FACTORS AFFECTING INCIDENCE OF CHILDHOOD DIARRHOEA AND ITS HOUSEHOLD MANAGEMENT BY RURAL MOTHERS IN KHONKAEN PROVINCE, THAILAND

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DECLARATION

Except where otherwise indicated,
this thesis is my own work

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ABSTRACT

The main objective of the study is to determine which factors are associated with the incidence of child diarrhoea and household management during the diarrhoea episodes. To achieve this, a case study was carried out in two villages in Khonkaen province, Thailand. The respondents were 271 mothers with children aged under five years. The data were collected on socioeconomic and demographic characteristics, environmental sanitation, preventive health behaviours, curative health behaviours, and anthropometric measurement.

The findings are that 63 of the 271 children (23.2 per cent) developed diarrhoea, and there were 79 episodes of diarrhoea, lasting an average of 2 days, during the three months reference period. About 65 per cent of the cases occurred to children aged under 12 months. Among the selected socioeconomic factors, mothers' education seemed to have a positive association with the incidence of diarrhoea. The appropriate preventive health behaviours of mothers appeared to have no influence on the incidence of diarrhoea. Whether households used rain water or used other sources for drinking the incidence of diarrhoea in children was not different. Household management during the episodes was not appropriate because most of the children did not receive ORS.

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CHAPTER ONE

INTRODUCTION

1.1 Diarrhoeal Disease: Its Impact on Child Health

Diarrhoeal disease is still a major cause of morbidity and mortality in developing countries. Diarrhoeal disease constitutes one of the greatest social evils, not only does it kill young children, especially in developing countries but it also retards their growth and impairs the quality of those who survive (Chen, 1983:4-5 ; Black et al., 1983:75). Recent estimates indicate that each year there are at least 1.4 billion episodes of acute diarrhoea among children under 5 years in Asia, Africa and Latin America (Chen, 1983:3-4).

In the Southeast Asian region, the incidence of diarrhoeal disease varies among countries with a rate of between 1.5 and 12 persons per 1000 population of all ages per year. A study in seven developing countries by a WHO team found that between 1960 and 1965 the average monthly incidence rate of diarrhoeal disease among young children was as high as 40 per cent. More than one-third of the beds in children's wards or children's hospitals in those countries were occupied by diarrhoeal cases receiving expensive antibiotics and intravenous fluids, putting a heavy load on the limited health budgets of those countries (WHO, 1978:369).

1.2 Diarrhoeal Disease in Thailand: Morbidity and Mortality

In Thailand, diarrhoeal disease has long been recognized as a major health problem. In 1980, it was the leading cause of morbidity (311 per 100,000) and the seventh highest cause of mortality (3.4 per 100,000) in all age groups, and it was the second major cause of mortality in the under 5 years age group (Family Health Division, 1987:51). These rates could be underestimated due to underreporting, especially in rural areas where there is no provision of health services. The reports on the surveillance of diarrhoeal diseases between 1974 and 1978 show that the morbidity rates for all ages increased markedly from 1.33 per 1000 people in 1974 to 3.04 per 1000 people in 1978 while the mortality rates declined from 0.81 per 1000 people in 1974 to 0.49 per 1000 people in 1978 (Epidemiological Division, 1980:50).

In 1985, a national study of diarrhoeal disease in Thailand found the incidence of diarrhoea among children under 5 years was about 2 episodes per child per year, with a death rate of 21 per 100,000 live births. National estimates were that in 1985 a total of 6 million children aged under 5 years developed about 12 million diarrhoea episodes with 1260 deaths. (Porapakkham et al., 1986:24). The reports from the Ministry of Public Health reveal an increase in incidence of diarrhoea while the case fatality rate and hospital admission rates seemed to decrease. The incidence of diarrhoea increased from 4.76 per 1000 in 1980

to 8.16 per 1000 in 1984 (Ramaboot, 1986:33-35). This may be due to the improvement of the reporting system and the use of a referral system that brought diarrhoea cases to the hospital or health centre.

Northeast Thailand is the largest region of the country and the most populous, with an estimate in 1984 of 37 per cent of the total population or about 17.8 million people (Division of Health Statistics, 1984:13). Most of the people have low education and their living standard is poor, with inadequate clean water supplies and sanitation, which are recognized as risk factors in diarrhoeal disease. Although the government is trying to solve these problems and to provide nationwide primary health care services, the problems still remain, especially in the rural areas.

It was reported that the highest death rates for all ages due to diarrhoeal disease among the four regions of Thailand occurred in the Northeast region. In 1980, the death rate for all regions was 9.3 persons per 100,000 people while the death rate in the northeast was 12.4 persons per 100,000 people. In 1984, although the death rate for all regions had declined to 4.8 persons per 100,000 people, it was still high in the Northeast region with a death rate of 7.9 persons per 100,000 people (Division of Health Statistics, 1984:196).

1.3 Underlying Causes of Diarrhoeal Disease

It is well recognized that there are various factors underlying diarrhoeal complex problems as they involve socioeconomic and cultural factors as well as biological factors (WHO, 1978). Among the socioeconomic factors, characteristics of the mother remain the key factor in the child's health, in particular the mother's health beliefs and health knowledge (education) are important determinants of the child's exposure to the risk factors related to malnutrition and infection or injury as well as of the therapy that may be selected for these conditions (Caldwell, 1979).

As far as the biological factors are concerned, diarrhoea in children is a disease of multiple causes resulting in both infectious diarrhoea and non-infectious diarrhoea. The infectious diarrhoea is commonly caused by a variety of bacteria (Escherichia Coli, Salmonella, Shigella, Vibrio, etc.), viruses (Rotavirus), protozoa (Amoeba, Giardia) and parasites (Mata, 1983:3-10). The non-infectious diarrhoea such as toxicity caused by allergies to chemical substances or bacterial toxins, malnutrition, early weaning and non-specific causes. Also, there are some factors which make children more susceptible to diarrhoea, such as the age of the children, impaired health, climate and environment (Mata, 1983:91-92 ; Pemberton,1963:49-50).

1.4 Socioeconomic Factors and Diarrhoeal Disease

It is accepted that socioeconomic characteristics of individuals are associated with the occurrence of diarrhoeal disease. These factors generally include illiteracy, low income and poor sanitation conditions that have their basis predominantly at the household level and reflect community characteristics. Among the socioeconomic factors, beliefs about and attitudes towards diarrhoeal disease are recognized as important factors influencing the incidence of diarrhoea, treatment of the disease, and care of the patient. Some of these behaviours sometimes are directly harmful to diarrhoeal conditions, other harmless or beneficial.

In rural India, it is believed that diarrhoea results from cultural **heat** in the body which should be treated with **cold**. Sugar is one component of oral rehydration solution (ORS), but as sugar is believed to be **hot**, therefore, the villagers avoided the use of ORS in the sick or children with diarrhoea (Lozoff et al.,1975). In Turkey, diarrhoea is believed to be a **cold** disease which has to be treated with **hot** foods so fluids which are considered cold are withheld from the sick children (Merdol, 1981:274). Diet restriction is seen to be a common feature of management of diarrhoea among people in most societies. This practice is probably based on the very closed observation by mothers that feeding is associated with increasing frequency of bowel movements. However, withholding of fluid and food are detrimental to

diarrhoea and as a consequence, increases the fatality rate (WHO/UNICEF, 1985). Food withdrawal during diarrhoea is commonly found in Bangladesh (Khan and Ahmad, 1986), the Guatemalan highlands and the Punjab, India (Scrimshaw et al., 1968:258).

A study by Bertrand and Walmus (1983), of maternal knowledge, attitudes and practices as predictors of diarrhoeal disease in young children in Cali, Colombia, shows the association between diarrhoea prevalence in children 0-4 years old and indicators of maternal knowledge and practices, social characteristics of the mothers, quality of housing, sanitary factors and mothers' perception of malnutrition in the children. Many studies have noted a difference in the prevalence of diarrhoea among people in different socioeconomic conditions. For example, Freij and Wall (1979, cited in Black, 1984:141) found that in Addis Ababa, the prevalence of diarrhoea has a negative association with good housing conditions and parental education. The difference in child care practices , such as preparing of weaning foods, boiling of drinking water, or personal hygiene, might be due to the difference in level of socioeconomic variables. This can be explained by low income families having poor nutritional status, a factor that is known to be associated with more prolonged diarrhoea.

1.5 Feeding Patterns and Diarrhoeal Disease

1.5.1 Breastfeeding

Breastmilk provides more than nutrients to the infant. It also confers some degree of protection against infection, both by the transmission of the mothers antibodies and by stimulating the development of the infant's own defences (Chandra, 1978 ; The Lancet, 1981). Breastmilk provides enough nutrients without any other sources of nutrition to permit growth up to 4-6 months of life (Population Reports, 1980:530-532). Thereafter food supplements should be introduced. These foods, however, may introduce a number of pathogenic organisms which become responsible for diarrhoeal diseases and the high mortality rates which are characteristic of the time of weaning in poor societies (Martorell, 1980). In developing countries, breastfeeding often continues into the second year, generally with inadequate food supplements, and then children go directly to adult food without appropriate transitional weaning food (Taylor et al., 1983:7).

Colostrum, or the pre-milk produced by the women in the first few days postpartum before mature milk comes in, is a concentrated yellow fluid 20-200 ml. per feeding in the first 3 days after birth (Lawrence, 1985:68). It contains antibodies which help to protect the intestine of the infant against infection (Helsing and King, 1982:27 ; Lawrence, 1985:65). Feeding colostrum not only reduces the risk of morbidity and mortality but also prevents malnutrition

(Mata, 1976:171). But women in many countries misunderstand it, because of the small amount and strange colour. Guatemalan women believe that colostrum is harmful to children on the grounds that it can cause diarrhoea (Tietjen, 1985:128). The Usino women in Papua New Guinea, believe that colostrum is bad and contaminated milk, and that it will be poisoned because it is related to pregnancy (Conton, 1985:104). In rural Java, most of the women believe that colostrum is dirty and has a bad taste which contains germs or is a cause of stomach upset and is therefore detrimental to the baby (Hull, 1985:84). In rural central Thailand, mothers believe that feeding a new born with colostrum would set a bad habit for future breastfeeding (Esterik, 1985:155).

Infectious diarrhoea is relatively uncommon during breastfeeding while the child is protected by passively acquired maternal antibodies and minimal exposure to infections. As the baby becomes more mobile, direct exposure to infections increases, and as supplementary foods replace breastfeeding during the second half of the first year and the second year of life the prevalence of infection can become extremely high (Mata et al., 1971). An epidemiological study of breastfeeding conducted in 1981 in eight Latin America countries and in Portugal shows a clear-cut decrease of diarrhoea and dehydration among children who took colostrum in the early and late neonatal period. In particular, children who were given breast milk in the first 30 days of life experienced the lowest morbidity rate, even

in children coming from the lowest socio-economic levels in developing countries (Schmidt, 1983:179-180).

The decline of breastfeeding and increase of bottlefeeding in many developing countries typically has an adverse effect on a child's health (Wray, 1977). Firstly, because formula milk is generally more expensive it is often diluted so that it is an inadequate substitute for breast milk. Secondly, bottle milk is often highly contaminated with bacteria, while breast milk is fresh and sterile. This increases the risk of diarrhoeal disease and further deterioration in nutritional status. Bottle-fed children are also deprived of a number of constituents of breast milk which are directly protective against infectious diseases. In Colombia, Wray and Aguirre (1969) mentioned that only 25 per cent of the exclusively breast-fed children had diarrhoea during the first five months of life, compared to 54 per cent of the partially bottle-fed and 73 per cent of the exclusively bottle-fed children. Poovorawan et al. (1981) reported similar results from a study in Thailand.

1.5.2 Introduction of Supplemental Foods

The appropriate time to introduce supplemental foods would be based on nutritional needs and developmental goals. But it seems that in the real situation supplementation varies with social, sociological, developmental and psychological considerations. Early introduction of supplemental feeding has potential harmful effects on

nutritional status and contribute to the incidence of diarrhoea (Mata et al., 1976:312 ; Barness, 1981:287). The harmful effects of early supplemental foods is related to the physiological stage of body growth and development. Supplemental feeding can occur whenever babies can suck, swallow and chew well, that means whenever the accessory muscles are strong enough, normally present from 4-8 months. The extrusion reflex, which helps prevent fluid leak and forces food out of the sides of the mouth is normally present from 6 weeks to 3 months. The Gastroesophageal reflex, which helps to control the flow of food through the intestine, is more common after 4 months of age. The proper position for feeding is the sitting position; normally babies can sit by themselves after the age of 6 months (Fomon et al., 1979). Food supplements should be introduced at the age of about 4 to 6 months among breast-fed infants in order to obtain essential nutrients, since from that time the store from birth is being diminished, and protein should be added during the rapid growth at the end of the first year of life, while the protein content of milk begins to drops slightly after 9 months of lactation. Even though the teeth are not all in, the development of good dentition needs chewing exercise (Lawrence, 1985:238 ; The Committee on Nutrition of the Academy of Pediatrics, 1976:765).

The problems of diarrhoeal diseases associated with weaning, so called 'weanling diarrhoea', are quite common in poor societies where malnutrition and deficient hygiene prevail. Weanling diarrhoea is strongly associated with

weaning not only because of the introduction of other foods, but also because of the loss of the protective properties of human milk. During the first few weeks of life, the infant's intestine is quite free from pathogenic bacteria and protozoa, especially during the period of exclusive breast feeding; and anti-infective properties from breastmilk help protect infants against intestinal infection. Soon after supplemental foods are introduced, children are more susceptible to intestinal infection because of contaminated foods. As new foods are introduced, breastmilk consumption seems to be reduced, resulting in less protection against infection (Mata et al., 1976:311-319). In rural Thailand, it has been reported that traditional foods were introduced to infants very early, even during the first weeks of life (WHO, 1955:52 ; Esterik, 1985:140). These might lead to a high risk of exposure to diarrhoeal infection in young children.

1.6 Environmental Factors, Hygiene Practices and Diarrhoeal Disease

It is well accepted that the reduction of morbidity and mortality from infectious diseases as well as diarrhoeal disease in the so-called developed countries followed improvement of environmental sanitation and personal hygiene. Learning from the previous experience in developed countries diarrhoeal disease control in the present day developing countries emphasizes the improvement of environmental conditions. However, diarrhoeal morbidity and

mortality are still far behind their goals. For example, in Bangladesh, it was found that the provision of a clean water supply by increasing the number of handpump wells in rural areas failed to protect against cholera or other diarrhoeal disease. The increase in number of handpump wells was not accompanied by an increase in the number of handpump well users and their behaviours were still the same (Levine et al., 1976:86-89). In the Pacific lowlands of Guatemala, it was also found that the introduction of clean water supply system was not associated with reduced incidence of waterborne diseases (Torum, 1983:235-245).

Gordon et al. (1964:21-28) argue that most of the programmes place emphasis on the improvement at the community levels rather than in both community and individuals. However, the effect of improvement in environmental sanitation on health would be restricted by traditional patterns that are usual in poor societies. Therefore, improvement in environmental sanitation alone may be insufficient to control diarrhoeal disease, especially in developing countries. The ultimate control of diarrhoea should be based on integrated programmes in order to correct the faulty practices of personal hygiene and to eliminate cultural disadvantages coupled with improving the community environment as well as personal hygiene (Gordon et al., 1983:27). An example of a successive integrated health education and improvement of environmental sanitation program has been studied in Guatemala between 1979-1980 by Torum (1983:246-263).

1.7 Treatment and Oral Rehydration Therapy

A significant development in recent years has been the discovery that dehydration from acute diarrhoea due to a variety of causes in all age groups can be prevented and cured by the simple method of oral rehydration therapy (ORT), using either pre-packed sachets of oral rehydration salts (ORS) or a home-made solution (Grant, 1986:90-91 ; Rahaman, 1985:69). Although ORT was developed as an easily available therapy mainly for cholera, of far more importance was its usefulness against diarrhoea of all children (Nalin et al., 1968). In contrast with intravenous rehydration, ORT is inexpensive, utilizes ingredients found in the community, requires neither sterile materials (except boiled water) nor highly specialized personnel, and the mother can be actively involved in the treatment by having her administer the ORS to the infant.

The efficacy of ORS is based on the discovery that glucose can be absorbed by the small intestine by an active transport mechanism, even during diarrhoea, and salts and water can accompany it (Nalin et al., 1968:370 ; Grant, 1984:35). Field studies in the Philippines, Turkey, Egypt and Iran have shown not only a reduction in child deaths and hospitalizations, but also a positive nutritional impact based on the provision of early rehydration either in nearby health centres or in the home by the mother. Children who received ORS showed from 0.25 to 0.50 kg. higher weight gain

over one year in comparison to a control group who received only the nutrition advice. And the greater impact on children experiencing multiple episodes supports the importance of ORS in the improved growth. Coupled with detailed advice to continue feeding the child and provide extra food in the recovery period, the provision of early rehydration may be avoiding the occurrence of malnutrition (Rohde and Hendrata, 1981).

Although ORS is very worthwhile, there are some limitations in using it. ORS cannot be used in cases of shock, severe cholera, limited oral absorption and severe vomiting. But the percentage of cases which fail in treatment with ORS is very low. According to a statement from UNICEF (Grant, 1984:74), about 90-95 per cent of all patients with acute watery diarrhoea, including infants, can be treated by ORS alone. In regard to the rest, they need more complex treatment with intravenous therapy. A study in Thai villages also found that only 6 per cent of 160 children who had an episode of diarrhoea failed to respond to ORS and required intravenous therapy (Varavithya et al., 1985:394). It was also found that the number of deaths decreased by 50-60 per cent while ORS was being used for treating dehydrated children at the community level.

