতে পারেন। এমতাবস্থায় আপনি ইচ্ছা করলে গবেষণায় অংশগ্রহণ করা থেকে বিরত থাকতে পারেন অথবা প্রয়োজনে পরিচিত চিকিতসক বা এই পত্রের শেষে যে হেল্পলাইনগুলোর তালিকা আছে তাদের একটিতে যোগাযোগ করে এই গবেষণায় অংশ নিতে পারেন।

গোপনীয়তা

আপনার সকল তথ্য আমাদের সাথে নিরাপদ থাকবে, আমরা সর্বোচ্চ চেষ্টা করব তার গোপনীয়তা বজায় রাখার জন্য। তারপরও আপনাকে সংবেদনশীল ও ক্ষতিকারক তথ্য সরবরাহ করা থেকে বিরত থাকার জন্য অনুরোধ করব। আপনার পরিচয় যাতে প্রকাশ না পায় সেজন্য আমরা সচেষ্ট থাকব। আপনার নাম ও পরিচয় একটি কোড দ্বারা স্থানান্তর করা হবে। শুধুমাত্র এই গবেষণার প্রধান গবেষক আপনার কোড এবং তথ্য প্রবেশাধিকার পাবে। আপনাকে



সাক্ষাতকারের সময় নাম ধরে ডাকা হবেনা। আপনার তথ্যগুলো অন্যদের তথ্যের সাথে “গর্ভতী মহিলা” বা “মা” বা একটি কল্পিত নাম দিয়ে প্রকাশ করা হবে।

সুবিধা

এই গবেষণায় অংশগ্রহণের মাধ্যমে আপনি সরাসরি কোন সুযোগ-সুবিধা পাবেননা। তবে আপনার এই অংশগ্রহণের মাধ্যমে ডিনেটের আপনজন সেবার মান উন্নয়ন সম্ভব হবে এবং বাংলাদেশের মায়েরা যারা মোবাইল ফোনের মাধ্যমে সেবাগ্রহণ করবেন তাঁরা উপকৃত হবেন।

গবেষণার নীতিঃ

এই গবেষণাটির নীতিগতভাবে অনুমোদন করেছে অস্ট্রেলিয়ান ন্যাশনাল ইউনিভার্সিটির হিউম্যান রিসার্চ এথিক্স কমিটি। এই গবেষণার নীতির ব্যাপারে প্রশ্ন থাকলে আপনি নিম্নোক্ত ঠিকানায় যোগাযোগ করতে পারেনঃ

Ethics Manager

The ANU Human Research Ethics Committee

The Australian National University

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যোগাযোগঃ

আপনার এই গবেষণার বিষয়ে কোন প্রশ্ন থাকলে আপনি তা সরাসরি প্রধান গবেষক মাফরুহা আলমকে যোগাযোগের মাধ্যমে করতে পারেন নিম্নোক্ত ঠিকানায় ইমেইল বা ফোন করেঃ

ইমেইলঃ mafuaha.alam@anu.edu.au

ফোনঃ ০১৬২৮৩২৫৭৯৬

সাক্ষাতকার দেবার সময় আপনি যদি মানসিক চাপ বোধ করেন তবে আপনি চাইলে নিম্নোক্ত ঠিকানায় যোগাযোগ করতে পারেনঃ

জাতীয় মানসিক স্বাস্থ্য ইন্সটিটিউট ও হাসপাতাল, শের- এ- বাংলা, ফোনঃ ০১৭৩০৩৩৩৭৮৯

মা ও শিশু স্বাস্থ্যের বিষয়ে আপনি স্থানীয় মোবাইল স্বাস্থ্যসেবায় যোগাযোগ করতে পারেনঃ

চট্টগ্রাম উপজেলা স্বাস্থ্য কমপ্লেক্সঃ ০১৭৩০৩২৪৪৪৩ (আনোয়ারা), ০১৭৩০৩২৪৪৫১ (পটিয়া)

বাগেরহাট জেলা হাসপাতালঃ ০১৭৩০৩২৪৭৯৩

লক্ষ্মীপুর জেলা হাসপাতালঃ ০১৭৩০৩২৪৭৭৩

বগুড়া জেলা হাসপাতালঃ ০১৭৩০৩২৪৮০৩

আপনজন সেবা সম্পর্কে প্রশ্ন থাকলেঃ

আপনজন সেবা যোগাযোগঃ ১৬২২৭



মৌখিক সম্মতিপত্রঃ

উন্নয়নশীল বিশ্বে মা ও শিশু স্বাস্থ্য সেবায় মোবাইল ফোন ভিত্তিক সেবার ভূমিকাঃ পটভূমি বাংলাদেশ

আমি আপনাকে গবেষণাটি সম্পর্কে বলেছি। আপনার কাছে তথ্যগুলো স্পষ্ট মনে হয়েছে? আপনি কি গবেষণাটি নিয়ে আর কিছু জানতে চান?

আপনি কি এই গবেষণায় অংশগ্রহণ করতে ইচ্ছুক? হ্যাঁ/ না

আপনি কি সাক্ষাতকারটি রেকর্ড করতে সম্মত ? হ্যাঁ/না

আপনার তথ্য আমি গবেষণায় দুই ভাবে উপস্থাপন করতে পারিঃ ছদ্মনামে অথবা কোন পরিচয়েই উল্লেখ না করে।

আপনি কি চান আপনাকে গবেষণায় ছদ্মনামে ডাকা হোক ? হ্যাঁ/না

আপনি কি চান আপনাকে কোন ধরনের পরিচয়ে উল্লেখ না করা হোক ? হ্যাঁ/না

আমি কি এখন আপনার সাক্ষাতকার নিতে পারি? হ্যাঁ/ না

সাক্ষাতকারগ্রহণকারীর স্বাক্ষরঃ

তারিখঃ

সাক্ষাতকারপ্রদানকারীর প্রাথমিক তথ্যঃ

	প্রশ্ন	উত্তর	নির্দেশাবলী
১।	নাম		
২।	বয়স		
৩।	গর্ভবতী বা মায়ের শিক্ষাগত যোগ্যতা		
৪।	স্বামীর শিক্ষাগত যোগ্যতা		
৫।	গর্ভবতী বা মায়ের পেশা		
৬।	স্বামীর পেশা		
৭।	বাড়ীর সদস্য সংখ্যা		
৮।	গর্ভবতী বা মা থাকে	১) একক পরিবারে ২) যৌথ পরিবারে	
৯।	বাড়ীর গৃহ প্রধান	১) স্বামী ২) শ্বশুর ৩) শ্বাশুড়ী ৪) গর্ভবতী/মা নিজে ৫) ভাসুর/দেবর ৬) জা/ননদ ইত্যাদি ৬৬) অন্যান্য_____	
১০।	জীবিত সন্তান সংখ্যা		
১১।	পাঁচ বছরের নীচে সন্তান মৃত্যু সংখ্যা		
১২।	সন্তানদের মৃত্যুর কারণসমূহ		
১৩।	বাচ্চা নষ্ট হবার ঘটনা আছে কি?	১) হ্যাঁ ২) না	
১৪।	দাম্পত্য সংসারের বয়স		
১৫।	যে ধরনের বাড়ীতে থাকেন	১) পাকা বাড়ী, টিনের চাল ২) পাকা বাড়ী, ছাদ পাকা ৩) টিন আর কাঠের বাড়ী ৪) মাটির ঘর, ছনের ছাদ ৫) অ্যাপার্টমেন্ট/ বিল্ডিং ৬) অন্যান্য_____	
১৬।	বাড়ীতে যা যা আছে	▪ টিভি ▪ ফ্রিজ ▪ সিলিং ফ্যান ▪ এসি ▪ অন্যান্য_____	