1.8 Diarrhoeal Disease and Nutritional Status

It is well documented that diarrhoea is a factor in malnourishment (Black et al., 1983:75 ; Mata, 1983:92). The effects of diarrhoea on infant nutritional status are enormous; in particular, it has been shown that diarrhoeal disease is associated with severe marasmous and kwashiorkor (Scrimshaw, 1977:1536). On the other hand, when there is no diarrhoea, malnutrition is a rare occurrence. It is clearly necessary to consider the relative importance of improving food intake as a means of preventing and alleviating the problem of severe malnutrition (Keusch and Katz, 1978:2035).

The relationship of diarrhoeal disease and nutritional status is thought to be synergistic. A child with diarrhoea is prone to growth retardation and is more susceptible to infectious diseases. Mata and his colleagues (1977:1215) have presented longitudinal data on malnourished patients concerning the relationship of infective episodes and nutritional status. It was found that diarrhoea is the most important factor inducing weight loss. A study of the role of infections on child nutritional status in Gambian villages by Rowland et al. (1977:441-450), also found that diarrhoeal disease is one of the infectious diseases which has a highly significant negative relation to weight and height gains. The same results were also reported by Martorell (1980:88) from a study of Guatemalan children.

Once diarrhoea occurs, the nutritional status of the host is affected through a variety of mechanisms: reduced food consumption (vomiting, anorexia, withdrawal of food) impaired intestinal absorption, increased nutrient loss through stools and urine, increased nutrient requirements and adverse effects of treatment on nutrition (Rosenberg et al., 1977:1248 ; Martorell, 1980:96 ; Mata, 1983:86-90). The loss of appetite is sufficient to make it difficult or impossible to maintain a constant food intake during the acute phase of the illness. In addition, especially in diarrhoeal disease, there is a strong cultural tendency to withdraw solid food and substitute intravenous fluid infusions. This is often reinforced by physicians who advise fasting and liquid diets for the sick child. There are other adverse effects of the treatment of diarrhoea on the nutrition of the host. For example, prolonged antibiotic therapy may interfere with the intestinal flora that synthesize some essential nutrients (such as vitamin K) or may interfere with intestinal absorption (Rosenberg et al., 1977:1248 ; Hamilton et al., 1985:407).

1.9 Conceptual Framework of the Study

The conceptual framework for the study (see Figure 1) was derived from the framework for child mortality which was developed by Mosley and Chen (1984). This framework is based on the proposition that all socioeconomic determinants operate directly on the proximate determinants which affect child morbidity and mortality. The proximate determinants

have been categorised into five groups; maternal factors, environmental contamination, nutrient deficiency, injury, and personal illness control. These categories play a major role in both incidence of illness and the recovery stages.

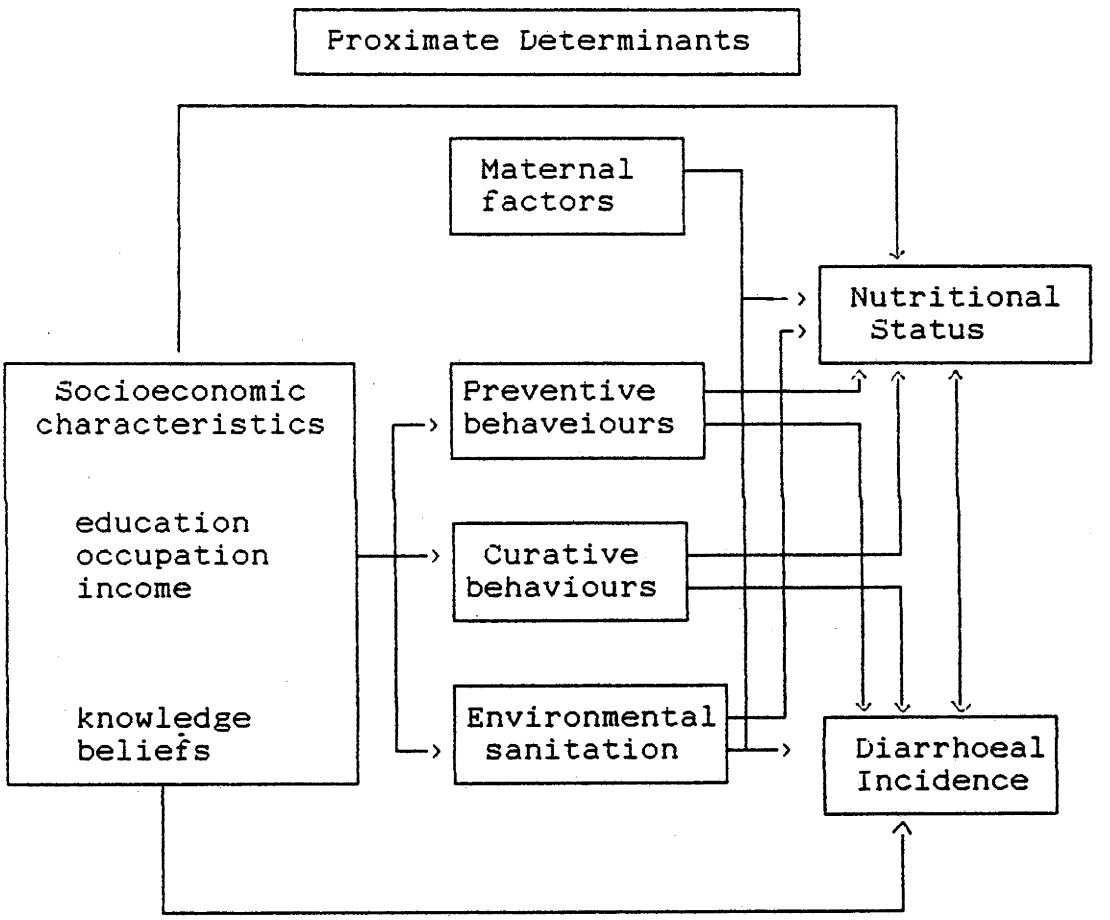


Figure 1 Relationship between socioeconomic characteristics, proximate determinants and incidence of child diarrhoea and nutritional status (derived from Mosley and Chen analytical framework, 1984)

In this study, it has been assumed that socioeconomic factors, both individual and household, have some effect on the incidence of child diarrhoea and household management during the episodes. These factors also operate through maternal factors, preventive health behaviours, and environmental sanitation. Therefore, the ultimate control of diarrhoeal disease should take into account all the factors mentioned above. According to the WHO (1978:370-371), the comprehensive understanding of the local people - their socioeconomic characteristics, attitudes, beliefs and health behaviours - should be integrated with providing safe water supplies and proper excreta disposal facilities, controlling food hygiene and improving personal cleanliness.

1.10 Objectives of the Study

In Thailand, most of the studies on diarrhoeal disease have been concerned with the treatment and causes of diarrhoea among patients in an institute or hospital; very few have been conducted in rural settings with an emphasis on the factors affecting the incidence of childhood diarrhoea and care of children with diarrhoea. It is clear that proper management at the early stage of diarrhoeal disease helps to prevent severe dehydration and decreases mortality. The objectives of the study are as follows:

1. To obtain information on mother's knowledge and beliefs about childhood diarrhoea as well as preventive behaviours.

2. To assess the nutritional status of children aged under 5 years.
3. To determine the effects of socioeconomic factors and demographic factors on preventive behaviours.
4. To determine the effects of socioeconomic factors, demographic factors and preventive behaviours as well as environmental facilities on the incidence of child diarrhoea.
5. To obtain information on the actual household management or curative behaviours among children with diarrhoea.

This chapter has discussed the background of the study as well as reviewed related literature. The next chapter, Chapter Two will be focused on the study area and methodology, Chapter Three and Chapter Four will discuss the findings and analysis, and the last chapter will summarise and conclude the study.

CHAPTER TWO

STUDY AREA AND METHODOLOGY

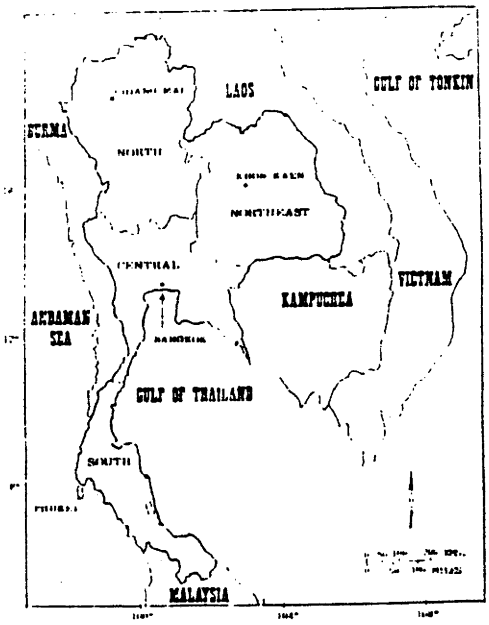
2.1 Selection of Study Area

The two villages in the study were selected purposively. In the first stage, based on the district health statistics records for prevalence of diarrhoea (diarrhoea is one of the notifiable diseases which has to be recorded by health personnel from all hospitals, health centres and clinics) the district was selected which had the highest diarrhoea prevalence (see Appendix B). The rationale behind this was to ensure that there would be sufficient children who had diarrhoea in the previous three months. Next, two sub-districts were randomly selected, and from each sub-district the village which had the highest number of children under five years of age was selected in order to get enough cases of children who had diarrhoea in the previous three months. All mothers who had children under five years of age were regarded as eligible respondents (100 mothers from Sila village and 186 mothers from Sawathi village).

2.2 Background to the Study Area

The survey was conducted in two villages (Sila and Sawathi) in Muang district in Khonkaen province in January 1988. The two villages are among 1,749 villages of Khonkaen province (see Figure 1 and 2), which is the centre of administration of the Northeast part of Thailand. Khonkaen is 450 kilometres from Bangkok Metropolitan District.

The Northeast part, named the "Korat Plateau", is a flat limestone plateau, with an average elevation of about 200 metres above sea level. Owing to its elevation, the temperatures in Khonkaen are more extreme than in other regions of the country, it is hotter in summer and colder in winter. There are three seasons: summer, rainy, and winter. Summer is roughly from February to April. The rainy season lasts from May till September and winter from October till January. The land is mainly a semi-arid plateau with relatively infertile soil and insufficient irrigation for larger-scale cultivation. Cultivation of the main agricultural crops (glutinous rice, cassava, corn, kenaf, and sugar cane) is based largely on rain water. There are two main rivers (the Pong and the Chee rivers) and one large water reservoir (Ubornratana dam) which can serve a cultivation area of about 32,000 acres.



MAP OF KHONKAEN PROVINCE

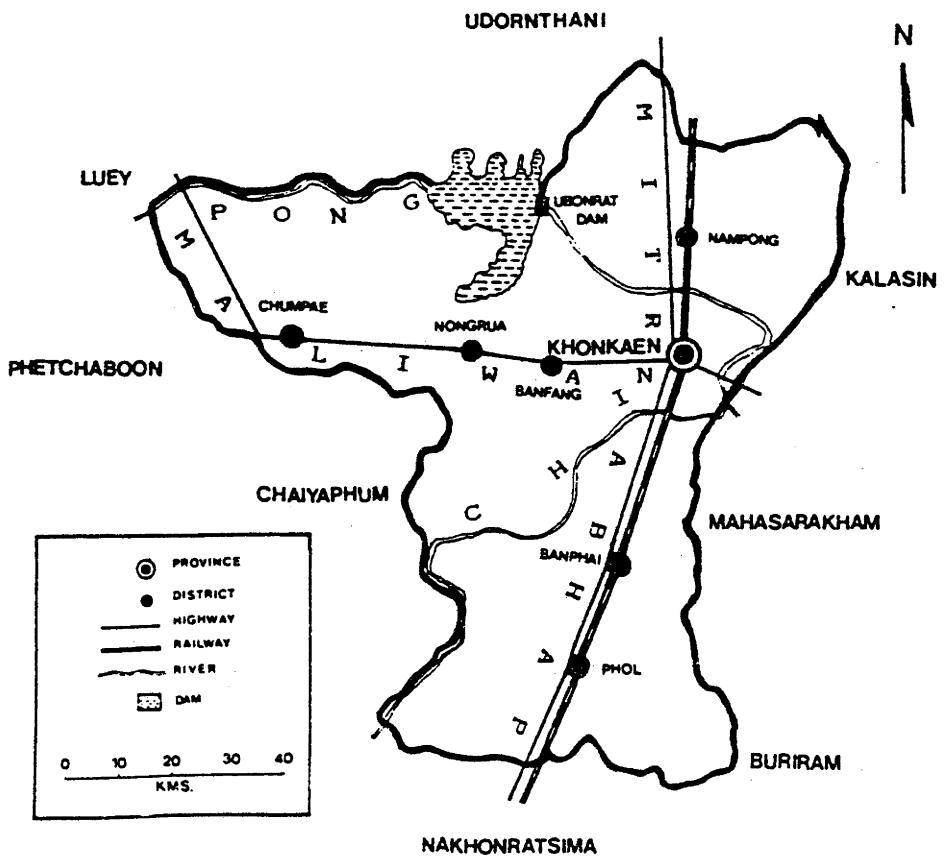


FIGURE 1 MAP OF THAILAND AND KHONKAEN PROVINCE

MAP OF MUANG DISTRICT

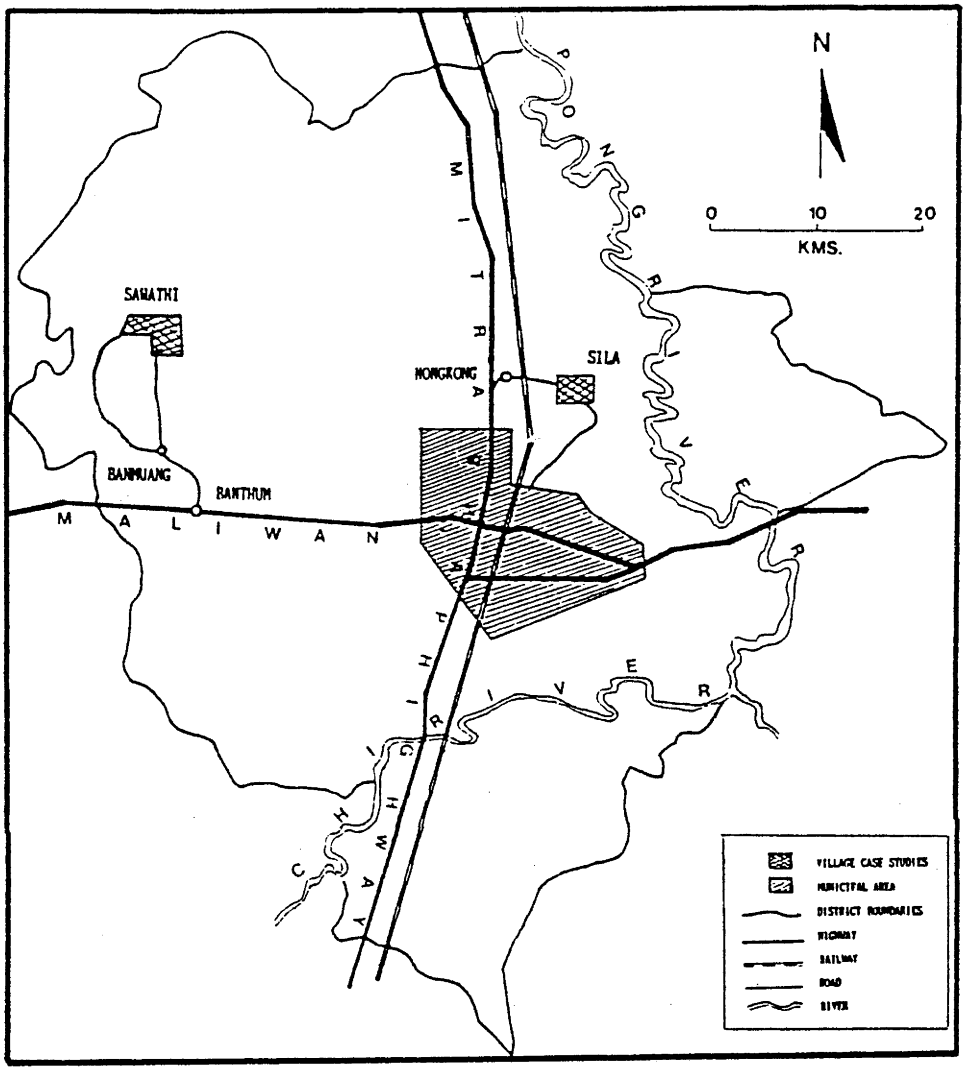


FIGURE 2 MAP OF THE STUDY SITE

The population in Khonkaen province, like most parts of the country, is predominantly of the Thai ethnic group and 95 per cent are Buddhists. The main occupation of the people

is agriculture and most of the people (85 per cent) live in rural areas. In regards to socioeconomic characteristics, Khonkaen province ranks somewhat low in Thailand. The economy is almost entirely agriculturally based as mentioned above.

Although Khonkaen provides the central administration of the northeast region, it still suffers from an uneven distribution of health services through remote areas. Apart from a district hospital in each district, there is a health centre located in each of the 169 sub-districts to provide simple health services to the population of about 1749 rural villages. All the sophisticated health services are located in Khonkaen city.