১৭।	পারিবারিক মাসিক খরচ (টাকা)		
১৮।	বাড়ীতে সতগুলো মোবাইল ফোন আছে		
১৯।	গর্ভবতী বা মায়ের মোবাইল ফোন ব্যবহার	১) একদমই ব্যবহার করেন না ২) শুধু ফোন ধরেন ৩) ফোন ধরেন এবং করেন ৪) ফোন ধরেন, করেন এবং ম্যাসেজ পাঠান ৬৬) অন্যান্য _____	
২০।	গর্ভবতী বা মায়ের ব্যক্তিগত মোবাইলফোন আছে কিনা	১) হ্যাঁ ২) না	
২১।	আপনজন ম্যাসেজ কে রিসিভ করেন?	১) সবসময় মহিলা ২) সবসময় অন্য কেউ ৩) মহিলা অথবা অন্য কেউ	
২২।	আপনজন সেবায় ব্যবহৃত মোবাইল ফোন নম্বর		

সম্ভাব্য প্রশ্নসমূহঃ

প্রশ্ন	উত্তর
আপনজন সেবা সম্পর্কে আপনি জানলেন কিভাবে? সেবাটি সম্পর্কে আপনার অভিজ্ঞতা বলুন। মোবাইল ফোন আপনি কি ভাবে ব্যবহার করেন একটু বলুন।	
আপনি কি ভবিষ্যতে নিজে এই সেবাটি আবার ব্যবহার করবেন কিংবা অন্য কাউকে ব্যবহার করতে বলবেন? কেন ?	
আপনার সন্তানদের জন্ম, বয়স, কোথায়, কিভাবে হয়েছে। সর্বকনিষ্ঠের পুরো ডেলিভারী সবিস্তারে বলুন। আগের ডেলিভারীতে কি হয়েছিল?	
বাচ্চার ওজন কত ছিল? শিশুর জন্মের পরপর কি খাওয়ানো হয়েছিল?	
বাচ্চার জন্মের পরপর কি করা হয়েছিল? বাচ্চার প্রথম গোসল কে, কখন দিয়েছিল? বাচ্চার নাভি কি করেছেন? বাচ্চার চুল কাটা হয়েছিল? কবে? বাচ্চার জন্মের ৪২ দিনের মধ্যে স্বাস্থ্যপরীক্ষা করিয়েছেন?	



করলে কে করেছে? কেন করেছেন ?	
আপনার বাচ্চা পেটে থাকা অবস্থায় কেমন খাওয়া দাওয়া করতেন? গর্ভাবস্থায় আপনি কি স্বাস্থ্যপরীক্ষা করিয়েছিলেন? টিটি দিয়েছিলেন? কার কাছে দেখাতেন?	
আপনার পূর্ব এবং শেষ গর্ভাবস্থার মধ্যে কোন তফাত পান?	
আপনার সন্তানের বা আপনার স্বাস্থ্য সম্পর্কে কোন চিকিতসকের পরামর্শ নিতে হয়েছে? কিভাবে যোগাযোগ করেছেন? কি ধরনের চিকিতসা সেবা গ্রহণ করেছেন? আপনি কি পুরো চিকিতসাটি শেষ করেছেন? না করলে কেন করেন নি?	
পরবর্তী সন্তানের জন্মের সময় কি কি বিষয় খেয়াল রাখবেন?	

Annex-8: Questionnaire for Chapter-6

Aponjon sample survey questionnaire
2014

Pregnant

Interview ID: P_____ (3 digits)

Location _____

Written consent for interview, photograph and audio recording:

Hi, my name is _____ and I am involved in a mobile phone based service research study called Aponjon (a brand service under the initiative of Mobile Alliance for Maternal Action). This research is initiated by USAID and implemented by Dnet with support of outreach partners BRAC, Save the Children USA, NHSDP, Infolady, Ministry of Health and Family welfare (Government of Bangladesh) and PM's Access to Information services programme.

You are selected as a participant of this study as you are either pregnant or mother of an infant and had been registered for mobile based service for the last couple of months. I will ask you to participate in a survey that would include questions about how you feel about the service, what changes the service made/may make in your life, feedbacks regarding the service and compliance with the payment process of the service. The length of the survey will be about one hour.

There should be little or no risk involved in participating in this research. If any of the questions make you feel uncomfortable, you do not have to answer them. Your participation is voluntary, and you can leave the survey or withdraw from the study at any time without any consequences to you. We will audio record the survey so that we can have a good record of what everyone says. We will transcribe (write down) the information from the recording and erase the recording after writing the final draft.

We may also ask to take photos of you. The pictures may be published in reports and journal articles but would never include your name or name of this venue. Photos may be posted online in reports or the project website. After we take the photographs, you may view them and request that they not be used.

The information from this study may be used in the future for other studies on similar topics. You will not benefit directly from participating in this research. If you wish to participate in this research we have some gift items from this service as a token of your valuable time to the survey.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. The information will be kept in a secure location where only the researchers in this study will have access. We will replace your name with a code. Data from this study will be kept indefinitely.

Here is my card with my name, contact information, name of the research organization responsible for the research. Please feel free to contact me in future if you have any question related to the survey. You might also check out your right to participate in the survey, in that case I can provide you with the contact details to USAID.

Do you have any questions about this research? Yes/No (Tick as appropriate)

Are you willing to participate in the survey? Yes/No (Tick as appropriate)

Annex

Do you give us permission to take photographs of you? Yes/No (Tick as appropriate)

Thank you for your cooperation.

Signature & Name of interviewee

Signature & Name of interviewer

Date:

Time of interview: Start

End:

Annex

1. Interviewer's ID:

Background information of respondent:

	Question	Answer	Instructions for field researcher
2.	Respondent's Name:		
3.	Respondent's Registration ID		
4.	Type of respondent	☐ Pregnant (1)	
5.	Cell number of respondent which is used for Aponjon		
6.	Type of message	☐ Text messages (1) ☐ Pre-recorded voice messages (0)	
7.	Time when message is received	☐ Morning (8 am- 12 pm) (1) ☐ Afternoon (12-4 pm) (2) ☐ Evening (4-8 pm) (3) ☐ Night (8-11 pm) (4)	
8.	Payment method for the service	☐ Free subscriber (1) ☐ Paid subscriber (0)	
9.	Last menstruation initiation date (LMP)	Write (DD/MM/YYYY)	
10.	Respondents' address	Division: Distrcit: Upazilla: Union: Village/ Moholla:	
11.	Education level of pregnant woman	☐ Never attended school (1) ☐ Primary education incomplete (2) ☐ Primary education complete (3) ☐ Junior secondary (level 8) complete (4) ☐ Secondary education complete (5) ☐ Higher Secondary incomplete/grade 11 (6) ☐ Higher education complete (7) ☐ Higher than HSC/More than 12 years of education (8) ☐ Others _____(66)	
12.	Education level of pregnant woman's husband	☐ Never attended school (1) ☐ Primary education incomplete (2) ☐ Primary education complete (3) ☐ Junior secondary (level 8) complete (4) ☐ Secondary education complete (5)	