2.3 Background to the Village Case Studies

Sila village is 10 kilometres from Khonkaen city, the provincial capital, and comprises 324 households and a population of 1,759. The village is located in a fertile area with an irrigation canal crossing the south border of the village. Irrigation makes multiple cropping possible. The lands around the village are used throughout the year for cultivating mainly rice, flowers and vegetables. A road system links the village to others in the district and the city is quite convenient. Normally the villagers transport their agricultural products to the market in the city by bus which departs every 30 minutes. There is a primary school located in the village to provide compulsory education for

the villagers. A Buddhist temple is centrally located also in the village for religious practices. A health centre is not located in the village but in the adjacent village (two kilometres away). Three health personnel (a health worker and two midwives) are allocated to the health centre to provide health services not only to the nearby villages but to all villages in the district (16 villages altogether). For water, most of the villagers own an open well on their land using water for agricultural and washing purposes. There are three open wells outside the village which are favourite sources of drinking water for most of the villagers. Only 18 households own a rain water tank that can provide drinking water throughout the year.

Sawathi village is about 25 kilometres from the city, and comprises 424 households and 2,470 inhabitants. Like most of the Northeast region, it is semi-arid, quite dry in both the wet and dry season. The agriculture depends largely on rain water as there is no irrigation canal. Although there is a river near the village, the water cannot be used throughout the year, as the river usually dries up during the dry season. The water from this source is not used for agricultural purposes but for household water supply, for washing and in some cases for their domestic animals. The main source of drinking water is the public open wells in the field outside the village (about 0.5 - 2 kilometres away). Transportation between villages is by bus which departs whenever there are enough passengers, normally quite frequently in the morning when villagers go to work in the

city, and when they return in the evening. The village is centrally located in the district so there is a secondary school located in the village to provide education for the nearby villages in the district and a primary school as well. Two Buddhist temples are located in the village. A health centre in the village is staffed by a health worker and two midwives, two of whom live in the village and one who stay in the nearby village. The three health personnel have to serve the people in 15 villages in the district.

2.4 Data Collection and Field Operation

The data were collected by interviewing mothers whose youngest child was aged under 60 months at the time of survey in the two villages. There were 286 eligible respondents from the two villages, but not all eligible mothers were interviewed. As the time of the study was after the harvesting season (normally from October to December) there were some families who had moved out to work in other areas (15 families altogether). Therefore, only 271 mothers were interviewed and the youngest child of each mother was included, thus the total number of children in the study was 271 (34 mothers had 2 children under 5 and only one mother had 3 children). To ensure the complete coverage of all eligible households for the particular village an updated listing of the households was confirmed with the head of the village.

The interviewing was carried out under the auspices of the Child Survival Project, International Population Dynamics Program, The Australian National University, by the author and four assistants; three were fourth year student nurses who had previous experience of interviewing techniques and anthropometric measurement. All of them could speak the E-san dialect. One was a lecturer from the Faculty of Nursing, Khonkaen University, who also was the principal supervisor in developing the questionnaire and controlling field supervision.

The questionnaire was first developed in English then translated into the Thai language. The questions asked were about socioeconomic status at both the individual and household level, environmental sanitation, maternal knowledge and beliefs regarding child diarrhoea, preventive behaviour (feeding patterns, hygiene practices), incidence of diarrhoea in the previous three months, curative behaviour or household management (care of children with diarrhoea, treatment, feeding during diarrhoea episodes, oral rehydration therapy), and weight and height. Weight and height were measured at the end of the interview period. The answers providing the above information were elicited voluntarily from the respondents, without prompting answers. The questionnaire was pre-tested with 20 mothers in other rural villages in Khonkaen province, in order to determine the feasibility of the questions and to avoid any pitfalls or misunderstandings which might be found in the questionnaire. After pre-testing, the questionnaire was

revised and rearranged for final use (see Appendix A).

In the field survey, after completing the first questionnaire, interviewers had to check the completeness and discuss problems with the author. The completed questionnaires were checked one by one and day by day by the author. If there was something wrong or not clear, the same interviewer was asked to check and reinterview. As time for observation of household behaviours was very limited it was decided to focus only on food preparation and storage in the kitchen, in 246 households. This was the only topic thoroughly observed although the writer visited more than half of the 271 households noting behaviour such as child care, hand washing, household hygiene, etc.

At the end of the survey period in each village, the respondents were asked to bring their children to some central place in the village to have their weight and height recorded. Weight was measured by a simple portable market balance with a scale measuring up to a maximum of 25 kg with up to 100 gms precision. Each child was suspended in a specially designed cloth bag. Height or body length was measured by plastic tailor's tape with a scale measuring up to a maximum of 150 cms. and 0.1 cm. precision separately for children under 2 years (horizontal plane) and children older than 2 years (vertical plane). For older children the upright position without shoes was employed. To read the scale, a ruler was used to flatten the hair on top of the head. Younger children were measured in the supine position.

The child's head was positioned firmly against the fixed head board, with their knees extended and feet flexed. A ruler was applied to firm contact with the heels. To get an accurate value for weight and height, each child was measured twice and the average value was taken.

2.5 Tools of Analysis

A combination of descriptive and statistical techniques makes up the analytical tools used in this study. The descriptive technique includes crosstabulation which is used to condense and describe the quantities of data that were collected by showing the single effects of the variables under investigation. The statistical technique includes the Chi-square test of significance.

2.6 Limitations of Data

2.6.1 Coverage

This study is a purposive study so the results of the study refer to a small area in Khonkaen province and thus cannot be generalized without reservation to the other provinces or regions. Nevertheless, social and economic conditions in Khonkaen province or the Northeast region of Thailand are similar in a number of respects to those for poor, predominantly agricultural populations elsewhere and the results can at least be suggestive of diarrhoea problems and relationships that prevail within such a setting.

2.6.2 Response errors

This study uses many categories of retrospective data as mentioned above. These data are based largely upon the mother's memory. Although the data are reported by interviewing the mothers of the children and are recorded by health personnel, they are subject to bias. There are three possible factors influencing the reported level of morbidity from diarrhoea: memory lapse, perception of diarrhoeal disease, and social attitudes towards diarrhoeal disease.

According to memory lapse, the mis-reporting may be due to either memory decline, omission of illness which occurred during the reference period, or memory transfer of illness which occurred before the recall period. A reasonable recall period for morbidity should be two weeks or at most four weeks (Ross and Vaughan, 1984:17-18). Moreover, the degree of underreporting of disease due to memory lapse may not be uniform among mothers of different socio-economic groups and can be a serious limitation in studying morbidity differentials. Some common diseases may not be considered as an occurrence of disease, and some socially unacceptable diseases may be deliberately excluded from reporting. The perception or attitude toward diarrhoeal disease among rural people in the northeast region is that infantile diarrhoea **sou** is not serious, and some people believe it is a natural phenomenon, part of development of children (Thongkrajai et al., 1987).

2.6.3 Anthropometric Measurement

Although all mothers were asked to bring their children to the health centre for weighing after the survey, in practice, not all children were weighed in the same place and same time. Some children were not brought to be weighed so they had to be weighed at home. To overcome this problem the same group of interviewers weighed each child twice using the same weighing device.

The measure of nutritional status used in the study did not include all possible anthropometric variables for children nutritional status. This study uses weight-for-age as an indicator of nutritional status as it is considered to be a sensitive indicator of nutritional status, responsive to acute nutrient deficiency of a short duration. Since height or body length was measured by using a tailor's tape instead of a wooden length board and a vertical rod as recommended by WHO, the data were considered unreliable.

The NCHS standard which is recommended by WHO (WHO, 1983:11) was used. The standard has been developed by the (U.S.) National Centre for Health Statistics (NCHS). In this case, the results may reveal a higher number of malnourished children than that obtained using the Thai standard which has a lower median weight-for-age than the WHO/NCHS standard at all ages (see Appendix B1 and B2). As can be seen the Thai standard which was developed by Vichaidit (1985) shows

a lower value of weight-for-age distribution in all age groups except in the age group under one month for both sexes.

2.6.4 Timing

The study had to be conducted during the four weeks of January 1988 which is considered a cold month in Thailand. Many studies have indicated that there is an impact of seasonal variation on the incidence of diarrhoea (Gordon et al., 1964:14). A study in Thailand also found that the distribution of diarrhoeal cases are uneven throughout the year. There are two peaks of diarrhoeal disease: during the hot-humid months of May to July and during the cold months of December to February (Sarasombath, 1985:64). This variable, seasonality, will not be analyzed in the study, as to obtain more information the study must be conducted over a longer time.

Children in Thailand especially in rural communities are cared for by many different family members during infancy. The behaviour of these people may affect the incidence of diarrhoea, also management, during the episodes. Due to time limitations and consistency of respondent definition for the analysis, the other family child carers were not interviewed in this study. A future larger scale study might usefully include such people as respondents.

2.7 Operational Definition of the Terms Used

In order to avoid any confusion in terms used in the study, these terms are defined as follows:

Diarrhoea is defined as a change of the frequency, consistency or colour of stools from the individual's normal pattern toward more frequent (at least 3 times per day) or watery stools, with or without other features, such as, vomiting, fever, and abdominal pain, mucous or blood in stool. In order to cover all information on diarrhoea, the following terms in Thai language were used **sou** (infantile diarrhoea), **thongsai**, **thongruang**, **thaithong**, **kheehai**. In terms of scientific knowledge there is no difference in the above terms. Considering the beliefs about diarrhoeal disease among the rural people as mentioned by Thongkrajai et al. (1987), **sou** can be found only in infants (age under 1 year); the other terms can occur in all age groups.

Mother's education is expressed in the study as number of completed years of schooling.

Mothers' occupation is defined as the main occupation of the mother which earns payment regardless of seasonality or number of hours per week.

Annual household income is the income from all sources in the family. This includes the monthly wages or salaries brought into the family by all members and the value of the

annual production of the household. By combining this information a single figure of annual income is derived in terms of cash value in Baht (in 1988 U$ 1 = 25 Baht).

Incidence of diarrhoea is defined as the occurrence and the number of episodes of diarrhoea in the previous three months (first of October to the end of December) among the youngest children aged under 60 months.

Household management or **curative behaviour** of diarrhoea are the mother's actions taken in order to care for the youngest child with diarrhoea in the previous three months in terms of feeding practices, hygiene practices, treatment and oral rehydration therapy.

Nutritional status was determined as a modified "Gomez Classification" based on a comparison of the observed weight of the given child with expected weight for his/her age using the WHO/NCHS standard. Children whose weights were 90 per cent or higher of the mean standard were defined as "normal nutritional status children". Those whose weights were less than 90 per cent but higher than or equal to 75 per cent were classified as "mildly malnourished". Those whose weights were between 60 - 74 per cent of the mean were "moderately malnourished" and under 60 per cent were "severely malnourished".

Infant supplemental foods are any foods other than breast-milk, both liquid and solid forms, which are introduced to young children to complement milk-feeds in

order to meet the nutritional requirements and coincide with the physiological and developmental stages of the body. Categories of supplemental foods and the time when those foods are introduced are quite divergent among societies according to socio-cultural differences. The study uses the list of foods for children under one year which is recommended by the (Thai) Family Health Division (1985) (see Appendix D1). There are four main types of supplemental foods; cereal or starchy, animal protein, fruits and vegetables. In considering the time when supplemental foods were introduced, it can be seen whether each type of food was introduced too early, at the proper age or too late (see Appendix D2).

CHAPTER THREE

DETERMINANTS OF CHILDHOOD DIARRHOEA AND CONSEQUENCES OF DIARRHOEA

3.1 Introduction

As previously described in Chapter Two, the occurrence of diarrhoea among children closely relates to various factors. These factors are analysed and discussed here. This chapter will discuss the characteristics of the survey respondents by focussing on maternal knowledge, beliefs regarding childhood diarrhoea, some selected preventive behaviours as well as household sanitation and nutritional status of children.

3.2 Maternal Knowledge

It can be assumed that the knowledge of the nature of disease will contribute to the prevention of such disease, and as a consequence even if the disease occurs, the care of a sick person is more likely to be appropriate. The present study has collected the data on maternal knowledge of childhood diarrhoea - in terms of any ideas on the causes of diarrhoea, mode of diarrhoeal transmission, symptoms of diarrhoea treatment and care of a child with diarrhoea.

3.2.1 Knowledge of Causes of Diarrhoea

The data in Table 3.1 show that about 90 per cent of the mothers knew at least one cause of childhood diarrhoea and 10 per cent of the mothers did not know any, and that between the two villages, there was some difference in the proportion of the mothers knowing the true causes of child diarrhoea. However, the proportion of the mothers knowing the true cause of diarrhoea was greater in Sila village. In addition, among the specific causes of diarrhoea, eating contaminated or unclean milk or foods and drinking contaminated water was generally mentioned by the mothers as causes of childhood diarrhoea.

3.2.2 Knowledge about Mode of Transmission

Information on knowledge about the transmission route of diarrhoea is also shown in Table 3.1. Most of the mothers (84 per cent) mentioned that diarrhoea can get into the children through their mouths, some of them (4 per cent) believed that it can enter into children through the respiratory tract and skin, and the rest (12 per cent) did not know anything. It appears that a higher proportion of the mothers with knowledge of the true route of diarrhoea transmission was found in Sawathi village.

TABLE 3.1

MATERNAL KNOWLEDGE ABOUT CHILDHOOD DIARRHOEA

(percentage)

Knowledge	Sila	Sawathi	Both
Causes of diarrhoea:			
eating contaminated foods	54.2	54.3	54.2
drinking contaminated water	20.8	15.4	17.3
eating pickled foods	13.5	11.4	12.2
others #	2.0	8.6	6.3
don't know any of the above	9.4	10.3	10.0
Total	100.0	100.0	100.0
	(96)	(175)	(271)
Mode of diarrhoeal transmission:			
mouth	82.3	84.6	83.8
others $	17.7	15.4	16.2
Total	100.0	100.0	100.0
	(96)	(175)	(271)

Notes:
1. # Includes diarrhoea caused by eating uncooked foods and milk allergy.
2. $ Includes the mothers who mentioned respiratory tract and skin rather than hands.
3. Numbers in brackets are the base numbers for percentages.
4. The term 'contaminated' excludes spiritually contaminated

3.2.3 Knowledge about Symptoms of Diarrhoea

When asking about the symptoms of diarrhoea, those for severe and mild diarrhoea were asked separately. Whether they thought diarrhoea was severe or mild was defined by the mothers. From the results in Table 3.2 it can be concluded that 94 per cent of mothers mentioned that mild diarrhoea is just slightly loose stools for no more than 2-3 days, about 27 per cent of those pointed out some other mild symptoms such as weakness, fever and vomiting accompanied the loose stools. At least 6 per cent of mothers do not know the symptoms of mild diarrhoea.

TABLE 3.2

KNOWLEDGE ABOUT SYMPTOMS OF DIARRHOEA

(Percentages)

Knowledge	Sila	Sawathi	Both
Mild diarrhoea:			
slightly loose stools	93.8 (91)	94.9(166)	94.5(256)
loose stools with fever	18.8 (18)	9.1 (16)	12.5 (34)
loose stools with vomiting	8.3 (8)	9.7 (17)	9.2 (25)
all of above	1.0 (1)	10.9 (19)	7.4 (20)
don't know	4.2 (4)	6.3 (11)	5.5 (15)
Severe diarrhoea:			
watery loose stools more than 3 times in 24 hours	75.0 (72)	80.6(141)	78.6(213)
mucous or bloody stools	14.6 (14)	11.4 (20)	12.5 (34)
loose stools with fever	12.5 (12)	18.3 (32)	16.2 (44)
loose stools with vomiting	30.2(29)	39.4 (69)	36.2 (98)
loose stools and refuse to eat	19.8 (19)	18.9 (33)	19.2 (52)
loose stools and weight loss	17.7 (17)	12.0 (21)	14.0 (38)
loose stools and weakness	39.6 (38)	45.1 (79)	43.2(117)
loose stools with dehydration	12.5 (12)	6.3 (11)	8.5 (23)
don't know any of above	9.4 (9)	14.3 (25)	12.5 (34)

Notes: 1. The information for knowledge of symptoms of diarrhoea are multiple answers.
2. Number in brackets are the number of mothers.

For severe diarrhoea, most of the mothers (79 per cent) mentioned that there will be watery loose stools more than three times in 24 hours. Some mentioned that this may be accompanied by vomiting (36 per cent), loss of appetite, weight loss (14 per cent), and dehydration (9 per cent).

3.2.4 Maternal Opinion about the First Action taken to care for a Child with Diarrhoea and Feeding during the Episode

The data show that the care of mild diarrhoea differs from the care of severe child diarrhoea. It can be seen in Table 3.3 that if mothers believe that diarrhoea is severe, most of the mothers (93 per cent) will take children to a nearby hospital or health centre; only one per cent of mothers would buy medicine for self treatment; and less than one per cent will leave children to recover themselves. By contrast, if mothers think that diarrhoea is not severe, 40 per cent of mothers will take children immediately to a hospital or health centre while as many as 30 per cent of those will buy drugs for self treatment and about 9 per cent would just leave the children to recover themselves. Such a pattern of care has been found in both villages.

Whether the diarrhoea was mild or severe, most of the mothers preferred treatment from a medical doctor. However, for non-severe diarrhoea, they would rather seek drugs for self-treatment which were readily available in both villages. Surprisingly, none of the mothers from Sila village mentioned using the local health personnel whether

diarrhoea was severe or not, while quite a high proportion of mothers from Sawathi village (14 per cent for non-severe and 6 per cent for severe diarrhoea) thought they should seek treatment from the local health personnel first. As described in Section 2.3, only Sawathi village had a health centre located in the village which was more likely to be used by villagers. The mothers in Sila village preferred treatment from highly qualified health personnel from the city, even though the health centre was located just 2 kilometres away from the village.