Annex

		○ Higher Secondary incomplete/grade 11 (6) ○ Higher education complete (7) ○ Higher than HSC/More than 12 years of education (8) ○ Others _____(66)	
13.	Occupation of pregnant woman	○ Housewife (1) ○ student (2) ○ Day laborer (3) ○ Farm (4) ○ Fisher woman (5) ○ Driver –car/heavy vehicle (6) ○ Small businessman (owner of local shop etc.) (7) ○ Business man (8) ○ Govt. employees (9) ○ Private service holder(10) ○ NGO worker (11) ○ Garments worker (12) ○ Others _____(66)	
14.	Pregnant woman's husband occupation	○ Unemployed (1) ○ Student (2) ○ Day laborer (3) ○ Farmer (4) ○ Fisherman(5) ○ Rickshaw puller (6) ○ Driver- CNG (7) ○ Driver –Car/ Heavy vehicle (8) ○ Small business man (9) ○ Businessman (10) ○ Govt. employee (11) ○ Private service holder (12) ○ NGO worker (13) ○ Overseas worker (14) ○ Others _____(66)	
15.	Family monthly income (BDT)	○ Below 5000 taka (1) ○ 5001-10000 (2) ○ 10001-20000 (3) ○ 20001-50000 (4) ○ 50001-100000 (5) ○ 100000 or above (6)	
16.	Sanitary latrine present at residence?	○ Yes (1) ○ No (0)	
17.	Age of pregnant woman	○ Under 15 (1) ○ 15- 19 years (2) ○ 20 -24 years (3) ○ 25 –29 years (4)	

Annex

		○ 30 -34 years (5) ○ Above 35 years (6)	
18.	Pregnancy stage during interview	○ First trimester (1) ○ Second trimester (2) ○ Third trimester (3) ○ Baby was born, but not updaed for new mother's service (4) ○ Others_____ (66)	
19.	Pregnant woman had (live) children before this pregnancy?	○ Yes (1) ○ No (0)	
20.	If yes, what is the age of the child before this pregnancy?	_____ years	
21.	Any incident of miscarriage by pregnant woman?	○ Yes (1) ○ No (0)	
22.	Aponjon content version received by pregnant woman	○ Urban (1) ○ Rural (0)	
23.	Aponjon service registration for	○ Pregnant woman alone (1) ○ Pregnant woman and husband (2) ○ Pregnant woman and other family member (3) ○ Only husband (4) ○ Only family member(other than husband) (5) ○ Others_____ (66)	

Aponjon service related:

	Questions	Answer	Instructions for field researchers
24.	Who enrolled you in this service?	○ Health worker (1) ○ From hospital (2) ○ My husband (3) ○ I myself called or texted to 16227 (4) ○ Others_____ (66)	
25.	Before enrolment, how did you find out about this service?	○ From health worker (1) ○ From an Aponjon subscriber (2) ○ From hospital (3) ○ From Blue star clinics (4) ○ From a brand promoter (5) ○ Husband (6) ○ From TV (7) ○ From billboard(8)	

Annex

		○ From newspaper advertisements (9) ○ From SMS in my phone (10) ○ I received calls about this service (11) ○ From leaflet (12) ○ I don't know (98) ○ Others _____ (66)	
26.	Do you currently receive Aponjon messages?	○ Yes (1) ○ No (2) ○ Received it previously, but not anymore (3) ○ Others _____ (66)	
27.	On whose phone you receive messages?	○ Pregnant woman(1) ○ Pregnant woman's husband (2) ○ For someone else in the house(3) ○ Neighbour's (4) ○ Others _____ (66)	
28.	How many messages you receive weekly now	○ 0 (1) ○ 1 (2) ○ 2 (3) ○ 3 (4) ○ More than 3 (5) ○ Never received any messages (6) ○ I received messages but did not notice when it came as I was not aware I was enrolled in the service (7) ○ I don't receive the messages as it drops phone balance (8) ○ Others __ (66)	
29.	Who receives messages?	○ Pregnat woman herself (1) ○ Some one else other than pregnant woman (who owns the phone) (2) ○ Pregnant woman or some one from the house (shared family phone) (3)	
30.	Do you have any problem to receive the messages?	○ Yes (1) ○ No (2) ○ Don't know (98) ○ Others _____ (66)	If yes, go to next question no. 31
31.	If yes, what kind of problem did you encounter?	○ The service is pricy (1) ○ I can't listen to the messages myself as the call comes when the cell phone is not with me (2) ○ Don't receive messages anymore	✓ Mark means (1=yes) No mark (0=no)

Annex

		due to loss pf phoneset/ sim card (3) ○ I can't read the transliterated text messages (4) ○ In the recorded voice messages, the messages are said with hurry , difficult to get the information (5) ○ I had a miscarriage, but still receiving messages which is annoying (6) ○ There is nothing new in this information (7) ○ The weekly messages are not according to my current state (8) ○ I can't hear anything after receiving the phone call (problem due to zero balance in phone) (9) ○ I can't hear after receiving the phone call (mobile network is weak in that area) ○ Others_____ (66)	
32.	Can you remember the short code which provides you the messages?	○ Could tell the full shortcode (1) ○ Could tell the shortcode partially(2) ○ Could not tell the shorcode(3)	

Pregnant woman's knowledge (related to antenatal checkups)

	Question	Answer	Instructions for field researchers
33.	Did you have a physical examination after you discovered that you were pregnant?	○ Yes (1) ○ No (0)	Ask all pregnant women If no, skip to Q-37
34.	If yes, who did you see?	○ Trained medical professionals (health worker, doctor from health center)(1) ○ Quacks (2) ○ Both (3)	Applicable for only who has done ANC
35.	How many times did you perform these	○ 1 (1) ○ 2 (2)	Applicable for only who has done ANC

Annex

	examinations	○ 3 (3) ○ 4 (4) ○ More than 4 (5)	
36.	Where did you learn about the physical checkups	○ From Aponjon (1) ○ From Aponjon and other sources (2) ○ Other sources (3) ○ Don't know (98) ○ Others_____ (66)	Applicable for only who has done ANC

Knowledge of Pregnant woman (regarding testing blood group)

	Question	Answer	Instruction for field researchers
37.	Do you know your blood group?	○ Yes (1) ○ No (0)	The researcher will fill out this question after the respondent has confidently told her bloodgroup. If answer is no, skip to Q-41
38.	If yes, when did you learn about your blood group	○ Before I got pregnant (1) ○ After I got pregnant (0)	
39.	Where did you learn about blood group testing	○ Only from Aponjon (1) ○ Aponjon and others (2) ○ Other sources (3) ○ Don't know (98) ○ Others_____ (66)	
40.	Did you identify anybody who can donate blood during your delivery?	○ Yes (1) ○ No (2) ○ Haven't thought about it yet (3) ○ Didn't know before, now I'll do it (4) ○ It's not necessary (5) ○ Others_____ (66)	

Knowledge about pregnancy and birth preparedness

	Question	Answer	Instruction for field researchers
41.	Do you have a plan where the baby will be delivered?	○ Yes (1) ○ No (2) ○ Baby is born (3) ○ Others_____ (66)	If no, skip to Q-47