TABLE 3.3

OPINION ABOUT FIRST ACTION TO TAKE CARE OF CHILD WITH DIARRHOEA

Care	Non-severe diarrhoea			Severe diarrhoea		
	Sila	Sawathi	Both	Sila	Sawathi	Both
a) do nothing	14.6	5.1	8.5	1.0	0.6	0.7
b) give traditional medicine	1.0	1.7	1.5	1.0	0.0	0.4
c) buy drug for self treatment	27.9	32.0	30.0	1.0	1.1	1.1
d) consult physician	40.6	42.3	41.7	88.5	89.7	89.3
e) other health personnel	0.0	13.7	8.9	0.0	6.3	4.1
f) cancel milk and foods	2.1	1.1	1.8	3.1	0.6	1.5
g) cancel foods	4.2	0.0	1.5	0.0	0.0	0.0
h) feed as normal	8.3	2.3	4.4	2.1	0.6	1.1
i) don't know any	2.1	1.1	1.5	3.1	1.1	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(96)	(175)	(271)	(96)	(175)	(271)

Opinions about milk and solid feeding during diarrhoea episodes can be seen in Table 3.4. When asked about milk feeding during diarrhoea episodes the majority (48 per cent) of the mothers agreed that they should not stop feeding their children, while 40 per cent of mothers believed that children should fast. Only 12 per cent of mothers did not know whether children should be fed. Among those who accepted that children should fast during episodes, a very high proportion (about 44 per cent) of mothers mentioned that milk would worsen diarrhoea; 24 per cent thought that the doctor would suggest that the children should have all food withheld, and some mothers (14 per cent) believed that milk caused diarrhoea. Comparing the two villages, it appears that the appropriate opinion about feeding during diarrhoea episodes was more prevalent among the mothers in Sila village than Sawathi village.

TABLE 3.4

OPINION ABOUT FEEDING DURING DIARRHOEA EPISODES

Opinion	Stop feeding milk* (%)			Stop feeding solids (%)		
	Sila	Sawathi	Both	Sila	Sawathi	Both
Yes	38.5	40.6	39.9	35.4	37.7	36.9
No	49.0	48.0	48.3	52.1	50.3	50.9
Don't know	12.5	11.4	11.8	12.5	12.0	12.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(96)	(175)	(271)	(96)	(175)	(271)

Notes:
1. * Includes breast milk
2. The numbers in brackets are the base numbers for percentages.

In regard to continuing to feed children with solid food during diarrhoea episodes, Table 3.4 shows that half the mothers knew that children should not fast, whereas 37 per cent of the mothers disagreed and only 12 per cent did not know whether children should fast. The mothers who supported fasting during an episode had different reasons, as follows: food made children more sick (46 per cent); the suggestion of the doctor (22 per cent); food may cause vomiting (10 per cent); babies refused to eat (9 per cent). When asked what should be given during the episode, only 20 per cent of the mothers believe that children should have ORS and 9 per cent insisted that children should be fed rice water.

3.3 Maternal Beliefs about Childhood Diarrhoea

3.3.1 Causes of Diarrhoea

As can be seen in Table 3.5 maternal beliefs about diarrhoea are very different as to the causes of infantile diarrhoea **(sou)** and of childhood diarrhoea. **Sou** is the local term for infantile diarrhoea which occurs in children aged one year or below. Actually, an infant can get several different types of diarrhoea. Over 90 per cent of mothers believed that **sou** occurred naturally in every child without association with environmental sanitation (73 per cent). A very high percentage of those believed that **sou** was just an excretion of accumulated waste products from the baby (92 per cent), or that the baby could contract diarrhoea if it

was being breast-fed after the mother was working in the sun (80 per cent) or ate taboo foods (72 per cent). Only 21 per cent of mothers believed that infant diarrhoea was caused by infection. By contrast, for child diarrhoea, approximately 93 per cent of mothers believed that diarrhoea was caused by a contaminated environment such as unclean food and water, and about 83 per cent of the mothers believed that diarrhoea in children was caused by infection (including infections from unclean food or water).

TABLE 3.5

MATERNAL BELIEFS ABOUT INFANT AND CHILD DIARRHOEA

Beliefs	agree	disagree	not sure
Cause of diarrhoea:			
Sou is a natural phenomenon	94.1	3.7	0.4
Every infant has **sou**	92.6	4.4	3.0
There is no association between **sou** and **environment**	73.8	20.7	5.5
Sou is caused by mother eating taboo foods	72.3	21.8	5.9
Sou caused by germs	21.0	69.4	9.6
Sou is accumulated waste products	91.9	3.3	4.1
Sou is part of development	73.8	24.0	1.5
Mother's diarrhoea caused **sou**	67.9	19.9	11.4
Hot breast-milk caused **sou**	77.9	16.6	5.2
Contaminated environment caused **diarrhoea**	93.0	5.2	1.8
Diarrhoea caused by infection	83.0	15.5	1.5
Severity and treatment of infant with diarrhoea:			
Frequent **sou** occurs in a chubby infant	63.8	26.2	10.0
Sou can be fatal	22.9	68.6	8.5
Sou needs no treatment	86.0	9.2	4.8
Diarrhoea needs no treatment	10.0	86.3	3.3
Should withhold solids and milk	57.9	36.9	4.1
Should feed as normal	62.4	32.5	4.1

Notes:

1. Excludes 'not applicable' and 'not stated'
2. The total number of cases is 271

3.3.2 Severity and Treatment

The data indicate that diarrhoea in children is a more severe situation than diarrhoea in infants **(sou)**. As can be seen in Table 3.5, 64 per cent of mothers believed that infants with frequent **sou** would be healthy. Only 23 per cent of mothers believed that **sou** in an infant could be fatal, and a very high proportion of mothers (86 per cent) believed that **sou** needs no treatment, while only 10 per cent of mothers thought that diarrhoea needs no treatment even though the symptoms are the same.

3.4 Preventive Health Behaviours

The preventive health behaviours in the study emphasize the behaviours which are presumably related to the child's protection against diarrhoeal diseases as follows:

3.4.1 Feeding Patterns

Table 3.6 presents information on feeding patterns of children. The table reflects that breastfeeding was very high in both villages. The mothers were asked what kind of milk they have ever fed their children. Exactly 80 per cent of the children were exclusively breast-fed; about 18 per cent of the children were exclusively artificially fed and the last 2 per cent were receiving a combination of breast and artificial feeding. The data show that there are differences in the feeding patterns between the two villages. This study reveals quite a high proportion of children who have never been breast-fed at all compared to

the figure for the region as a whole, which shows that in 1985 only 3 per cent of children were bottle-fed (Kamnuansilpa and Knodel, 1985:32).

TABLE 3.6

FEEDING PATTERNS OF THE CHILDREN

Items	Sila	Sawathi	Both
Milk feeding from birth: $			
breast-fed	81.3	79.4	80.1
bottle-fed	18.7	17.1	17.7
mix-fed	0.0	3.5	2.2
Total	100.0	100.0	100.0
	(96)	(175)	(271)
Colostrum given:			
yes	83.3	81.1	81.9
no	16.7	18.9	18.1
Total	100.0	100.0	100.0
	(96)	(175)	(271)
When first breast-fed (after birth): #			
first day	22.5	33.1	29.3
second day	37.5	44.4	41.9
third day or more	40.0	22.5	28.8
Total	100.0	100.0	100.0
	(80)	(142)	(222)

Notes:
1. $ Includes children who were ever or currently milk-fed
2. # The number of children who received colostrum
3. Numbers in brackets are the base numbers for percentages

Among those who were ever breast-fed, approximately 82 per cent (222 children) were given colostrum, whereas only 18 per cent never got colostrum at all. The reasons underlying not feeding colostrum were: some of the mothers believed that colostrum was dirty, or that the first milk was not tasty, or that colostrum was hot. The information on when breastfeeding started among the children who received colostrum revealed that about 24 per cent of children were fed on the first day after birth, 42 per cent

were fed on the second day after birth and at least 29 per cent of children were fed three days or more after birth.

Appendix F1 presents the analysis of factors which relate to feeding practices. It can be seen that mother's education ($p < 0.01$), mothers' occupation ($p < 0.01$), and annual household income ($p < 0.01$) show a negative and statistically significant relationship with feeding patterns. Full breastfeeding is more common among lees educated women than those with higher education. It is also more common among low income women. This finding is contrary to the findings of the study by Knodel and Debavalya (1980:364-365) who indicated that there was no difference in breast-feeding between women with less than four years schooling and those who had completed four years. In relation to the number of living children, the percentage of children who were breast-fed tends to increase, but there was no significant difference in breastfeeding pattern.

3.4.2 Supplemental Feeding (foods other than milk)

From the review of related literature about the introduction of supplementary foods (see Section 1.5), various studies indicated that the most suitable food for a baby is breast milk because it provides the complete nutrition requirements for growth and development during the first three months. Any foods other than breast-milk should be introduced after the body is ready to accept them, normally around four to six months, in order to meet the increasing nutritional requirements of a child of that age.

The introduction of supplementary foods to the child's diet will increase opportunities for the child's exposure to contaminated foods, especially if weaning is early. On the other hand, late introduction of solids obviously affects a child's nutritional status and mortality (Mata et al., 1976:312). The present study has not attempted to reveal the relationship between weaning and incidence of diarrhoea. This would need more information and a long observation period as well as confirmation by laboratory examination. The data in this study were collected to reflect how villagers carried out weaning of young children. The study period of supplemental feeding was limited to only the first year of life, because most studies of weaning practices in Thailand revealed that new foods normally were introduced to babies too early rather than too late.

Table 3.7a presents information on the type of foods which were introduced to the child during the first year of life. As can be seen, at least 87 per cent of the children were introduced to at least one type of rice or cereal before aged three months (early weaning), but only 5 per cent of children got the same foods at the appropriate time. The feeding pattern for animal protein is definitely different from rice, and animal protein is likely to be introduced too late. At least 89 per cent of children were fed at least one type of animal protein too late (after 5 months). Fruits also were given to a high proportion (64 per cent) of the children before the appropriate age. For the group of vegetables, only 17.6 per cent of the children were given them at the appropriate age but most children were

given them too late. Apparently, the patterns of supplementary feeding, especially of animal protein, were similar in both villages (see Table 3.7b). Chewed rice was more preferred among the mothers in Sawathi village than in Sila village.

TABLE 3.7a

PERCENTAGE DISTRIBUTION OF CHILDREN BY TYPE OF SUPPLEMENTARY FOOD AND TIMING OF INTRODUCTION OF SOLID FOOD

Type of food	Number of children (a)	(b)	Time solids introduced $ Early (c)	Proper (d)	Late (e)
Rice and Cereals:					
chewed rice	90	33.2	86.7	2.2	11.1
rice porridge	225	83.0	48.0	8.9	43.1
steamed rice	175	64.6	46.9	29.1	24.0
others #	111	41.0	85.6	2.7	11.7
Animal Protein:					
fish meat	178	65.7	5.6	4.5	89.9
chicken	213	78.6	48.4	13.6	38.0
pork	237	87.5	46.0	15.6	38.4
egg	241	88.9	14.1	10.8	75.1
Fruits:					
orange	238	87.8	76.1	10.1	13.8
banana	258	95.2	53.9	30.6	16.3
Vegetables:	193	71.2	33.7	17.6	48.7

Notes:
- # Includes commercial foods substitutes
- $ Percentage of (a) and the definitions see Section 2.7
- (a) Excludes children who have not yet received any supplemental foods and those for whom there was no data
- (b) Percentage of 271
- (c), (d), and (e) are the percentages of (a) corresponding to time each type of food was introduced

TABLE 3.7b

PERCENTAGE DISTRIBUTION OF CHILDREN WEANED TOO EARLY BY TYPE OF SUPPLEMENTARY FOODS AND VILLAGE

Type of food	Early weaning		Overall
	Sila	Sawathi	
Rice and Cereals:			
chewed rice	76.5 (17)	89.0 (73)	86.7 (90)
rice porridge	64.2 (81)	38.9 (144)	48.0 (225)
steamed rice	50.0 (44)	45.8 (131)	46.9 (175)
others #	78.9 (38)	89.0 (73)	85.6 (111)
Animal Protein:			
fish meat	9.1 (44)	4.5 (134)	5.6 (178)
chicken	47.5 61)	48.7 (152)	48.4 (213)
pork	48.1 (79)	44.9 (158)	46.0 (237)
egg	14.8 (81)	13.8 (160)	14.1 (241)
Fruits:			
orange	61.1 (95)	48.5 (163)	57.6 (238)
banana	73.8 (80)	77.2 (158)	76.1 (258)
Vegetables:	34.6 (78)	33.0 (115)	33.7 (193)

Notes:
1. # Includes commercial foods substitutes
2. Numbers in brackets are the base numbers for percentages; these numbers are excluding 'not stated' and children who were not yet weaned

Of the different types of supplementary foods, banana is the most common infant food for as much as 95 per cent of the children. There are several varieties of banana in the two villages. The favourite one is "nem lavar" which is of much value as an infant food. Mashed banana, either ripe or roasted is the ordinary way of eating it. Rice is also popular in the Northeast region. The study of Kamnuansilpa and Knodel (1985:34) of mortality, health and infant feeding practices clearly showed that approximately 90 per cent of children received some sort of rice supplement. Roasted

chewed glutinous rice (cooked rice which is normally pre-chewed by the mother, is wrapped in banana leaves then roasted on the fire) is the most popular form of rice supplement introduced as the first supplemental food for as much as 76 per cent of children in the Northeast region. The same results were found by Thongkrajai et al. (1987:36).

TABLE 3.7C

INCIDENCE OF DIARRHOEA (PERCENTAGE) AND PROPORTION OF MALNOURISHED AMONG CHILDREN AGED 0-11 MONTHS ACCORDING TO TIME SOLIDS INTRODUCED

Time solids introduced	Diarrhoea incidence (%)	Malnourished (%)	N
Early weaning:			
Animal protein	56.7	63.3	30
Rice and cereals	65.5	47.3	55
Fruit	73.5	42.9	49
Late weaning:			
Animal protein	60.0	64.0	25
Rice and cereals	60.0	50.0	20
Fruit	60.0	40.0	15
Total	59.3	45.8	59

Note: N are the base numbers for percentages which include all children aged 0-11 months

Analysis of data on impact of weaning practices on the incidence of diarrhoea and nutritional status are shown in Table 3.7c. As mentioned earlier the data on supplementary feeding were collected among children during their first year of life; therefore only the children aged 0-11 months either weaned early or late were analysed. The data show that there was no effect of either early weaning or late weaning on the incidence of diarrhoea. However, there was an

increase in incidence of diarrhoea among the children who were weaned early on to fruit with 73.5 per cent compared to 59.3 per cent for all children. Among the group of malnourished children, only the early or late weaning on to animal protein had an negative impact on children's nutritional status (63.3 per cent and 64.0 per cent of malnourished children respectively).

3.4.3 Hygiene Practices

As long as diarrhoea-causing pathogens can be transmitted through direct person to person contact the hygiene practices of the mother have a great influence on preventing infectious diseases, in particular diarrhoea. The selected preventive behaviours practised by the mothers will be discussed in the following sections.

3.4.3.1 Hand Washing before Feeding

Mothers' unclean hands are thought to be a main source of contamination, in particular among the rural Thai people who normally eat rice and other food with their hands. Whenever they have contact with their babies it is easy to transfer germs. To break the infectious cycle hands should be properly washed. The data in Table 3.8 show that most of the mothers always washed their hands before feeding their children, but 69.3 per cent used water only, while 18.8 per cent of the mothers always washed their hands with soap, and another 13 per cent uncertain. Analysing selected factors related to this behaviour (see Appendix F2), only maternal education was found to show a significant positive

association ($p < 0.1$) with the use of soap for hand washing. Although annual household income also showed a positive relation, there was not a significant difference ($p < 0.1$).

TABLE 3.8

SELECTED PREVENTIVE HEALTH BEHAVIOURS

Preventive behaviours	Sila (%)	Sawathi (%)	Both (%)
Hand washing before feeding:			
always with water only	61.5	73.5	69.3
always with soap	25.3	15.3	18.8
uncertain	13.2	11.2	11.9
Total	100.0 (91)	100.0 (170)	100.0(261)
Hand washing after toilet:			
always with water only	43.4	48.6	46.8
always with soap	47.9	36.0	40.1
uncertain	8.5	15.4	13.0
Total	100.0 (94)	100.0(175)	100.0(269)
Clean of feeding set:			
with water only	49.5	43.8	45.8
with soap or detergent	46.1	53.1	50.6
uncertain	4.4	3.1	3.6
Total	100.0 (91)	100.0 (160)	100.0(251)
Boil drinking water:			
always	34.4	22.9	26.9
sometimes	7.3	1.1	3.3
never	58.3	76.0	69.7
Total	100.0 (96)	100.0 (175)	100.0(271)

Note: The number of households dose not add up to 271 due to the exclusion of 'not stated'

3.4.3.2 Hand Washing after Using the Toilet

In response to the question about whether the mothers usually washed their hands after using the toilet (see Table 3.8), most mothers indicated they always washed their hands after defecation. Most (47 per cent) used water only, and about 40 per cent of mothers used soap or

detergent. Looking at factors related to hand washing after using the toilet (see Appendix F3), the data show that mothers with secondary education, those working as government officials, and those in the highest annual household income groups were more likely to adopt appropriate behaviour for washing hands after defecation. Age of the mothers had a negative relationship ($p < 0.1$) with hand washing with older age groups being less likely to wash their hands with soap or detergent.