Annex

42.	If yes, where will be /was delivered	○ Hospital/Clinic/Health center (1) ○ Home (0) ○ Others_____ (66)	If answer is not “home” than skip to Q-47
43.	If answer is at home, then who will be assisting during delivery?	○ Trained birth attendant (1) ○ Untrained birth attendant (Mother, mother-in-law, neighbor, relative) (2) ○ Others_____ (66)	Applicable for delivery at home
44.	Did you take any precautions for delivery at home?	○ Yes (1) ○ No (0)	Applicable for delivery at home If answer is No, then skip to Q-47
45.	(If yes) What precautions did you take for delivery at home? (Multiple answers)	▪ Informed trained birth attendant ▪ I bought the safe delivery kit ▪ Bought appliances that will be helpful during delivery at home (bucket, blade etc.) ▪ Stored fund for delivery ▪ Informed the local transport in case there is an emergency ▪ Others_____	Applicable for delivery at home ✓ Mark means (1=yes) No mark (0=no)
46.	How did you know that you have to take these precautions?	○ Only from Aponjon (1) ○ Aponjon and other sources(2) ○ Other sources (3) ○ Don't know (98) ○ Others_____ (66)	Applicable for delivery at home
47.	What are the danger signs of pregnancy?	○ Respondent could mention the signs (1) ○ Respondent could not name the signs (0) ○ Others_____ (66)	high fever, severe headache, blurry vision, convulsions, vaginal bleeding, severe lower abdominal pain, swelling in hands and feet, hypertension and less fetal movement

Practice regarding nutrition:

	Questions	Answers	Instructions for field researchers
48.	How many times in a day you eat one of these food items-vegetables, fruits, protein (such as milk,	○ Once (1) ○ Twice (2) ○ Thrice (3) ○ 4 times (4) ○ 5 times (5)	

Annex

	fish, meat, chicken, egg)?	○ Others _____(66)	
49.	Can you name the foods that you have been taking during pregnancy?	Write here _____	
50.	Which foods you avoid during pregnancy?	Write here _____	
51.	Why are you not taking this food?	Write here _____	
52.	What did/will you feed your child when he was/is born?	○ Colostrum (1) ○ Honey (2) ○ Sweetened water (3) ○ Formula milk (4) ○ Whatever the birth attendant/family member says (5) ○ Don't know (98) ○ Others (66) _____	

Information on pregnant woman's care at home

	Question	Answer	Instructions for field researchers
53.	Pregnant woman residing	○ At her father's home (1) ○ With her in-laws (2) ○ With husband and/or child (3) ○ Others _____(66)	
54.	Do you get some rests every day?	○ Yes (1) ○ No (2) ○ Others _____(66)	
55.	Who helps you at with household chores?	○ Husband (1) ○ Everybody at home (2) ○ No body (3) ○ Others (66) _____	
56.	Did you get all the TT shots?	○ Yes (1) ○ No (2) ○ Others (66) _____	

Annex

Practice regarding drinking water

	Question	Answer	Instructions for field researchers
57.	Where do you get the drinking water from?	○ Potable/treated water (boiled/ safe tubewell/filter) (1) ○ Open surface water(pond, river, tap etc.) (0)	If drink potable water, then go to next Q-58
58.	Where did you learn about potable drinking water?	○ Only from Aponjon (1) ○ Aponjon and other sources (2) ○ Other sources (3) ○ Don't know (98) ○ Others_____ (66)	

Practice regarding hand-wash:

	Question	Answer	Instructions for field researchers
59.	When do you wash hands everyday? (multiple answers)	▪ Before prayers ▪ After waking up in the morning ▪ Before meal ▪ After meal ▪ After defeacation ▪ During bath ▪ Before cook ▪ While washing cooking ingredients ▪ Others__	✓ Mark means (1=yes) No mark (0=no)
60.	How do you clean your hands for hygiene purposes usually?	○ With water (1) ○ Water and soap (2) ○ Water, soap , sometimes antiseptics (3) ○ Others_____ (66)	
61.	Where did you learn about hand washing prcatice	○ Only Aponjon (1) ○ Aponjon and other sources (2) ○ Other sources (3) ○ Don't know (98) ○ Others_____ (66)	✓ Mark means (1=yes) No mark (0=no)

Annex

Level of satisfaction on Aponjon:

	Questions	Answers	Instructions for field researchers
62.	Are you benefitted by Aponjon service?	○ Yes (1) ○ No (2) ○ Others____(66)	If No, skip to Q-64
63.	If yes , Can you explain how?	▪ I am reminded for timely vaccination ▪ I eat more now ▪ Avoid heavy work ▪ Everbody helps me ▪ Planned for delivery ▪ Identified a blood donor ▪ Keep clean and maintain hygiene ▪ Take enough rest ▪ Know about child's growth ▪ Not scared of delivery anymore ▪ I found talking to Aponjon doctor (by counseling line) useful ▪ Others_____	✓ Mark means (1=yes) No mark (0=no)
64.	Are you satisfied with Aponjon?	○ Yes (1) ○ No (2) ○ sort of (3)	If No, go to next Q-65
65.	If you are not satisfied, what is the reason behind this?	▪ I know all the information ▪ Do not receive messages regularly ▪ Messages come at an odd time ▪ Service is pricy ▪ Could not connect to doctor at counselling line by dialling 16227 ▪ Others_____	✓ Mark means (1=yes) No mark (0=no)
66.	What else do you want from Aponjon service?	Write here _____	
67.	How will you score this service between 1-5 (1= lowest performance, 5= highest performance)	○ 1 (1) ○ 2 (2) ○ 3 (3) ○ 4 (4) ○ 5 (5)	

68. Special note (to be filled out as part of filed observation by researchers)

Aponjon Sample survey questionnaire Bangla

2014

গৰ্ভবতী

Interview ID: P_____ (3 digits)

Location _____

লিখিত সম্মতিপত্র (সাক্ষাৎকার, অডিও রেকর্ডিং এবং ছবি তুলবার জন্য)

সালাম নিবেন। আমার নাম_____। আমি বর্তমানে “আপনজন” নামক মোবাইল ফোন ভিত্তিক স্বাস্থ্যতথ্য সেবার গবেষণার কাজ করছি। আমাদের এই উদ্যোগটি ইউএসএআইডি’র সূচনা অর্থায়নে ডি.নেট বাস্তবায়ন করছে। ব্র্যাক, সেভ দ্যা চিলড্রেন (ইউএসএ), সূর্যের হাসি, ডি.নেটের তথ্যকল্যাণী এবং বাংলাদেশ সরকারের স্বাস্থ্য ও পরিবার পরিকল্পনা মন্ত্রণালয়, তথ্য মন্ত্রণালয় এবং প্রধানমন্ত্রীর কার্যালয়ের এক্সেস টু ইনফরমেশন প্রোগ্রাম এই কাজের সহযোগী।

আপনাকে এই গবেষণায় অন্তর্ভুক্ত হতে অনুরোধ করবার কারণ আপনি গর্ভবতী অথবা মা, যার বাচ্চার বয়স এক বছরের নীচে এবং আপনি আপনজন স্বাস্থ্য পরামর্শ পেতে নিবন্ধন করেছিলেন। আমি আপনাকে এই গবেষণায় যে বিষয়গুলো জিজ্ঞাসা করবো সেগুলো হচ্ছে এই সেবা নিয়ে আপনার মতামত, আপনার দৈনন্দিন জীবনে এই তথ্য কোন ভূমিকা রাখতে পারছে কিনা, সেবাটির মূল্য ইত্যাদি নিয়ে আপনার পরামর্শগুলো আমি জানতে চাইবো। সাক্ষাৎকারটি আনুমানিক এক ঘণ্টা হতে পারে।

আপনি এই সমীক্ষায় অংশগ্রহণ করলে সেটা প্রাথমিকভাবে আপনার গোপনীয়তার উপর একটি হস্তক্ষেপ বলে আপনার মনে হতে পারে। এই সমীক্ষায় অংশগ্রহণে আপনার ক্ষতির সম্ভাবনা নেই। যদি আপনি কোন প্রশ্নের উত্তর দিতে না চান, তাহলে আপনাকে সেগুলোর উত্তর দিতে হবে না। আপনার অংশগ্রহণ স্বেচ্ছামূলক, এবং আপনি যে কোনো সময়ে সাক্ষাৎকার বন্ধ করে দিতে পারেন এবং/অথবা নিজেকে এই সমীক্ষা থেকে প্রত্যাহার করে নিতে পারেন, এর ফলে আপনার কোনো সমস্যা হবে না। কোনো পরিস্থিতিতে আপনাকে এই সমীক্ষা থেকে প্রত্যাহার করার প্রয়োজন হলে আমি তা করতে পারি।

আমরা আপনার দেওয়া সাক্ষাৎকারটি রেকর্ড করতে চাই কারণ এটা আপনার দেওয়া মতামতকে আরোও ভালভাবে বিশ্লেষণ করতে আমাদের সাহায্য করবে। রেকর্ডগুলো ট্রান্সক্রিপশনের পর আর সংরক্ষণ করা হবেনা। আপনার যদি সমস্যা না থাকে তাহলে আমরা আপনার ছবি তুলতে চাই যেটা আমাদের অনলাইন বা অন্যান্য রিপোর্ট এ প্রকাশ হতে পারে। আপনি ইচ্ছে করলে ছবিগুলো দেখে বলতে পারেন সেগুলো দেয়া যায় কিনা।

এই সমীক্ষার তথ্যসমূহ ভবিষ্যতে একই বিষয়ে অন্যান্য সমীক্ষার জন্য, নীতিনির্ধারনী সিদ্ধান্তকে জানানোর জন্য এবং অন্যান্য প্রয়োজনীয় মূল্যায়ন সমীক্ষায় ব্যবহার করা হতে পারে। আপনি এই গবেষণা থেকে সরাসরিভাবে লাভবান হবেন না। যদি আপনি এই গবেষণায় অংশগ্রহণ করতে রাজী থাকেন তাহলে আপনার এই মূল্যবান সময়ের জন্য আমরা কিছু উপহারের ব্যবস্থা রেখেছি।

এই সমীক্ষার সময় সংগৃহীত যেকোনো তথ্য যা আপনাকে সনাক্ত করতে পারে সেগুলো গোপন থাকবে এবং শুধু আপনার অনুমতিক্রমে তা প্রকাশ করা হবে। তথ্যগুলো একটি সুরক্ষিত স্থানে সংরক্ষণ করা হবে যেখানে শুধু এই সমীক্ষার গবেষকদের প্রবেশাধিকার থাকবে। আপনার নাম- পরিচয়ের বদলে একটি কোড ব্যবহার করা হবে। এই সমীক্ষা থেকে পাওয়া তথ্য আপনার পরিচয়সহ অনির্দিষ্টকালের জন্য সংরক্ষণ করা হবে।

এই কার্ডটিতে দায়িত্বপ্রাপ্ত ব্যক্তির নাম, যোগাযোগ নম্বর, সংশ্লিষ্ট গবেষণা প্রতিষ্ঠানের নাম দেয়া আছে। আমাকে এই সেবা সংক্রান্ত যে কোন প্রশ্ন করতে দ্বিধা করবেন না। আপনি ইচ্ছা করলে এই সেবায় যোগদানের ব্যাপারে আপনার অধিকার যাচাই করতে পারেন, সেক্ষেত্রে আমি আপনাকে ইউ এস এ আইডি’র যোগাযোগ নম্বর দিতে পারি।

Annex

আপনার কি এই গবেষণা/সেবা নিয়ে কোন প্রশ্ন আছে?

☐হ্যাঁ ☐না

আপনি কি এই গবেষণায় অংশগ্রহণ করতে চান?

☐হ্যাঁ ☐না

আপনি কি ছবি তুলতে রাজি আছেন?

☐হ্যাঁ ☐না

সম্মতি থাকলে সাক্ষাৎকার গ্রহণ করুন_____

টিক (✓) ব্যবহার করুন

অথবা

সম্মতি না থাকলে সাক্ষাৎকার গ্রহণ বন্ধ করুন_____

টিক (✓) ব্যবহার করুন

আপনার সহযোগিতার জন্য আপনাকে অনেক ধন্যবাদ।

সাক্ষাৎকার প্রদানকারীর নাম ও স্বাক্ষর

তারিখ:

সাক্ষাৎকার গ্রহণকারীর নাম ও স্বাক্ষর

তারিখ:

Annex

১। সাক্ষাৎকার গ্রহণকারীর আই ডি/Interviewer's ID:

সাক্ষাৎকারপ্রদানকারীর তথ্যঃ

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
২।	সাক্ষাৎকার প্রদানকারীর নাম: /Respondent's Name:		
৩।	সাক্ষাৎকার প্রদানকারীর নিবন্ধন আই ডি/ Respondent's Registration ID		
৪।	সাক্ষাৎকারপ্রদানকারীর ধরন (একটি উত্তর)	○ গর্ভবতী (1)	
৫।	সাক্ষাৎকারপ্রদানকারীর মোবাইল নম্বর(যে নম্বরে আপনজন ম্যাসেজ পায়)		
৬।	সেবা যেভাবে পেয়ে থাকেন	○ এস এম এস (1) ○ কল (0)	
৭।	কলের ক্ষেত্রে যেসময়ে কল পাওয়ার কথা (সিস্টেম থেকে)	○ সকালে (৮- ১২টা) (1) ○ দুপুরে (১২- ৪টা) (2) ○ বিকালে (৪- ৮টা) (3) ○ রাতে (৮- ১১টা) (4)	
৮।	সেবা গ্রহণকারীর সেবার মূল্য পরিশোধ সঙ্ক্রান্ত(সিস্টেম থেকে)	○ তিনি ফ্রি পান (1) ○ তিনি সেবার মূল্য পরিশোধ করেন (0)	
৯।	গর্ভবতীর শেষ মাসিকের তারিখ		
১০।	উত্তরদাতার ঠিকানা	বিভাগঃ জেলাঃ উপজেলাঃ ইউনিয়নঃ গ্রাম/মহল্লাঃ	
১১।	গর্ভবতীর শিক্ষাগত যোগ্যতা	○ কখনো পড়েনি (1) ○ প্রাইমারী শিক্ষা অসমাপ্ত (2) ○ প্রাইমারী শিক্ষা সমাপ্ত / ক্লাস ফাইভের বেশি(3) ○ নিম্ন মাধ্যমিক সমাপ্ত (4) ○ মাধ্যমিক শিক্ষা সমাপ্ত / কলেজে পড়েনি(5)	