3.4.3.3 Cleaning Feeding Sets

The data in Table 3.8 showed that half the 251 mothers (excluding not stated) always cleaned their children' feeding sets by using soap or detergent; a little lees than half used water only for cleaning although a few mentioned that they always cleaned the feeding sets with hot water. When testing for the differences between the proportion of mothers who cleaned their babies feeding sets, it appeared that none of the selected variables showed a significant influence ($p < 0.1$) on the mother's behaviour (see Appendix F4).

3.4.3.4 Boiling Drinking Water

The data on mothers who boiled drinking water showed that as many as 70 per cent of mothers never boiled drinking water at all, while only 27 per cent of mothers always boiled water (see Table 3.8). In order to study factors related to the practice of boiling drinking water, because only a small proportion of mothers sometimes boiled

drinking water in this study, the test statistics take only mothers who always or never boiled drinking water (see Appendix F5). Age of mother and number of living children show a statistically significant negative relationship ($p < 0.05$), while mother's occupation ($p < 0.01$) and education ($p < 0.001$) show a positive relationship. Only the highest income group shows a positive significant difference; there is no sign of an effect of annual household income on the practice of boiling drinking water.

Looking at the villages separately, the data in Table 3.8 show that the proper health behaviours were found more often among the mothers in Sila village than those in Sawathi village, although the distribution of level of mother's education, mother's occupation and household income was quite similar. The difference may be due to the fact that Sila villagers were more exposed to a modernized life style that brought about more acceptance of new knowledge and changed behaviours.

3.5 Environmental Sanitation

3.5.1 Toilet Facilities

There is no doubt about the importance of environmental hygiene for the general state of health of the population. Contaminated water is a major source of gastro-intestinal disorders. Use of sanitary toilets can break the cycle of infection and re-infection by making both the household and the community water supply safe.

TABLE 3.9

PERCENTAGE DISTRIBUTION OF HOUSEHOLD

ENVIRONMENTAL SANITATION

Environment	Sila	Sawathi	Both
a) Ownership of latrine: $			
Yes	84.4	77.7	80.1
No	15.6	22.3	19.9
Total	100.0	100.0	100.0
	(96)	(175)	(271)
b) The main source of drinking water:			
Rain water	56.3	34.9	42.4
Open well	41.7	65.1	56.8
Tube well	2.1	0.0	0.7
Total	100.0	100.0	100.0
	(96)	(175)	(271)
c) Cooking area and food handling: #			
Animals present in kitchen	12.3	14.3	13.7
Dirty dishes left in kitchen	20.0	21.7	21.2
Poor storage of cleaned dishes	63.1	61.5	61.9
Cooked foods left uncovered	4.6	2.5	3.1
Total	100.0	100.0	100.0
	(65)	(161)	(226)

Notes:

1. $ All toilets were water-seal type.
2. # The information was obtained by observation on the day of interview. Not all of the households were observed, therefore, the number of households does not add up to 271.
3. Numbers in brackets are the base numbers for percentages

The questionnaire attempted to determine the percentage of households in the survey population with toilet facilities. As can be seen in Table 3.9, both villages showed a high proportion of households with a toilet (all are water-seal type). However, Sila village had a higher proportion (84 per cent) of households with toilets than Sawathi village (78 per cent). These proportions were quite high for rural settings. This is possibly because the two villages were the centres of the sub-districts; most of the health service programmes in Thailand were first established in the central villages. All of the toilets reported were of the water-sealed type which are thought to effectively prevent the spread of germs through insects and domestic animals. Among the non-toilet households, over 10 per cent mentioned that they defecated on the ground around their home or back yard. This ensured the widest distribution of germs and risk of infection. Only 6 per cent shared toilets with their neighbour or relatives. Not many young children were trained and allowed to use toilets alone. Most of the mothers thought the children were too young to use the toilets, the toilets were considered too dirty and too dangerous for them. Most of the toilets in rural areas were constructed separate from the houses and they were just a small dark room. Therefore, defecation on the ground around the houses is preferred by children.

3.5.2 Cooking Areas

Another source of environmental contamination was the kitchen, where foods are prepared, cooked and stored. Food

is easily contaminated if people are not aware or are careless. The observation time during the interview was short but it obtained useful information about household sanitation (see Table 3.9). The data were obtained from only 226 households, at least half of the households poorly handled clean dishes and utensils as they just put them somewhere in the kitchen where they were easily exposed to dirt or micro-organisms, rather than in the cupboard. Almost 18 per cent of households left dirty dishes and utensils in their kitchen and did not clean up right after meals, and about 11 per cent of households had domestic animals present in the kitchen. Similar patterns were found in the two villages.

3.5.3 Sources of Drinking Water

The principle water sources in both villages were public open wells, generally hand-dug with casing and without covers. Some had curbstones and all of the villagers used their own buckets which may not be clean enough to take water from the wells so that the water was subjected to chemical and bacterial contamination. The data indicated that 57 per cent of the villagers took the water for drinking from the open wells and 42 per cent used rain water (see Table 3.9). Even though there are artesian wells available which are much safer, the villagers are less likely to drink the water from that source because of the unpleasant taste. Comparing the two villages, a higher proportion of the Sawathi mothers (65 per cent) took water for drinking from open wells than those of Sila (42 per

cent). None of the mothers from Sawathi village said that they took water from borewells for drinking while two households from Sila village mentioned that they relied on that sort of water. Again, more than half of the households (56 per cent) in Sila village used rain water for drinking compared with only 35 per cent of households in Sawathi village. In regard to analysis of factors related to source of drinking water (see Appendix F6), maternal education, number of living children, and annual household income were three variables which influenced the use of rain water for drinking; among these variables, maternal education shows a strong relationship ($p < .05$).

Rain water was thought to be cleaner and safer from micro-organisms if it was kept in a proper container. Only 40 per cent of households had a big tank or jar to keep rain water in and to serve for drinking throughout the year. These big jars or tanks were made from cement which had faucets or taps at the bottom in order to provide water when needed or to clean them. It seems to be difficult to clean such a big container, especially the big tanks which were usually constructed on a fixed base. These might be subjected to left-over unclean water. There are other problems with jars or tanks; people may not take water from the tap because it is broken, so the only way to get water from the jar or tank is by putting buckets or bowls in the top. Therefore, rain water was subjected to contamination.

3.6 Nutritional Status.

Information on weight for age was collected for each child in this survey. Although the children were weighed every four months by local health personnel, these sets of data were thought to be incomplete and unreliable. So weight for age of the study children was taken only for assessing their nutritional status. According to the NCHS standard, it appears that only 35 per cent of the children were normally nourished (90 per cent of median weight-for-age or higher); a very high proportion of children (10 per cent) were classified as moderately malnourished (60-74 per cent), and as many as 55 per cent were in the mildly malnourished (75-89 per cent) group (see Table 3.10).

3.6.1 Age Differentials

Table 3.10 also shows that a high proportion of older age children were malnourished compared to younger children. In other words, younger age groups (especially age below 6 months) have a higher proportion of normally nourished children (75 per cent) than older age groups; the difference was significant ($p < 0.001$). None of the children aged below 6 months was found to be moderately malnourished while among age 48 months or older there were 21 per cent. However, there was some fluctuation around age group 12-17 That might because children were being weaned.

TABLE 3.10

PERCENTAGE DISTRIBUTION OF THE CHILDREN'S NUTRITIONAL STATUS ACCORDING TO AGE

Age (months)	Number of children	Nutritional status (%)		
		Normally nourished	Mildly malnourished	Moderately malnourished
< 6	24	75.0	25.0	0.0
6 - 11	35	40.0	51.4	8.6
12 - 17	41	29.3	63.4	7.3
18 - 23	26	46.2	46.2	7.7
24 - 35	57	36.8	54.4	8.8
36 - 47	50	24.0	64.0	12.0
48 +	38	13.2	65.8	21.1
Total	271	34.7	55.4	10.0

Notes:
1. None of the children were classified as severely malnourished.
2. Malnourished children include mildly malnourished (75-89 % of median of weight-for-age) and moderately malnourished (60-74 % of the median of weight-for-age)

3.6.2 Sex Differentials

In regard to sex of the children, Table 3.11 shows that a higher proportion of female children were malnourished than male children of the same age group, and that the association was statistically significant ($p < 0.05$). This might be because male children are preferred to female children, thus leading parents to take more interest in the care of male children than female children in some aspects.

The study in Bangladesh described by Kim (1986) indicated that food consumption of boys was more concentrated in both quality and quantity than for girls. Chen (1979) observed that male children are more preferred thus female children are neglected; this brings about more malnutrition among female than male children.

TABLE 3.11

PERCENTAGE DISTRIBUTION OF MALNOURISHED CHILDREN ACCORDING TO AGE, SEX AND VILLAGES OF RESIDENCE

Age in months	Male			Female		
	Sila	Sawathi	Both	Sila	Sawathi	Both
< 6	33.3	20.0	27.3	16.7	28.6	23.1
6-11	40.0	54.5	50.0	50.0	76.9	68.4
12-17	66.7	57.1	59.2	83.3	100.0	92.8
18-23	66.7	45.5	53.0	100.0	42.9	55.6
24-35	50.0	55.0	53.3	87.5	68.4	74.1
36-47	80.0	66.7	71.5	77.8	84.6	81.8
48 +	83.3	76.9	80.0	100.0	100.0	100.0
Total	63.6	57.6	59.7	70.7	73.7	72.6
	(55)	(99)	(154)	(41)	(76)	(117)

Note: Numbers in brackets are the base numbers for percentages

TABLE 3.12

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG NORMALLY NOURISHED AND MALNOURISHED CHILDREN ACCORDING TO AGE

Age in months	Incidence of diarrhoea (%)	
	normal	malnourished
< 6	66.7 (18)	50.0 (6)
6-11	64.3 (14)	66.6 (21)
12-17	25.0 (12)	31.1 (29)
18-23	0.0 (12)	14.3 (14)
24-35	19.0 (21)	8.4 (36)
36-47	0.0 (12)	5.3 (38)
48 +	0.0 (5)	6.1 (33)
Total	29.8 (94)	19.8 (177)

Notes:
1. 'Malnourished' includes mildly and moderately malnourished children
2. Numbers in brackets are the base numbers for percentages

3.6.3 Nutritional Status: the consequences of diarrhoea

As can be seen in Table 3.12, there was no effect of diarrhoea on the nutritional status of the children, especially among younger age groups (under age 1 year). Although the children under 1 year of age had a higher proportion of diarrhoea in the last 3 months, the children were better nourished (see Table 3.10). This pattern was not evident among age group 24-35 months as the proportion of malnourished children was about 19 per cent. Evidence from the national survey suggests that the Thai children, especially in rural areas were breast-fed for a period up to

two years of age (Knodel and Debavalya, 1980). Although they had diarrhoea during this period, continued feeding was also common. The older children who were given adult foods during ordinary circumstances, would be shifted to softer food or not given food in some cases whenever diarrhoea occurred. Therefore diarrhoea might have less effect on the nutritional status of the younger children than the older children.

CHAPTER FOUR

FACTORS RELATED TO INCIDENCE OF CHILDHOOD DIARRHOEA AND ITS HOUSEHOLD MANAGEMENT

4.1 Factors related to Incidence of Childhood Diarrhoea

4.1.1 Age and Sex Differentials

The data reveal that, overall, there were 79 diarrhoea episodes among 63 of the 271 children in the study (23.3 per cent of the total children) during the previous 3 months (the first of October to the end of December). This period was found to have a very high incidence of rotavirus infection among young children (Thongkrajai et al., 1986:26). These episodes lasted an average of two days, with nearly 25 per cent of children having diarrhoea for more than 3 days. It appears that of the two villages, the proportion of children with diarrhoea was higher for Sila village (27.1 per cent) than Sawathi village (21.2 per cent) (see Table 4.1a).

In regard to the age of children, Table 4.1a also shows that the proportion of children with diarrhoea varied inversely with age of children (the relationship was statistically significant $p < 0.001$), and reaches 63 per cent among children under 6 months of age and 57 per cent among children 6-11 months of age. Comparing the two

villages, a higher proportion of children with diarrhoea in the younger age group (under 12 months) was found in Sawathi village; conversely, a higher proportion of children with diarrhoea in almost all older age groups (> 12 months) was found in Sila village.

TABLE 4.1a

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS ACCORDING TO VILLAGE OF RESIDENCE AND AGE

Age in months	Incidence of diarrhoea (%)		
	Sila	Sawathi	Both *
< 6	58.4 (12)	66.7 (12)	62.6 (24)
6-11	54.5 (11)	58.3 (24)	57.1 (35)
12-17	33.3 (12)	27.6 (29)	29.3 (41)
18-23	25.0 (8)	0.0 (18)	7.7 (26)
24-35	16.7 (18)	10.3 (39)	12.3 (57)
36-47	0.0 (19)	6.5 (31)	4.0 (50)
48 +	6.2 (16)	4.6 (22)	5.3 (38)
Total	27.1 (96)	21.2 (175)	23.3 (271)

Notes:
1. Numbers in brackets are the base number for percentage. These include all children in each age group.
2. * Association was statistically significant ($p < 0.001$)

Analysis of the distribution of the incidence of diarrhoea episodes among the different age groups (see Table 4.1b), reveals that diarrhoea episodes occurred more frequently in the younger children than those in older age groups. The proportion of children who had two or more diarrhoea episodes reaches 25 per cent in children aged 6-11 months. The finding was contrary to the expected advantage of breast milk the babies received during their early life. That might be due to the children receiving contaminated

foods and water during early weaning as in rural Bangladesh where most of the traditional weaning foods and water are subject to contamination (Black et al., 1983:23-27). Therefore, the protection afforded by breast-feeding against diarrhoea may be less obvious in this case and that leads to more diarrhoea infections among the young.

TABLE 4.1b

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS ACCORDING TO THE NUMBER OF EPISODES AND AGE

Age in months	Number of children	Number of episodes (%)		
		0	1	2+
< 6	24	37.5	54.2	8.3
6-11	35	34.3	40.0	25.7
12-17	41	70.7	26.8	2.4
18-23	26	92.3	3.8	3.8
24-35	57	87.7	10.5	1.8
36-47	50	96.0	4.0	0.0
48 +	38	94.7	5.3	0.0
Mean number of diarrhoea episodes = 1.86				
Total	271	76.8	18.1	5.2

Diarrhoeal disease incidence by sex of children is presented in Table 4.1c. The data show a statistically significant ($p < 0.05$) association between sex of children and incidence of diarrhoea episodes, with a higher proportion of female children with diarrhoea than male children in almost all age groups. A big difference exists in the youngest age groups (0-11 months), where the incidence of diarrhoea among female children is 10 per cent

higher than male. There is little difference in proportions of children of either sex with two episodes or more. This may reflect the nutritional status of the female children as described in Chapter 3, with a higher proportion of malnourished female children than malnourished male children. It is well recognized that poor nutritional status leads to increased diarrhoeal morbidity (Chen, 1983:3-5). It may be true in this case that female children with a higher proportion of malnutrition, were more susceptible to diarrhoea than males, resulting in more diarrhoeal infections in female children.

TABLE 4.1c

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS ACCORDING TO SEX AND AGE

Age in months	Incidence of diarrhoea(%)	
	Male	Female
0-11	59.3 (27)	68.8 (32)
12-23	20.4 (44)	21.8 (23)
24 +	6.0 (83)	9.7 (62)
Total *	19.5 (154)	28.2 (117)

Notes:

1. Numbers in brackets are the base numbers for percentages
2. * Association was statistically significant ($P < 0.05$)
3. The last age group includes children age 24 to 59 months

4.1.2 Socioeconomic Factors

Only annual household income shows a positive influence on the incidence of diarrhoea, with lower income families appearing to have a higher proportion of children with diarrhoea than the high income families, though the relationship was not statistically significant (see Table 4.2). A fluctuating incidence of diarrhoea was found when age of mothers, mother's education, mother's occupation, and number of living children was taken into account. Although the younger groups of mothers were more highly educated than the older, a higher incidence of diarrhoea was found (27 per cent) among mothers aged 25-29 years. There was a similar finding for mother's education, where it seems that higher education was associated with higher incidence of diarrhoea in children.

For mother's occupation, there was little difference in the incidence of diarrhoea except for the housewife group, where the incidence of diarrhoea in their children was as high as 50 per cent (see Table 4.2). The question is why the incidence of diarrhoea is so high compared to other occupation groups when housewives are the only people who spend most of their time bringing up children. Therefore, it is plausible to look at the characteristics of this group in terms of distribution of age, education, and income. The housewives are characterized by high income with about one-third of the families with cash incomes of at least 15,000 Baht per year. Most of them (about 80 per cent) are in the

younger age groups (below 30 years), and there is a quite uniform proportion of housewives in each educational category.