		○ উচ্চ মাধ্যমিক শিক্ষা অসমাপ্ত/কলেজ ফাস্ট ইয়ার (6) ○ উচ্চ মাধ্যমিক শিক্ষা সমাপ্ত (7) ○ উচ্চ মাধ্যমিক উর্ধ্ব/ অনার্স বা ডিগ্রী শেষ করেনি (8) ○ অন্যান্য _____ (66)	
১২।	গর্ভবতীর স্বামীর শিক্ষাগত যোগ্যতা	○ কখনো পড়েনি (1) ○ প্রাইমারী শিক্ষা অসমাপ্ত (2) ○ প্রাইমারী শিক্ষা সমাপ্ত (3) ○ নিম্ন মাধ্যমিক সমাপ্ত (4) ○ মাধ্যমিক শিক্ষা সমাপ্ত (5) ○ উচ্চ মাধ্যমিক শিক্ষা অসমাপ্ত (6) ○ উচ্চ মাধ্যমিক শিক্ষা সমাপ্ত (7) ○ উচ্চ মাধ্যমিক উর্ধ্ব (8) ○ অন্যান্য _____ (66)	
১৩।	গর্ভবতীর পেশা	○ গৃহস্ত্রী (1) ○ ছাত্র (2) ○ দিন মজুর (কুলি, ফেরিওয়ালা, মাটি কাটা শ্রমিক ইত্যাদি) (3) ○ কৃষক (4) ○ জেলে (5) ○ চালক - কার/ভারী যানবাহন (6) ○ ক্ষুদ্র ব্যবসায়ী (দোকানের মালিক ইত্যাদি) (7) ○ ব্যবসায়ী (8) ○ সরকারী চাকুরীজীবী (9) ○ বেসরকারী চাকুরীজীবী (10) ○ এনজিও কর্মী (11) ○ গার্মেন্টস কর্মী (12) ○ অন্যান্য _____ (66)	
১৪।	গর্ভবতীর স্বামীর পেশা	○ বেকার (1) ○ ছাত্র (2) ○ দিন মজুর (কুলি, ফেরিওয়ালা ইত্যাদি) (3) ○ কৃষক (4) ○ জেলে (5) ○ চালক- রিকশা (6) ○ চালক- সি এন জি (7) ○ চালক - কার/ভারী যানবাহন (8) ○ ক্ষুদ্র ব্যবসায়ী (দোকানের মালিক ইত্যাদি) (9) ○ ব্যবসায়ী (10) ○ সরকারী চাকুরীজীবী (11) ○ বেসরকারী চাকুরীজীবী (12) ○ এনজিও কর্মী (13) ○ প্রবাসী (14) ○ অন্যান্য _____ (66)	

Annex

১৫।	পারিবারিক মাসিক আয় (টাকা)	৫০০০ টাকার নীচে (1) ৫০০১- ১০০০০ (2) ১০০০১- ২০০০০ (3) ২০০০১- ৫০০০০ (4) ৫০০০১- ১০০০০০ (5) ১০০০০০ টাকার উর্ধে (6)	
১৬।	বাড়িতে স্বাস্থ্যসম্মতপায়খানা আছে?	- হ্যাঁ (1) - না (0)	
১৭।	গর্ভবতীর বয়স	১৫ এর নীচে (1) ১৫- ১৯ বছর (2) ২০ - ২৪ বছর (3) ২৫ -২৯ বছর (4) ৩০ - ৩৪ বছর (5) ৩৫ বছরের উর্ধ (6)	
১৮।	তিনি এখন যত মাসের গর্ভবতী	- প্রথম ত্রৈমাসিক (1) - দ্বিতীয় ত্রৈমাসিক (2) - তৃতীয় ত্রৈমাসিক (3) - বাচ্চা হয়ে গেছে, কিন্তু নতুন মায়ের সেবা পাচ্ছেন না (4) - অন্যান্য_____ (66)	
১৯।	গর্ভবতীর আগে কোন সন্তান হয়েছে কি?	- হ্যাঁ (1) - না (0)	
২০।	হ্যাঁ হলে, ঠিক আগের সন্তানটির বয়স কত?	_____ বছর	
২১।	গর্ভবতীর কি গর্ভপাতের ঘটনা আছে?	- হ্যাঁ (1) - না (0)	
২২।	আপনজনের যে ভার্সন টি তারা পান (সিস্টেম থেকে)	- আরবান (1) - রুরাল (0)	
২৩।	আপনজন সেবাটি যারা যারা পায়	- গর্ভবতী একা (1) - গর্ভবতী এবং স্বামী (2) - গর্ভবতী এবং অন্য কোন অভিভাবক (3) - শুধু স্বামী (4) - শুধু অভিভাবক (5) - অন্যান্য_____ (66)	

Annex

আপনজন ম্যাসেজ শোনা সংক্রান্তঃ

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
২৪।	আপনাকে এ সেবায় নিবন্ধন করল কে?	○ স্বাস্থ্যকর্মী (1) ○ হাসপাতাল থেকে (2) ○ আমার স্বামী (3) ○ আমি নিজেই এস এম এস/ফোন করে (4) ○ অন্যান্য_____ (66)	
২৫।	নিবন্ধনের আগে সেবাটি সম্পর্কে কার থেকে জেনেছেন?	○ স্বাস্থ্যকর্মী (1) ○ আপনজনের গ্রাহকের কাছ থেকে (2) ○ হাসপাতাল থেকে (3) ○ বু স্টার ক্লিনিক থেকে (4) ○ ব্র্যান্ড প্রোমোটর- এর কাছ থেকে (5) ○ স্বামী (6) ○ টিভি থেকে (7) ○ বিলবোর্ড থেকে (8) ○ পত্রিকার বিজ্ঞাপন থেকে (9) ○ আমার ফোনে আসা এস এম এস থেকে (10) ○ আমাকে ফোন করে জানিয়েছে(11) ○ লিফলেট থেকে (12) ○ আমি জানতাম না কে নিবন্ধন করেছে (98) ○ অন্যান্য_____ (66)	
২৬।	আপনার /আপনাদের কাছে আপনজন ম্যাসেজ আসে?	○ হ্যাঁ (1) ○ না (2) ○ আগে আসত , এখন আসেনা (3) ○ অন্যান্য_____ (66)	
২৭।	আপনি যে ফোনে ম্যাসেজ পান/পেতেন সেটি কার?	○ আমার (1) ○ আমার স্বামীর (2) ○ বাড়ির অন্য সদস্যের (3) ○ প্রতিবেশীর (4) ○ অন্যান্য_____ (66)	
২৮।	বর্তমানে সপ্তাহে কয়টি ম্যাসেজ পান?	○ ০ (1) ○ ১ (2) ○ ২ (3) ○ ৩ (4) ○ ৩ এর অধিক (5) ○ কখনো কোন ম্যাসেজ পাইনি (6) ○ আমি জানতাম না ম্যাসেজগুলো কিসের, তাই খেয়াল করি নাই (7) ○ টাকা কাটা যাবার ভয়ে ফোন ধরি না(8) ○ অন্যান্য_____ (66)	

২৯।	ম্যাসেজ কে রিসিভ করে?	○ আমি (1) ○ আমি ছাড়া অন্য কেউ (ফোন যার কাছে থাকে) (2) ○ আমি এবং পরিবারের অন্য কেউ (3) ○ ঠিক নাই, ফোনের কাছে যখন যে থাকে সে ধরে (4)	
৩০।	ম্যাসেজ শুনা বা পাওয়া নিয়ে কোন অসুবিধা হয়?	○ হ্যাঁ (1) ○ না (2) ○ জানিনা (98)	হ্যাঁ হলে পরের প্রশ্ন ৩১- এ যান।
৩১।	হ্যাঁ হলে, কী ধরনের সমস্যা হয়েছে?	○ বেশী টাকা কাটে (1) ○ যেসময়ে ফোন আমার কাছে থাকে না, সেসময়ে ম্যাসেজ আসে তাই ম্যাসেজ শুনতে পারিনা (2) ○ আমার ফোন নষ্ট / হারিয়ে গিয়েছে তাই ম্যাসেজ শুনতে / পড়তে পারিনা (3) ○ আমি এস এম এস পাই, এটা পড়তে অসুবিধা হয় (4) ○ ম্যাসেজ এত তাড়াতাড়ি বলে বুঝতে অসুবিধা হয় (5) ○ আমার বাচ্চা নষ্ট হয়ে গেছে, তাও ম্যাসেজ পাই (6) ○ ম্যাসেজে যা বলে তার সবই জানি, তাই ফোন ধরিনা (7) ○ আমি ভুল সময় (সপ্তাহ/মাসের) ম্যাসেজ পাচ্ছি (8) ○ ফোন ধরার পর কিছু শোনা যায়না (ব্যালেন্স না থাকার কারণে) (9) ○ ফোন ধরার পর কিছু শোনা যায়না (এলাকায় নেটওয়ার্কের সমস্যা) ○ অন্যান্য_____ (66)	
৩২।	কোন নম্বর থেকে আপনার ফোনে ম্যাসেজ আসে?	○ উত্তরদাতা সম্পূর্ণভাবে বলতে পেরেছে (1) ○ উত্তরদাতা অসম্পূর্ণভাবে বলতে পেরেছে (2) ○ উত্তরদাতা একেবারেই বলতে পারে নাই(3)	