TABLE 4.2

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS 5 YEARS BY SELECTED SOCIOECONOMIC FACTORS

Variables	Number of children	Children with diarrhoea	
		no	yes
Age of mothers: ns			
< 25 yrs	91	76.9	23.1
25-29 yrs	81	72.8	27.2
30-34 yrs	57	80.7	19.3
35 + yrs	42	78.6	21.4
Education of mothers: ns			
lower elementary	211	78.2	21.8
upper elementary	26	65.4	34.6
secondary or higher	34	76.5	23.5
Occupation of mothers: *			
agriculture	225	78.7	21.3
labour	11	81.8	18.2
housewife	20	50.0	50.0
others #	15	80.0	20.0
No. of living children: ns			
one child	137	78.1	21.9
two children	68	70.6	29.4
three or more	66	80.3	19.7
Annual household income: ns			
< 10000 B	57	77.2	22.8
10000-19999 B	98	74.5	25.5
20000-49999 B	90	77.8	22.2
50000 or higher	26	80.8	19.2
Total	271	76.8	23.2

Notes:
Includes government officials, traders and entrepreneurs
ns Association was not statistically significant ($p < 0.1$)
* Association was statistically significant ($p < 0.05$)

4.1.3 Preventive Health Behaviours

In Table 4.3a the rate of diarrhoeal disease incidence in children according to practice of selected preventive health behaviours is presented. It can be seen that there was a very slight difference in the proportion of children with diarrhoea among those whose mothers usually washed their hands using soap or detergent, water only and sometimes used soap or sometimes used water (uncertain) before feeding their babies.

TABLE 4.3a

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS BY MATERNAL HYGIENE PRACTICES

Hygiene practices	Incidence of diarrhoea (%)		
	water	soap	uncertain
Hand washing before feeding: ns	23.0 (126)	24.1 (108)	22.9 (35)
Hand washing after toilet: ns	22.1 (181)	22.4 (49)	28.9 (31)
Cleaning feeding sets: ns	25.2 (115)	21.3 (127)	33.3 (9)
Boil drinking water: *	42.4 (73)	15.4 (189)	33.3 (9)

Notes:
1. The number of cases did not add up to 271 due to the exclusion of 'not stated'and 'not applicable'
2. The categories of boiling water are: always, never, and sometimes respectively
3. ns Relationship was not statistically significant ($p < 0.1$)
4. * Association was statistically significant ($P < 0.05$)

For the mothers who washed their hands after using the toilet, the data show no difference whether they used water only or soap. A slightly higher proportion of children with diarrhoea was found in the group of mothers who said they sometimes used water and sometimes used soap (uncertain).

In Table 4.3a data were also presented on the proportion of children with diarrhoea according to how the mothers washed the babies' feeding sets. Children whose mothers usually washed the babies' sets with soap or detergent had a lower incidence of diarrhoea (21 per cent). A very high diarrhoea incidence was found among the group where the mothers washed the babies' sets with water (42 per cent). This may reflect inadequate storing. According to the findings from the observation of kitchen areas, most clean dishes were prone to contamination and even cooked foods might be left uncovered. Therefore, one preventive behaviour alone may not have a great effect on reducing morbidity of diarrhoea in children; rather, the combined effects of the related behaviours may be more important.

The combination effects of preventive behaviours on the incidence of child diarrhoea are shown in Table 4.3b. In order to see the combination effects of selected preventive behaviours, a preventive behaviours index was made, by scoring each of behaviours then combining (see Appendix E). The Chi-square test was applied to test for difference between the proportion of children who had diarrhoea among

different preventive behaviour indexes. There was a surprising finding that the proportion of children with diarrhoea increased among the better preventive behaviour index groups. Although, the relationship was not significantly different. The highest proportion with diarrhoea (37.5 per cent) was found among the group with highest scores (appropriate behaviour).

TABLE 4.3b

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN UNDER 5 YEARS IN THE PREVIOUS 3 MONTHS BY PREVENTIVE BEHAVIOUR INDEX

Behaviour indexes	Incidence of diarrhoea (%)
0 = bad	16.7 (54)
1 = inappropriate	23.4 (94)
2 = quite good	25.0 (56)
3 = good	29.0 (31)
4 = very good	37.5 (8)
Total	23.5 (243)

Chi-square = 2.88, d.f. = 4, p = 0.58

Notes:

1. The total number of cases did not add up to 271 due to the exclusion of 'not stated'
2. Numbers in brackets are the base numbers for percentages

The giving of colostrum in relation to incidence of diarrhoea is presented in Table 4.3c. The effect of colostrum is to can protect against infectious diseases during early life, therefore the children under 6 months of age were analysed. Of the 24 children in this age group only 5 children were not fed colostrum at all. Among the 19

children who received colostrum, 13 had diarrhoea in the last three months. This is a very high proportion of younger children. The contradictory finding was that among the children who were not fed colostrum at all only 2 out of 5 children had diarrhoea. Nevertheless, because the number of study children is very small it can be said that according to the data there is no difference in incidence of diarrhoea whether the children were fed colostrum or not. Other behaviours which concerned food and water contamination or personal contact may have a great influence on prevention of diarrhoea in young children rather than the protective properties of colostrum.

TABLE 4.3c

RELATIONSHIP BETWEEN COLOSTRUM RECEIVED AND DIARRHOEA AMONG ALL CHILDREN AGED 6 MONTHS OR BELOW

Colostrum first given (days after birth)	Number of children		Total
	diarrhoea	non-diarrhoea	
from first day	4	1	5
from second day	4	1	5
from third day or more	5	4	9
not given at all	2	3	5
Total	15	9	24

4.1.4 Environmental Sanitation

4.1.4.1 Ownership of latrine

Another surprising finding is that no statistically significant correlation could be established between the percentage of households with toilet facilities and the occurrence of diarrhoea. Among the households with toilets about 24 per cent of children were found to have had diarrhoea, whereas in non-toilet households there was a slightly lower proportion (about 22 per cent) of children with diarrhoea (see Table 4.4a). According to the data, the number of toilets in the villages did not in any significant way influence the occurrence of diarrhoea. This, of course, was not without reason. For one, water is not the only carrier of diarrhoea-causing germs; there are a number of other carriers, such as food or contact contamination. More importantly, the mere existence of a number of toilets does not make any impact on the health situation, as long as they are not properly used, and as long as some people continue to dispose of their feces somewhere around the village. It was observed that among the households with toilets, only adults used the toilets; babies and young children seldom or never used them.

TABLE 4.4a

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN IN THE PREVIOUS 3 MONTHS ACCORDING TO HOUSEHOLD ENVIRONMENTAL SANITATION

Variables	Number of children	Incidence of diarrhoea (%) diarrhoea	non-diarrhoea	Total
Ownership of latrine: ns				
Yes	217	23.5	76.5	100.0
No	54	22.2	77.8	100.0
Sources of drinking water: ns				
rain water	115	26.1	73.9	100.0
others #	154	21.1	78.8	100.0
Total	271	23.2	76.8	100.0

Notes:
1. All latrines are water-sealed type
2. ns Association was not statistically significant (P <0.1)
3. # Includes open well and borewell (only 2 households)

The programme to introduce sanitary toilets is a recent integrated health programme especially in the rural areas. Defecation in the bushes or in the fields around the village is normal. Although the villagers have been encouraged to construct their own toilets, various constraints have been faced. Apart from poverty (most of the villagers could not afford to build toilets), awareness of sewage disposal and also cultural beliefs are remaining problems. Even though some households had built toilets, they were not very often used. As water is necessary for cleaning and flushing, lack of water, especially in the dry season, is a problem in most parts of the northeast, including the two villages. These may lead to improper use

of the toilets in the two villages. What should be achieved, therefore, is that all toilets conform with certain sanitary minimum standards, and are used properly and regularly by virtually everybody. Then and only then will an increase in the number of toilets in the community serve to prevent the occurrence of diarrhoeal disease.

4.1.4.2 Sources of Drinking Water

The data in Table 4.4a show the percentage of children with diarrhoea according to the household's source of drinking water. It can be seen that there was a very high percentage of children with diarrhoea whose households had taken rain water for drinking (26 per cent) while only 21 per cent of children had diarrhoea among households using open well water, although the relationship was not significantly different. There are many sources of drinking water in the study sample as described in Chapter Three. Some mothers were taking water straight from the source for drinking while others had treated water to make it safe enough to drink. Therefore, it is possible to see the relationship of the incidence of diarrhoea and source of drinking water and whether people had boiled water or not. It has been hypothesized that the children whose mothers state that they always boil drinking water are less likely to have diarrhoea. The data reveal that the children who drank boiled water had a higher incidence of diarrhoea (42.5 per cent) than those who drank unboiled water (15.4 per cent)(see Table 4.4b).

TABLE 4.4b

INCIDENCE OF DIARRHOEA (PERCENTAGE) AMONG ALL CHILDREN ACCORDING TO SOURCES AND BOILING DRINKING WATER

Sources	Incidence of diarrhoea (%)		Total
	always boil	never boil	
Rain	42.9 (49)	13.6 (66)	26.1 (115)
others #	41.7 (24)	16.3 (123)	20.4 (147)
Total	42.5 (73)	15.4 (189)	22.9 (262)

Notes:
1. # Includes open well and bore well.
2. Numbers in brackets are the base numbers for percentages.
3. The total number did not add up to 271 due to the exclusion of the cases of 'sometimes boiled' (9 cases).

These are contrary to the hypothesis. Can the programme of improving quality of water supply in rural areas help prevent diarrhoeal disease ? Certainly, if the water is properly treated, stored, and served. It had been observed that to feed younger children mothers preferred using a bottle to a spoon or bowl. As we know, it is not easy to clean a bottle, especially for rural mothers who lack knowledge of hygiene care and are surrounded by a poor environment. This may lead to a high risk of contamination of drinking water resulting in a high incidence of diarrhoea among children who drank boiled drinking water. For children who drank unboiled water the risk of exposure to diarrhoea may be less. Barrell et al. (1979:13-14) illustrate that small children do not in general consume large amounts of

water, especially if they are breast-fed, because breast milk is also a source of fluid.

Rain water is considered safer for drinking wherever there is no piped water supply. However, contamination can still easily occur when rain water is stored in a dirty container or tank. The campaign to encourage the drinking of rain water by building a big jar or tank to catch rain water is one of the recent popular projects for preventing diarrhoeal disease in most developing countries. The government of Thailand like most governments in developing countries, has developed a key strategy to improve its population's water supply with activities which have involved the construction of small-scale piped water systems and rain water tanks and jars (Ministry of Public Health, 1988:62-64). The program is not widely implemented. Although the two study villages were among the targets of the project, the incidence of diarrhoea in the households using rain water or other sources was not different.

It was observed that some of the villagers took the water from the top of the container using a bucket or bowl rather than from the tap at the bottom. Because these utensils usually have multipurpose uses in the household and are not exclusively for transferring water, this may lead to contamination of drinking water. Another common practice among the rural people is the use of the same bowl to get water to drink within the family or even

for the neighbours. The villagers may be unaware of the risks.

4.2 The Household Management and care of Children with Diarrhoea

The views on household management or curative behaviours and care of children with diarrhoea were based on a small sample of only 63 mothers whose children had diarrhoea in the three months before the survey. In the case of more than one diarrhoea episode, information only about the last episode was asked for. The data emphasised treatment, utilization of oral rehydration solution, feeding during the episode and hygiene practices.

TABLE 4.5

THE TREATMENT AND MEDICATION OF CHILDREN WITH DIARRHOEA

Treatment	Percentage	
Treatment:		
do nothing	34.9	(22)
modern medicine #	61.9	(39)
modern and medicinal herbs	3.2	(2)
Total	100.0	(63)
ORS started using:		
1st day	19.0	(12)
2nd day after onset	15.9	(10)
3rd day after onset	11.1	(7)
not giving ORS	54.0	(34)
Total	100.0	(63)

Notes:
1. The number of cases are children who had diarrhoea in the previous three months
2. # Including ORS

4.2.1 Treatment

Among 63 children with diarrhoea (see Table 4.5), 22 had not received any treatment and were left to recover by themselves as most of the mothers thought diarrhoea was not severe. Most of the children (41) were treated with some form of medicine (including 29 children who received ORS). Surprisingly, in two cases, the mothers mentioned using medical herbs (guava leaves and pomegranate fruit rind) together with modern medicine. Although respondents were asked about use of traditional medicines and traditional healers (Q. 81-83, Appendix A), no respondents mentioned visiting native doctors and only two said that they used medicinal herbs from their own gardens. In order to administer the herbs, they were grilled, ground then soaked or boiled in water used for drinking. The reasons for such a common practice were the traditional beliefs in herbal efficacy as well as the fact that the preparation was easy at home, as such herbs were available at home or from neighbours. Both of the herbs have an astringent taste, due to the chemical substance (called tannin), the effect of which is to contract the tissue or secretory mechanisms of the body, thereby diminishing discharge (Macquarie Dictionary, 1985:143; Mulholland, 1987:189-191). Therefore the two herbs can help prevent water loss in the case of diarrhoea.

As regards utilization of health resources, a large number of the mothers (22 mothers) whose children were given

medicine brought their children to the nearby health centre; 11 mothers took their children to get treatment from the private clinic in the city; seven of them brought the children to the provincial hospital and a very small number of mothers (5) bought drugs for self-treatment from a drug store or grocery shop. The pattern of health resources utilization is different from the hypothesized curative behaviours in the previous discussion (Chapter Three) which showed the outstanding importance of self-treatment. A national survey in Thailand suggested that there were many factors affected the utilization of health facilities among Thai people; for instance, availability and accessibility of the service outlets had a great effect, as well as seriousness of the illness (Porapakkham, 1982).

4.2.2 Utilization of ORS

ORS is well accepted as an effective means of replacing water and electrolytes as well as nutrients being lost through stools during diarrhoea episodes. It is believed that the correct time to use ORS in order for it to be of the greatest benefit is soon after the onset of diarrhoea. Table 4.5 presents data on the utilization of ORS. The study showed that only a little less than half the children who had diarrhoea (29 out of 63 children) received ORS. Among these, only 12 children were given ORS immediately on the first day of the onset, whereas the rest were given ORS two days or more after the onset.

There were 34 children who never received ORS during the attack of diarrhoea. Regarding the reasons for not giving ORS, 17 of the mothers said the diarrhoea was not serious, five mentioned that the children were too young to have ORS, four believed that all diarrhoea needed no treatment and the rest of the mothers said the children complained about the unpleasant taste.

Results of the analysis of the factors related to the utilization of ORS are shown in Table 4.6. It was found that there were no effects of maternal age, maternal education, maternal occupation, number of living children and annual household income on ORS use. This would indicate that the utilization of ORS in the two villages is generally uniform throughout the population. There was no doubt about the availability of ORS in the two villages as health centres were located in the village and they had supplies of ORS. The use of ORS in children was very low and the above findings also indicate that there were some misconceptions about ORS among the mothers.

TABLE 4.6

SELECTED SOCIOECONOMIC CHARACTERISTICS OF MOTHERS AND ORS UTILIZATION DURING DIARRHOEA EPISODE

Characteristics	Number of mothers	ORS used	
		yes	no
Age of mothers: ns			
< 25 yrs	21	33.3	66.7
25-29 yrs	22	54.5	45.5
30-34 yrs	11	36.4	63.6
35 + yrs	9	66.7	33.3
Years of schooling: ns			
< 5 years	46	52.2	47.8
5 + years	17	29.4	70.6
Occupation of mothers: ns			
agriculture	48	43.8	56.2
non-agriculture #	5	60.0	40.0
housewife	10	50.0	50.0
No. of living children: *			
one child	30	33.3	66.7
two children	20	65.0	35.0
three or more	13	46.2	53.8
Annual household income: ns			
< 10000 B	13	46.2	53.8
10000-19999 B	25	36.0	64.0
20000-49999 B	20	60.0	40.0
50000 or higher	5	40.0	60.0
Total	63	46.0	54.0

Notes:

\# Includes government officials, traders, entrepreneurs and labourers

* Association was statistically significant ($p < 0.1$)

ns Association was not significant different ($p < 0.1$)

4.2.3 Feeding during the Diarrhoea Episode

In regard to feeding practices during the episode of diarrhoea, questions were asked separately about milk and solid foods feeding. Fifty-seven children were still on milk (breastfeeding and bottle feeding); the rest (6 children) had already been weaned. The results showed that almost all mothers (54 out of 57) who maintained breastfeeding during diarrhoea replied that they continued feeding their children, not because they were aware of the adverse effects of diarrhoea on child nutritional status but as common sense that children would be hungry if they fasted. Although breastfeeding was continued, mothers also mentioned that the frequency and the amount of feeding were reduced during the episode, and that some of the children were fussy or refused to have food or were vomiting. Only three mothers immediately stopped breastfeeding, because they believed that milk caused diarrhoea and the babies refused to have it (see Table 4.7). These results tally with a study in rural north India by Bentley (1988:81) which found a very high proportion of mothers (95 per cent) continued breast-feeding their children during diarrhoea episodes.

Table 4.7 also shows the data on solid feeding. It illustrates that mothers were more likely to stop feeding solids than milk, as 11 of them stopped feeding their children any kind of food during the diarrhoea episode, mentioning that the children refused to eat and food could worsen diarrhoea. Among the group which continued feeding, a

shift in a child's diet toward softer foods was preferred. Most of the mothers mentioned that they fed their children rice porridge during the diarrhoea episode. This is considered appropriate action in taking care of children.