গর্ভবতীর জ্ঞান সঙ্ক্রান্ত (মাসিক চেক আপ)

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৩৩।	বাচ্চা পেটে আসার পর আপনি কি কাউকে দিয়ে শরীর চেক আপ করিয়েছেন?	○ হ্যাঁ (1) ○ না (0)	সবার জন্য প্রযোজ্য উত্তর না হলে, প্রশ্ন ৩৬ এ চলে যান।
৩৪।	হ্যাঁ হলে, কাকে দেখিয়েছেন	○ প্রশিক্ষিত স্বাস্থ্যকর্মকর্তা(স্বাস্থ্যকর্মী, স্বাস্থ্য কেন্দ্রের/ ক্লিনিকের ডাক্তার)(1) ○ অপ্রশিক্ষিত ব্যক্তি (কবিরাজ, দাই ইত্যাদি) (2) ○ উভয়কেই (3)	শরীর চেক আপ করিয়েছেন তাদের জন্য
৩৫।	আপনি কয়বার শরীর চেক আপ করিয়েছেন?	○ ১ (1) ○ ২ (2) ○ ৩ (3) ○ ৪ (4) ○ ৪ এর বেশী (5)	শরীর চেক আপ করিয়েছেন তাদের জন্য
৩৬।	শরীর চেক আপ করতে হবে এটা জানলেন কিভাবে?	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য _____ (66)	শরীর চেক আপ করিয়েছেন তাদের জন্য

গর্ভবতীর জ্ঞান সঙ্ক্রান্ত (ব্লাড গ্রুপ)

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৩৭।	আপনার ব্লাড গ্রুপ জেনেছেন?	○ হ্যাঁ (1) ○ না (0)	ব্লাডগ্রুপ জেনে তারপর গবেষক হ্যাঁ/না ভরাট করবেন। উত্তর না হলে, প্রশ্ন ৪১ এ চলে যান।
৩৮।	জানলে, আপনি কবে ব্লাড গ্রুপ জেনেছেন?	○ বাচ্চা পেটের আসার আগে থেকেই জানি (1) ○ বাচ্চা পেটে আসার পরে টেস্ট করে জেনেছি (2)	
৩৯।	ব্লাড গ্রুপ টেস্ট করার তথ্য	○ শুধু আপনজন থেকে (1)	

	পেয়েছেন কোথা থেকে?	○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য _____ (66)	
৪০।	ডেলিভারীর সময়ের জন্য কোন ব্লাড ডোনার (জরুরী সময়ে রক্ত দিবে) এমন কাউকে সনাক্ত করেছেন?	○ হ্যাঁ (1) ○ না (2) ○ আসলে চিন্তা করি নাই (3) ○ আগে জানতাম না, এখন করব (4) ○ এর প্রয়োজন নাই (5) ○ অন্যান্য _____ (66)	

ডেলিভারী সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৪১।	বাচ্চার ডেলিভারী কোথায় হবে এ নিয়ে কোন প্ল্যান করেছেন?	○ হ্যাঁ (1) ○ না (2) ○ বাচ্চা হয়ে গিয়েছে (3) ○ অন্যান্য _____ (66)	না হলে, প্রশ্ন ৪৭ এ চলে যান।
৪২।	(হ্যাঁ হলে) কোথায় হবে/হয়েছে?	○ হাসপাতাল/ক্লিনিক/স্বাস্থ্যকেন্দ্রে (1) ○ বাসায় (2) ○ অন্যান্য _____ (66)	বাসা ছাড়া অন্য উত্তরের জন্য প্রশ্ন ৪৭ এ চলে যান।
৪৩।	(উত্তর বাসায় হলে) কে প্রসব করাবেন?	○ প্রশিক্ষিত দাই (1) ○ অপ্রশিক্ষিত দাই(মা, শ্বাশুড়ী, প্রতিবেশী, আত্মীয়) (2) ○ অন্যান্য _____ (66)	বাসায় প্রসবের ক্ষেত্রে প্রযোজ্য
৪৪।	বাড়িতে প্রসবের জন্য আপনি কোন ব্যবস্থা নিয়েছেন/নিয়েছিলেন?	○ হ্যাঁ (1) ○ না (0)	বাসায় প্রসবের ক্ষেত্রে প্রযোজ্য উত্তর না হলে, প্রশ্ন ৪৭ এ চলে যান।
৪৫।	(হ্যাঁ হলে) বাড়িতে প্রসবের জন্য আপনি কি কি ব্যবস্থা নিয়েছেন? (একাধিক উত্তর হতে পারে)	▪ প্রশিক্ষিত দাইকে জানিয়ে রেখেছি ▪ সেফ ডেলিভারী কিট কিনেছি ▪ ব্রেড, গামলা ইত্যাদি কিনে রেখেছি ▪ টাকা জমিয়েছি ▪ জরুরী দরকারের জন্য এলাকার চালককে বলে রেখেছি ▪ অন্যান্য _____	বাসায় প্রসবের ক্ষেত্রে প্রযোজ্য ✓ Mar k means (1=yes) No mar k (2=no)
৪৬।	এসব ব্যবস্থা নিতে হবে তা আপনি কিভাবে জেনেছেন?	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2)	বাসায় প্রসবের ক্ষেত্রে প্রযোজ্য

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		○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য _____ (66)	✓ Mark means (1=yes) No mark (2=no)
৪৭।	গর্ভাবস্থার বিপদচিহ্ন গুলো কি?	○ বলতে পেরেছে (1) ○ বলতে পারেনি (2) ○ অন্যান্য _____ (66)	চোখ ঝাপসা, রক্ত ক্ষরণ, খিঁচুনি, জ্বর, তলপেটে ব্যথা, উচ্চ রক্তচাপ, হাত পা ফুলে যাওয়া, মাথা ব্যথা , বাচ্চার কম নড়াচড়া ইত্যাদি

পুষ্টি সংক্রান্তঃ

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৪৮।	আপনি দিনে ক'বার পুষ্টিকর খাবার (ফলমূল/ শাক-সবজি/ মাংস/ ডিম/ মাছ ইত্যাদি) খান?	○ ১ বার (1) ○ ২ বার (2) ○ ৩ বার (3) ○ ৪ বার (4) ○ ৫ বার (5) ○ অন্যান্য _____ (66)	
৪৯।	আপনার এই বিশেষ অবস্থায় আপনি কি কি ধরনের খাবার খাচ্ছেন?	লিখুন 	
৫০।	কোন কোন খাবার আপনি এখন একেবারেই খাননা?	লিখুন 	
৫১।	এসব খাবার কেন খাচ্ছেন না?	লিখুন 	

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৫২।	জন্মের পর আপনার শিশুকে প্রথমে কি খাওয়াবেন/ খাইয়েছেন ?	○ বুকের দুধ (1) ○ মধু (2) ○ মিছরি পানি (3) ○ টিনের দুধ (4) ○ অভিভাবক/ দাই যা ঠিক করবে তাই (5) ○ জানিনা (98) ○ অন্যান্য (66)	
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গর্ভবতী মায়ের যত্ন সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫৩।	গর্ভবতী বাস করেন	○ বাবার বাড়িতে (1) ○ যৌথ পরিবার/ শ্বশুর বাড়িতে (2) ○ একক পরিবার(স্বামী- স্ত্রী- সন্তান) (3) ○ অন্যান্য (66)	
৫৪।	আপনি কি কাজের ফাঁকে বিশ্রামের অবকাশ পান?	○ হ্যাঁ (1) ○ না (2) ○ অন্যান্য (66)	
৫৫।	আপনাকে দৈনন্দিন কাজে বাড়িতে কে বেশী সাহায্য করে ?	○ স্বামী (1) ○ বাড়ীর সবাই (2) ○ কেউ না (3) ○ অন্যান্য (66)	
৫৬।	আপনার টিটি ডোজ সব দেয়া হয়েছে?	○ হ্যাঁ (1) ○ না (2) ○ অন্যান্য (66)	

পানি পান করা সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫৭।	আপনাদের বাড়িতে খাওয়ার পানি কোথা থেকে আসে?	○ বিশুদ্ধ পানি (ফুটিয়ে, নিরাপদ টিউব অয়েল, ফিটকিরি দিয়ে, অথবা ফিলটার ব্যবহার করে) (1) ○ অবিশুদ্ধ পানি(পানি সরাসরি খায় তা যেখান থেকেই আসুক না কেন) (2)	বিশুদ্ধ পানি খেলে পরের প্রশ্ন (৫৮) এ যান।
৫৮।	পানি বিশুদ্ধ করে খেলে, আপনি এ পদ্ধতি জেনেছেন কিভাবে?	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3)	

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		○ জানিনা (98) ○ অন্যান্য_____ (66)	
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হাত ধোয়া সংক্রান্ত

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৫৯।	আপনি কি কি কারণে সারাদিন হাত ধুয়ে থাকেন?	▪ প্রার্থনা করার পূর্বে ▪ সকালে ঘুম থেকে উঠে ▪ খাবার খাওয়ার আগে ▪ খাবার খাওয়ার পরে ▪ মল-মূত্র ত্যাগ করার পরে ▪ গোসলের সময় ▪ রান্না করার আগে ▪ তরকারি ধোয়ার সময় ▪ অন্যান্য_____	✓ Mark means (1=yes) No mark (0=no)
৬০।	সাধারণত হাত ধোয়ার জন্য আপনি কি কি ব্যবহার করেন?	○ শুধু পানি (1) ○ পানি আর সাবান (2) ○ পানি, সাবান, অনেক সময় ডেটল (3) ○ লিকুইড সোপ এবং সাবান (4) ○ অন্যান্য_____ (66)	
৬১।	হাত ধোয়ার এই পদ্ধতি সম্পর্কে আপনি কোথায় জেনেছেন?	○ শুধু আপনজন থেকে (1) ○ আপনজন ও অন্যান্য তথ্যসূত্র (2) ○ অন্যান্য তথ্যসূত্র (3) ○ জানিনা (98) ○ অন্যান্য_____ (66)	

সম্পৃষ্টি এবং অন্যান্য

	প্রশ্ন	উত্তর	মাঠপর্যায়ে গবেষকের জন্য নির্দেশ
৬২।	আপনজন সেবার কারণে আপনার কোন উপকার হয়েছে?	○ হ্যাঁ (1) ○ না (2) ○ অন্যান্য_____ (66)	হ্যাঁ হলে পরের প্রশ্নে যাবেন।
৬৩।	হ্যাঁ হলে, কি ভাবে?	▪ সময়মত টিকা দিতে যাই ▪ বেশি বেশি খাই ▪ ভারী কাজ কম করি ▪ পরিবারের সকলে সাহায্য করে ▪ ডেলিভারী নিয়ে পরিকল্পনা করেছি	✓ Mark means (1=yes) No mark (0=no)

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		▪ ব্লাড গ্রুপ /ডোনার ঠিক করেছি ▪ পরিষ্কার- পরিচ্ছন্ন থাকি ▪ পর্যাপ্ত বিশ্রাম নেই ▪ বাচ্চার বৃদ্ধি সম্পর্কে জানছি ▪ ডেলিভারী নিয়ে ভয় পাচ্ছি না ▪ আপনজন ডাক্তারের সাথে কথা বলে আমার লাভ হয়েছে ▪ অন্যান্য _____	
৬৪।	আপনজন সেবা নিয়ে কি আপনি কি সন্তুষ্ট?	○ হ্যাঁ (1) ○ না (2) ○ মোটামুটি (3)	না হলে পরের প্রশ্ন ৬৫ এ যান।
৬৫।	সন্তুষ্ট না হলে , তার কারণ কি?	▪ তথ্যগুলো সব জানা ▪ নিয়মিত ম্যাসেজ আসেনা ▪ অসময়ে ম্যাসেজ আসে ▪ সেবামূল্য বেশী ▪ ১৬২২৭ এ ফোন করে ডাক্তারের সাথে কথা বলতে পারেনি ▪ অন্যান্য _____	✓ Mark means (1=yes) No mark (0=no)
৬৬।	আপনজন সেবা থেকে আপনি আর কি কি পেতে চান?	লিখুন 	
৬৭।	সেবাটিকে ১- ৫ এর মধ্যে কত দেবেন?(১=সর্বনিম্ন, ৫ = সর্বোচ্চ)	○ ১ (1) ○ ২ (2) ○ ৩ (3) ○ ৪ (4) ○ ৫ (5)	

৬৮। বিশেষ নোট

Annex-9. Conference presentation



mHealth: a practical tool for health promotion in resource-limited countries?

Alam, M., Banwell, C., D'Este, C., Olsen, A., Lokuqe.K.
Emerging Health Policy Research Conference 2018
University of Sydney
Presented by : Mafruha Alam
Date: 25.07.2018

Abstract:

Introduction/Background:

mHealth services are gradually becoming popular in resource- limited countries like Bangladesh which lack adequate health workforce, especially trained doctors in remote areas. We evaluated a mHealth service called “Aponjon” in Bangladesh to understand the effectiveness of such service in promoting good healthcare practices regarding childbirth. Every week the service provides text or voice messages to subscriber pregnant women and mothers of 0-11month old babies. Beside the regular messaging service, subscribers can call to the counselling service to talk to a medical doctor regarding delivery, maternal and child healthcare.

Research Question:

In an integrated health system that provides maternal and child health care, what are the areas that mHealth can best support?

Methodology:

We used mixed methods. We analysed secondary survey data (n=476) and primary qualitative interviews of subscribers (n=24) to understand the impact of messages on their delivery decisions and newborn care practices. We separately interviewed Aponjon doctors (n=11) and subscriber-callers (n=16) to understand the effectiveness of remote counselling in promoting health awareness.

Findings:

Our research findings suggest that counselling service was more useful and practical to respond to health needs of rural people than the messaging service sending general information. The doctors at the counselling service were able to dispel myths and misconception, improve decision making during emergencies, generate awareness about consequences of consulting unqualified providers and motivate families to seek treatment from health facilities.

Policy Implications:

We suggest continued investment in sustainable counselling services linked with appropriate health facilities to facilitate families access the right care.

Keywords: mHealth, resource-limited setting, health promotion, access