TABLE 4.7

CARE OF CHILD WITH DIARRHOEA

Care of children with diarrhoea	Percentage
1. Feeding during episode:	
a) Milk feeding #	
continue feeding	94.7 (54)
withhold feeding	5.3 (3)
b) Food feeding	
continue feeding	82.5 (52)
stop feeding	17.5 (11)
2. Hygiene practice:	
a) Excreta disposal	
latrine	23.8 (15)
on the ground	33.3 (21)
buried	25.4 (16)
river	4.8 (3)
combination	12.7 (8)
b) Hand washing after disposing babies soil	
with water	52.4 (33)
soap or detergent	34.9 (22)
uncertain	9.5 (6)
never	3.2 (2)

Notes:
1. The total number of cases is 63 children with diarrhoea in the previous 3 months
2. # including breast-feeding and formula-feeding there were 6 children who were weaned. Therefore, the number of cases did not add up to 63

4.2.4 Hygiene Practices

Diarrhoeal disease is infectious diseases. Transmission of diarrhoea-causing agents is rather easy since it involves the fecal-oral route. These agents are excreted in the feces

of ill persons and easily spread to other persons to infect or re-infect when personal hygiene and environmental sanitation are deficient. Feces disposal in an inappropriate place, such as on the ground or in a canal, especially, is a source of contamination of foods and surface water and can be spread by flies (WHO, 1980).

In taking care of children with diarrhoea, hand washing after contact with children, especially after disposing of feces, as well as the way in which excreta are disposed of, are thought to help immensely to break the cycle. The data from Table 4.7 show that quite a large number of mothers (21) just threw the child's feces on the ground somewhere around their houses, and some (3 mothers) usually washed out the child's clothes soiled with feces in the river; only 15 mothers disposed of the excreta in the latrine.

After disposing of a child's excreta, 33 mothers always washed their hands with water only, not using any soap or detergent. Both preventive behaviour and curative behaviour for hand washing using soap or detergent in the sample had similar patterns. This may reflect the fact that the mothers believed that diarrhoeal disease was not severe and could not be transmitted and that even if they washed their hands only with water they would be clean enough.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

5.1 Summary and Conclusions

The objectives of the study are to gain insight in to the present state of maternal knowledge and beliefs regarding child diarrhoea, factors affecting the incidence of diarrhoea, consequences of diarrhoea and the household management of diarrhoea by rural mothers. The data base for this study is composed of 271 questionnaires which were answered in two villages in Khonkaen province during January 1988. The major findings are summarized here.

In general, maternal knowledge of the true cause of childhood diarrhoea was very high in both villages. However, self-treatment was preferred, especially for non-severe diarrhoea. Half the mothers thought foods should be withheld from children, and slightly less than half the mothers thought that breastfeeding should be continued during the episode.

Maternal beliefs regarding infantile diarrhoea **(sou)** illustrated a number of major misconceptions: the causes of **sou** were centred around the transmission of diarrhoea to the infant through the mother's milk, as most of the mothers believed that **sou** was caused by babies being breast-fed by

mothers who had eaten taboo foods or who had diarrhoea, or babies being breast-fed hot milk after the mothers had been working in sun. The majority of the mothers believed that children with **sou** needed no treatment.

Breastfeeding was almost universal as 80 per cent of the children were exclusively breast-fed from birth. Half the children were fed colostrum in the first two days after birth. Supplementary foods, especially chewed rice and mashed banana, were introduced earlier than recommended, often within the first week of their life. This may increase the opportunities for exposure to diarrhoea-causing agents. This is true as the data indicated that a higher proportion of children with diarrhoea was found among infants (under one year) than among older age groups.

There was no piped water available in either village. The main sources of drinking water were open wells and rain water (57 per cent and 42 per cent of households respectively). Maternal education showed a strong relationship with the use of rain water for drinking. Eighty per cent of the households owned a latrine (water-sealed type). Most of the non-latrine households defecated on the ground around their houses or the fields. A few shared toilets with their relatives. During the interview period, the cooking areas of 226 households has observed. It was found that half the households had poor storage of clean eating utensils and some left dirty dishes in the kitchen.

Considering hygiene practices of the mothers, most of the mothers usually washed their hands before feeding their children and after defecation. This was not properly done as a large proportion of the mothers used only water. Analysing selected factors, mother's education and annual household income showed positive associations with hand washing. Only 27 per cent of the mothers always boiled drinking water. Only mother's education showed a positive relationship. Half the mothers used soap or detergent to clean their babies' feeding sets. There was no association between the selected socioeconomic factors and the use of soap.

Based on the body weight of the children at the end of the survey period about one-third of the children were normally nourished, 55 per cent were classified as mildly malnourished while the rest were moderately malnourished. None of the children was severely malnourished. The proportion of malnourished children was higher than that reported by the Nutrition Division. Even though the incidence of diarrhoea in the previous three months was higher among the younger age groups, the proportion of malnourished children was less than in older age groups.

The overall diarrhoea incidence during the three month reference period was 79 episodes occurring in 63 children. The episodes lasted on average 2 days, with only 25 per cent of the cases lasting three days or more. The proportions of children with diarrhoea varied inversely with age of the

children, and the relationship was statistically significant ($p < .001$). Sex of the children also showed a significant difference in incidence of diarrhoea; a higher proportion of female children had diarrhoea than of male children. None of the selected socio-demographic factors showed influence on the incidence of diarrhoea.

There was little difference in proportions of children with diarrhoea depending on whether mothers used only water or soap or detergent for washing their hands. Surprisingly, there was a negative relationship between children who drank boiled water and diarrhoea incidence. In regard to the combined effects of preventive behaviours on incidence of diarrhoea, the highest score of preventive behaviours (always boiling drinking water, using soap or detergent to wash hands, and cleaning babies' feeding sets with soap) indicates the highest proportion of children with diarrhoea. It was hypothesized that children who received breast milk during the early days after birth were less likely to have diarrhoea. The analysis was made only among the children under 6 months of age. It was found that there was no difference in incidence of diarrhoea whether the children were given colostrum on the first, second or later days after birth or not given colostrum at all.

Surprisingly, a higher proportion of children with diarrhoea was found among those whose households owned latrines than among non-latrine households. A similar finding was obtained for the source of drinking water,

however, the relationships were not statistically significant.

The majority (65 per cent) of the children with diarrhoea received treatment; the rest were left to recover by themselves. More than half the children did not receive ORS. The main reason for not using ORS was the belief that diarrhoea was not serious, and the children were too young to be fed ORS. The analysis of factors related to ORS use show that there was no influence of the selected socioeconomic factors on the utilization of ORS. In regard to feeding practices during a diarrhoea episode, maintaining feeding during the diarrhoea episode is the appropriate practice and can help prevent malnutrition. Almost all of the mothers continued feeding their children during the episodes. If they withheld feeding, solid foods were found to be more commonly withheld than milk and a shift in the child's diet toward softer foods was evident.

It can be concluded that diarrhoea morbidity among the study children is characterised by 'weanling diarrhoea'. Most of the children with diarrhoea were under one year of age and it was also found that milk supplements were introduced before 3 months. Environmental measures were less effective for the younger age group. Therefore, measures for control of child diarrhoea rely on improving maternal and child health practices, with a strong emphasis on nutrition and care of the children with diarrhoea rather than environmental measures, even though they are considered a

critical necessity in long-term community control. In addition, child diarrhoea needs more specific attention to the implications of individual measures for its control.

5.2 Health Implications.

It is well recognized that with adequate and appropriate health education, the practices of both the individual and the community can be changed. Based on the above information, a substantial effort is needed to educate mothers, and that can be made through: individual talks during home visits and at clinics by health providers, group talks during the mobile clinics and mass education programmes. More emphasis should be placed on nutrition, how to prevent diarrhoea, and, if diarrhoea occurs, how to manage it at once and properly. These goals may not be achieved in a short period of time, therefore an integrated action through the household and public environment should be considered. For example, the provision of a clean water supply in the area of deficient hygiene. Although the study reveals the adverse effects of drinking rain water on the incidence of diarrhoea, this needs further study in order to investigate what factors affect the quality of rain water.

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APPENDIX A

Questionnaire for the Survey on Factors Affecting Incidence of Childhood Diarrhoea, and Its Household Management by Rural Mothers in Khonkaen Province, Thailand

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Name of respondent.....
Household number.....
Name of village.....
Questionnaire number.....

Date of interview.....
Time begun....., finished.....
Name of interviewer.....

Part 1 Socioeconomic status

1. How old were you at your last birth day ?
..... years
2. How many years of schooling did you and your husband ?

	Husband	Wife
1. no school	( )	( )
2 (specify).....years	( )	( )
3. don't know	( )	( )

3. Can you and your husband read, for example, a simple letter ?

	Husband	Wife
1. no	( )	( )
2. yes	( )	( )
3. don't know	( )	( )

4. Can you and your husband write, for example, simple letter ?

	Husband	Wife
1. no	( )	( )
2. yes	( )	( )
3. don't know	( )	( )

5. What is your main occupation ? .....
6. What is the main occupation of your husband? .....

7. An average household income in the past 12 months.
   1. agricultural products =.....B
   2. payment made =.....B
   3. others =.....B
   Total =.....B
8. How many are your household members ? .....persons
9. How many are your living children ?
   ..... boys, ... girls
10. How many are your children ever born in the past 5 years ?
   1.name(youngest)sex...age....(mths) alive/dead
   2.name(intermediate)sex..age.(mths) alive/dead
   3.name(oldest) sex....age....(mths) alive/dead

Part 2 Maternal knowledge and beliefs regarding childhood diarrhoea

2.1 Maternal knowledge about diarrhoeal disease

11. What do you think can cause child diarrhoea ?
   (please specify) (n answer more than one) .....
12. Which route can diarrhoea use to get into child'body ?
   .....
13. What are symptoms of mild child diarrhoea ?
 (can answer more than one)
   (please specify).....
14. What is the first action in taking care of mild diarrhoea ?
   ( ) 1.don't know ( ) 2.do nothing
   ( ) 3.give traditional medicine
   ( ) 4.buy drugs for self treatment
   ( ) 5.temporarily withhold milk and give ORS
   ( ) 6.temporarily withhold food and give ORS
   ( ) 7.give milk and food as normal and ORS
   ( ) 8.consult physician
   ( ) 9.others (specify) .....
15. What are the symptoms of severe child diarrhoea?
   (can answer more than one)
   (please specify).....

16. What is the first action in taking care of severe diarrhoea?
( ) 1.don't know ( ) 2.do nothing
( ) 3.give traditional medicine
( ) 4.buy drugs for self treatment
( ) 5.temporarily withhold milk and food and give ORS
( ) 6.milk and food feed as normal and give ORS
( ) 7.consult physician
( ) 8.others (specify).....

17. When children have diarrhoea is it necessary to withhold milk ?
( ) 1.no why.....
( ) 2.yes why.....
( ) 3.don't know

When children have diarrhoea is it necessary to withhold food ?
( ) 1.no why.....
( ) 2.yes why.....
( ) 3.don't know

(If yes) What should be given during the episode ?
( ) 1.ORS (package) ( ) 2.Chinese tea
( ) 3.rice water ( ) 4.others.....

18. What milk yields the lowest risk of diarrhoea in children ? .....

2.2 Maternal beliefs

Please tell me do you agree or disagree with the following statements	Degree of beliefs		
	agree	disagree	not sure
2.2.1 Beliefs about causes of infant and child diarrhoea			
19. **sou** is a natural phenomenon			
20. every child has **sou**			
21. **sou** is caused by infection			
22. **sou** is accumulated waste product			
23. there is no association between **sou** and **environment**			

24. breastfeeding mothers eating taboo foods causes diarrhoea in children
25. breastfeeding mothers after working in sun cause diarrhoea in children
26. diarrhoeal breastfeeding mothers cause diarrhoea in children
27. child diarrhoea always exists in different stage of child growth and development
28. contaminated environment causes diarrhoea
29. change in certain food causes diarrhoea

2.2.2 Beliefs regarding to severity and care for child diarrhoea

30. infant with frequent **sou** will be chubby and healthy
31. **sou** can be fatal
32. **sou** needs no treatment
33. child with diarrhoea needs no treatment
34. diarrhoeal child can be cured by boiled water only
35. herbal medicine can cure diarrhoea
36. diarrhoeal child should be treated only after 2-3 days
37. diarrhoeal child should be given no food or drink except ORS
38. diarrhoeal child should given food and drink as normal and ORS

Part 3 Feeding and hygienic practices

39. What kind of milk do you or did you ever feed your baby ?

( ) 1. breastmilk only (skip to Q 47)
( ) 2. powdered milk only
( ) 3. sweetened condensed milk only
( ) 4. breastmilk and powdered milk

( ) 5. breastmilk and sweetened condensed milk
( ) 6. powdered and sweetened condensed milk
( ) 7. others (specify).....

40. Please specify your reason for feeding milk other than breastmilk .....

41. Who usually prepares the formula for your baby ?
..... (please specify)

42. Do you usually wash your hands before preparing formula ?
( ) 1.no (skip to Q. 43)
( ) 2.yes ( ) 3.uncertain

(If yes or uncertain) How do you do this ?
( ) 1. with water only
( ) 2. with water and soap or detergent
( ) 3.sometimes with water sometimes with soap

43. How many milk sets have you got ? .....sets

44. What kind of water do you use for mixing the formula ?
..... (please specify)

45. What do you usually do with the bottle
( ) 1.wash immediately
( ) 2.wash only when reuse it
( ) 3.uncertain

46. How do you usually wash the milk sets ?
( ) 1.wash with water only
( ) 2.wash with soap or detergent
( ) 3.wash with water then rinse with hot water
( ) 4.wash until clean then boil
( ) 5. wash until clean then steam

47. Do you usually clean your breast and nipple before breastfeeding ?
( ) 1. no (skip to Q. 48) ( ) 2. yes
( ) 3. uncertain

(If yes or uncertain) How do you do this ?
( ) 1.with water only ( ) 2.with soap
( ) 3.with your cloth
( ) 4.clean with cotton ball soak with warmed water
( ) 5.others.....

48. Was colostrum given ?

( ) 1.no why not.....

( ) 2.yes

If yes, when did you start..... (days after birth)

49. Is your baby on supplementary food ?

( ) 1.not yet why not .....(skip to Q. 57)

( ) 2.yes

( ) 3.have adult food already

50. When was your youngest child given the following foods ?

Type of solids	Age in months												
	<1	1	2	3	4	5	6	7	8	9	10	11	12	>12
1. Fruit:														
orange														
banana														
others.....														
2. Rice and cereal:														
chewed rice														
rice porridge														
steamed rice														
others.....														
3. Animal protein:														
fish														
chicken														
pork														
egg														
others.....														
4. Vegetable:														
gourd plant														
others.....														

51. How do you keep the baby food before serving ?

( ) 1.keep in cupboard

( ) 2.leave with cover ( ) 3. leave without cover

52. If your baby cannot finish the food, how do you keep it ?
( ) 1.throw away ( ) 2.keep in refrigerator
( ) 3.leave in room temperature with cover
( ) 4.leave in room temperature without cover

53. Does your baby have his/her own separate plate, bowl spoon and cup ?
( ) 1.no ( ) 2. yes

54. How do you clean the baby's utensils ?
( ) 1.with water only ( ) 2.with soap/detergent
( ) 3.with hot water ( ) 4.uncertain

55. Do you usually wash your hands before feeding your baby?
( ) 1.never ( ) 2.yes, always
( ) 3.sometimes

(If yes or sometimes) How do you wash them ?
( ) 1.with water only ( ) 2.with soap/detergent
( ) 3.sometimes with water, sometimes with soap

56. How do you feed your baby ?
( ) 1.with spoon ( ) 2.by hand
( ) 3.your baby eat by him/her self by hand
( ) 4.uncertainly

If the baby eats by him/her self, do you wash his/her hands?
( ) 1.never ( ) 2.yes, always
( ) 3.sometimes

(If yes or sometimes) How do you wash them ?
( ) 1.with water only ( ) 2.with soap/detergent
( ) 3.sometimes with water, sometimes with soap

57. What is the baby's drinking water ?

Season	Type of water							
	rain water		open well		river		artesian	
	boil	unboil	boil	unboil	boil	unboil	boil	unboil
Wet								
Dry								

58. If your baby drinks boiled water, how do you usually make hot water cold enough for drinking ?
..... (please specify)

59. Do you have a latrine ?

( ) 1. no ( ) 2. yes

(If not) How do you dispose of your excreta ?

.....(skip to Q. 60)

(If yes) what type of the latrine do you have ?

..... (please specify)

(If yes) Do you always use it ?

( ) 1.no why not .....

( ) 2.yes

( ) 3.sometimes why.....

(If yes) Does your baby always use it ?

( ) 1.no why not.....

( ) 2.yes

( ) 3.sometimes why.....

60. Do you usually wash your hands after defecation ?

( ) 1.never ( ) 2.yes, always

( ) 3.sometimes

(If yes or sometimes) How do you usually wash them ?

( ) 1.with water only ( ) 2. water and soap

( ) 3.sometimes with water, sometimes water and soap

61. For this question, the interviewer observed the kitchen or the place where food is prepared.

( ) 1.animals roam freely in the kitchen

( ) 2.dirty dishes in the kitchen

( ) 3.clean dishes prone to contamination (poor storage)

( ) 4.cooked food left uncovered

62. Do you have any domestic animals ?

( ) 1.no ( ) 2.yes

(If yes) Where is its stall ? ..... (specify)

Part 4 Incidence of Diarrhoea

63. Since October 1987, has your youngest baby had **sou or diarrhoea** ?

( ) 1.no (skip to Q. 86)

( ) 2.yes

(If yes) how many times did your baby have it ?

..... times

64. At the last attack of **sou** or **diarrhoea**
how old was your baby and how long did it last ?
age.....(mths), for .....days

65. For the last attack, did your baby have the
following signs ? (can answer more than one)
..... (specify)

Part 5 Household Management of Diarrhoeal Disease

5.1 Feeding Practices during Diarrhoeal Episode

66. Did you stop feeding baby milk during diarrhoeal episode ?
( ) 1.no
( ) 2.yes why.....

(If milk not given) When did you stop feeding ?
( ) 1.immediately after onset of diarrhoea
( ) 2.after loose stool for..... days

67.Did you feed your baby other food during diarrhoea?
( ) 1.no why ..... (skip to Q. 68)
( ) 2.yes

(If yes) What kind of food did you give to your baby and when did you start feeding ?

Kind of food	Time started (day after onset)
( ) 1.liquid diet i.e. soup, rice water	.....
( ) 2.soft diet i.e. rice porridge	.....
( ) 3.solid diet i.e. steamed rice	.....

5.2 Hygienic Practices During Diarrhoea

68. How did you dispose of your baby's excreta ?
( ) 1.into latrine ( ) 2.into garbage can
( ) 3.into river ( ) 4.on the ground
( ) 5.others.....

69. Did you wash your hands after cleaning up baby's excreta ?
( ) 1.never ( ) 2.yes, always
( ) 3.sometimes

(If yes or sometimes) How did you usually do it ?
( ) 1.with water only
( ) 2.wash with water and soap/detergent
( ) 3. sometimes with water, sometimes with soap

5.3 Rehydration Activities

70. Did you give your baby any oral rehydration solution ?
    ( ) 1.never why.....(skip to Q. 80)
    ( ) 2.yes
71. (If yes) What type of ORS ? ..... (specify)
72. At what time did you start giving ORS or electrolyte solution to your baby ?
    ( ) 1.immediately after onset of diarrhoea
    ( ) 2.after loose stool ..... days
73. Please tell me why you started giving ORS or electrolyte at that time.....
74. Who gave you advice about oral rehydration therapy ?
    ..... (specify)
75. Did you have any problem giving ORS to your baby ?
    ( ) 1.no
    ( ) 2.yes please specify.....
76. How often did you usually feed ORS to your baby ?
    ( ) 1.when the baby was thirsty
    ( ) 2.every time after loose stools
    ( ) 3.uncertain
    ( ) 4.others.....
77. How did you feed ORS to your baby ?
    ( ) 1.with spoon ( ) 2.with glass
    ( ) 3.with bottle ( ) 4.others.....
78. How did you prepare ORS (if home or ORS package was used) ?
    ( ) 1.homemade ORS
        - type of water used for mixing.....
        - ratio of water, salt and sugar.....
    ( ) 2.package ORS
        - type of water used for mixing.....
        - how much water for one package.....
79. How long did you keep the solution ? ..... (specify)

5.4 Treatment and Medical Attention

80. What sort of treatment did your baby receive ?
    ( ) 1.none (skip to Q. 86)
    ( ) 2.modern medicine (skip to Q. 84)
    ( ) 3.traditional medicine

( ) 4.both modern and traditional medicine

81.If your baby was given traditional medicine, what type of medicine did he/she get ?

( ) 1.herb (write down the name).....

( ) 2.others .....

82. Where did you get that medicine ?.....

83. Who gave you an advice about traditional medicine?

..... (specify)

84. Did you take your baby to any health institution ?

( ) 1.no (skip to Q. 86)

( ) 2.yes

If yes, where did you go ?

( ) 1.health centre ( ) 2.district hospital

( ) 3.provincial hospital ( ) 4.private clinic

( ) 5.others.....

85. Was your baby admitted ?

( ) 1.no (skip to Q. 86)

( ) 2.yes

If yes, how long had he/she been staying there ?

..... days

86. Measure weight and height for the youngest baby.

weight..... kgs.

height..... cms.

APPENDIX B

DIARRHOEA PREVALENCE FOR ALL AGE GROUPS BY MONTH IN KHONKAEN, THAILAND, 1986

District	Number of patient												Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Muang	148	186	185	207	199	190	114	84	111	113	83	157	1777
Banphai	84	119	93	144	101	162	166	64	33	32	29	21	1048
Chonabot	28	52	43	93	77	92	73	49	32	35	22	34	630
Munchakhiri	61	161	65	141	55	82	61	29	52	23	19	28	777
Phol	106	78	84	137	103	125	60	29	26	33	24	8	813
Waengnoi	67	49	70	86	51	37	26	15	8	14	11	15	449
Nongsonghong	84	61	51	50	59	92	51	15	16	14	20	25	539
Banfang	21	40	47	14	17	47	42	12	14	22	28	23	327
Nongrua	31	56	71	138	33	42	18	14	8	9	4	8	432
Phuvieng	148	167	150	192	156	143	68	39	36	37	60	42	1238
Chumphae	86	74	55	94	71	101	71	23	22	20	23	23	663
Srichomphu	68	41	57	108	60	29	47	13	5	1	9	5	443
Kranuan	56	84	53	64	67	62	70	62	24	47	62	29	680
Nampong	83	73	31	31	14	97	97	73	41	50	106	74	770
Ubornrat	88	89	60	108	79	118	57	37	33	39	36	27	771
Kaosuankuang	41	28	24	33	8	66	52	45	29	30	14	19	389
Puainoi	16	33	36	42	44	44	30	16	11	16	11	8	307
Phrayun	17	12	30	53	21	36	22	14	10	11	14	19	259
Waengyai	16	12	15	25	11	18	23	7	16	20	15	14	192
Phubaman	16	15	19	34	25	56	27	2	9	10	9	10	232
Total	1265	1430	1239	1794	1251	1639	1175	642	536	576	599	589	12735

Note: Only one reported case died according to diarrhoea

Source: Khonkaen Provincial Health Office Annual Report, 1986 (in Thai)

APPENDIX C1

PERCENTAGE OF MEDIAN VALUE OF WEIGHT-FOR-AGE OF BOYS AGE SIXTY MONTHS AND BELOW USING THAI VERSUS NCHS STANDARD

Age (months)	Weight-for-age (Boys)					
	60 %		75 %		90 %	
	Thai	NCHS	Thai	NCHS	Thai	NCHS
0	1.90	1.98	2.38	2.47	2.85	2.97
1	2.64	2.58	3.26	3.23	3.85	3.87
6	4.34	4.68	5.48	5.85	6.65	7.02
12	5.51	6.12	6.94	7.65	8.27	9.18
18	6.26	6.90	7.90	8.63	9.42	10.35
24	6.95	7.56	8.75	9.45	10.46	11.34
30	7.60	8.22	9.52	10.28	11.40	12.33
36	8.17	8.82	10.22	11.03	12.25	13.23
42	8.68	9.30	10.83	11.63	13.00	13.95
48	9.10	9.90	11.35	12.38	13.66	14.85
54	9.45	10.50	11.80	13.13	14.17	15.75
60	9.75	11.10	12.11	13.88	14.56	16.65

Note:

The NCHS values were calculated from 50th centiles

Sources:

1. Thai standard - Vichaiditha, 1985, Table 1
2. NCHS standard - Primary analysis of NCHS, WHO, 1983 Tables 24 and 25

APPENDIX C2

PERCENTAGE OF MEDIAN VALUE OF WEIGHT-FOR-AGE OF GIRLS AGE SIXTY MONTHS OR BELOW USING THAI VERSUS NCHS STANDARD

Age (months)	Weight-for-age (Girls)					
	60 %		75 %		90 %	
	Thai	NCHS	Thai	NCHS	Thai	NCHS
1	2.42	2.40	3.15	3.00	3.70	3.60
6	4.17	4.32	5.15	5.40	5.97	6.48
12	5.20	5.70	6.41	7.13	7.65	8.55
18	5.89	6.48	7.31	8.10	8.72	9.72
24	6.52	7.14	8.14	8.93	9.75	10.71
30	7.13	7.74	8.91	9.68	10.68	11.61
36	7.70	8.34	9.63	10.43	11.55	12.51
42	8.21	8.94	10.27	11.12	12.32	13.41
48	8.67	9.48	10.87	11.85	13.03	14.22
54	9.12	10.02	11.42	12.53	13.67	15.03
60	9.52	10.50	11.91	13.13	14.28	15.75

Note: The NCHS values were calculated from 50th centiles

Sources:

1. Thai standard - Vichaiditha, 1985, Table 1.
2. NCHS standard - Primary analysis of the NCHS, WHO, 1983, Table 22 and 23

APPENDIX D1

LIST OF SUPPLEMENTARY FOODS CATEGORIES RECOMMENDED FOR THAI INFANTS

Age in months	List of foods
0-2	breast milk only
3	breast milk + crushed ripe banana
4	breast milk + crushed ripe banana + ground rice and egg yolk 1-2 table spoon
5	breast milk + ground rice egg yolk or fish meat 2-4 table spoons + crushed banana or other fruits 3 table spoons + clear soup
6	same as 5 months and breast milk is substituted by other foods for 1 meal
7	same as 6 months and adding crushed pork meat and whole egg
8-10	same as 7 months two meal times are substituted breast milk and can add chicken meat
11-12	start to introduce steamed rice and adult foods, brast milk is substituted by foods three meal times

Source: Family Health Division, 1985, p. 23.

APPENDIX D2

DURATION OF BREAST-MILK SUBSTITUTE BY TYPE OF SUPPLEMENTARY FOOD FOR THAI INFANT

Type of food	Age at solids introduce (month)		
	Early	Proper	Late
Crushed banana	< 3	3-5	> 5
Crushed other fruits and vegetables	< 5	5-6	> 6
Ground rice and egg yolk	< 4	4-6	> 6
Whole egg	< 7	7-8	> 8
Crushed fish meat	< 5	5-6	> 6
Crushed other animal meat	< 7	7-10	> 10
Steamed rice	< 11	11-12	> 12
Adult foods	< 11	11-12	> 12

Source: Derived from Family Health Division, 1985, p. 23.

APPENDIX E

Preventive Health Behavioural Scoring

(a) Hand washing before feeding baby

0 = usually use water or sometimes not washing hand

1 = usually wash by soap or detergent

(b) Hand washing after using the toilets

0 = sometimes did not wash or sometimes washed with water only

1 = always wash with soap or detergent

(c) Cleaning feeding sets

0 = sometimes clean with water or sometimes with soap

1 = always clean with soap or detergent

(d) Boiling drinking water

0 = never or sometimes boiled drinking water

1 = always boiled drinking water

Range of the scores:

0 - 1 = inappropriate health behaviours

2 - 3 = appropriate health behaviours

4 = good behaviours

APPENDIX F1

FEEDING PATTERNS OF THE YOUNGEST CHILD BY SELECTED SOCIOECONOMIC AND DEMOGRAHIC CHARACTERISTICS

Characteristics	Number of children	Feeding patterns (%)		
		breastfed only	breast & bottle	bottlefed only
Age of mothers: ns				
< 25 yrs	91	78.0	4.4	17.6
25-29 yrs	81	82.7	1.2	16.0
30-34 yrs	57	75.4	1.8	22.8
35 + yrs	42	85.7	0.0	14.3
Education of mothers: *				
lower elementary	211	83.4	2.4	14.2
upper elementary	26	76.9	0.0	23.1
secondary or higher	34	61.8	2.9	35.3
Occupation of mothers: *				
agriculture	225	83.6	1.8	14.7
labour	11	54.5	9.1	36.4
housewife	20	75.0	5.0	20.0
others #	15	53.3	0.0	46.7
No. of living children: ns				
one child	137	77.4	2.9	19.7
two children	68	82.4	1.4	16.2
three or more	66	83.3	1.5	15.2
Annual household income: *				
< 10000 B	57	80.7	3.5	15.8
10000-19999 B	98	86.9	0.0	13.2
20000-49999 B	90	78.8	4.4	16.8
50000 or higher	26	57.7	0.0	42.3
Total	271	80.1	2.2	17.7

Notes:

Includes government officials, entrepreneurs and trader
- Statistical test excludes mothers who had mixed-fed and artificially fed their children
* Association was statistically significant ($p < 0.01$)
ns Association was not statistically significant ($p < 0.1$)

APPENDIX F2

SELECTED SOCIOECONOMIC FACTORS OF MOTHERS PRACTISING HAND WASHING BEFORE FEEDING BABIES

Characteristics	Number of mothers	Hand washing # (%)		
		water	soap	uncertain
Age of mothers: ns				
< 25 yrs	85	74.1	16.5	9.4
25-29 yrs	79	64.6	20.3	15.2
30-34 yrs	57	71.9	19.3	8.8
35 + yrs	40	65.0	20.0	15.0
Education of mothers: *				
lower elementary	206	71.8	16.0	12.1
upper elementary	23	73.9	17.4	8.7
secondary or higher	32	50.0	37.5	12.5
Occupation of mothers: ns				
agriculture	218	72.5	16.1	11.5
labour	10	40.0	40.0	20.0
Housewife	20	60.0	25.0	15.0
others $	13	53.8	38.5	7.7
No. of living children: ns				
one child	132	69.7	21.2	9.1
two children	64	75.0	14.1	10.9
three or more	65	63.1	18.5	18.5
Annual household income: ns				
< 10000 B	56	75.0	16.1	8.9
10000-14999 B	57	71.9	15.8	12.3
15000-19999 B	40	70.0	10.0	20.0
20000-29999 B	44	61.4	29.5	9.1
30000-49999 B	40	65.0	20.0	15.0
50000 or higher	24	70.8	25.0	4.2
Total	261	69.3	18.8	11.9

Notes:

\# Excludes 'not stated' and 'not applicable' cases

$ Includes government officials, traders, entrepreneurs

* Association was statistically significant ($p < 0.1$)

ns Association was not statistically significant ($p < 0.1$)

APPENDIX F3

SELECTED SOCIOECONOMIC FACTORS OF MOTHERS PRACTISING HAND WASHING AFTER USING THE TOILET

Characteristics	Number of mothers	Hand washing # (%)		
		water	soap	uncertain
Age of mothers: *				
< 25 yrs	91	49.5	38.5	12.1
25-29 yrs	80	35.0	47.5	17.5
30-34 yrs	57	42.1	45.6	12.3
35 + yrs	41	70.7	22.0	7.3
Education of mothers: **				
lower elementary	209	49.8	35.4	14.8
upper elementary	26	53.8	38.5	7.7
secondary or higher	34	23.5	70.6	5.9
Occupation of mothers: **				
agriculture	223	50.7	36.8	12.6
labour	11	27.3	45.5	27.3
housewife	20	35.0	50.0	15.0
others $	15	20.0	73.3	6.7
No. of living children: ns				
one child	137	47.4	41.6	10.9
two children	66	43.9	40.9	15.2
three or more	66	48.5	36.4	15.2
Annual household income: *				
< 10000 B	56	55.4	33.9	10.7
10000-19999 B	98	50.0	34.7	15.3
20000-49999 B	89	42.7	42.7	14.6
50000 or higher	26	30.8	65.4	3.8
Total	269	46.8	40.1	13.0

Notes:

#	Excludes 'not stated' and 'not applicable' cases
$	Includes government officials, traders, entreprenuers
*	Association was statistically significant ($p < 0.1$)
**	Association was statistically significant ($p < 0.01$)
ns	Association was not statistically significant ($p < 0.1$)

APPENDIX F4

SELECTED SOCIOECONOMIC FACTORS OF MOTHERS FEEDING SET CLEANING PRACTICES

Characteristics	Number of mothers	Cleaning feeding set $ (%)		
		water only @	soap & water	uncertain
Age of mothers: ns				
< 25 yrs	82	44.0	50.0	6.1
25-29 yrs	75	45.3	52.0	2.7
30-34 yrs	54	48.1	50.0	1.9
35 + yrs	40	47.5	50.0	2.5
Education of mothers: ns				
lower elementary	197	43.6	52.3	4.1
upper elementary	22	50.0	50.0	0.0
secondary or higher	32	56.3	40.6	3.1
Occupation of mothers: ns				
agriculture	207	47.8	48.3	3.9
labour	11	9.1	81.8	9.1
housewife	19	47.4	52.6	0.0
others #	14	42.9	57.1	0.0
No. of living children: ns				
one child	127	47.3	48.8	3.9
two children	65	41.6	35.4	3.1
three or more	59	47.5	49.2	3.4
Annual household income: ns				
< 10000 B	53	51.0	45.3	3.8
10000-14999 B	57	40.3	50.9	8.8
15000-19999 B	37	51.3	48.6	0.0
20000-29999 B	39	41.0	53.8	5.1
30000-49999 B	41	48.8	51.2	0.0
50000 or higher	24	41.6	58.3	0.0
Total	251	45.8	50.6	3.6

Notes:

$ Excludes 'not stated' and 'not applicable' cases
@ Includes cold and hot water
# Includes government officials, traders and entreprenuers
& Uncertain means sometimes they cleaned with water sometimes with soap or detergent
- Statistics test excludes the group of uncertain
ns Association was not significant different ($p < 0.1$)

APPENDIX F5

SELECTED SOCIOECONOMIC FACTORS OF MOTHERS PRACTISING BOILED DRINKING WATER

Characteristics	Number of mothers	Boil drinking water (%) always	sometimes	never
Age of mothers: *				
< 25 yrs	91	31.9	2.2	65.9
25-29 yrs	81	28.4	6.2	65.4
30-34 yrs	57	29.8	1.8	68.4
35 + yrs	42	9.5	2.4	88.1
Education of mothers: ***				
lower elementary	211	19.0	3.3	77.7
upper elementary	26	46.2	0.0	53.8
secondary or higher	34	61.8	5.9	32.4
Occupation of mothers: **				
agriculture	225	23.1	2.7	74.2
labour	11	36.4	0.0	63.6
housewife	20	40.0	15.0	45.0
others $	15	60.0	0.0	40.0
No. of living children: *				
one child	137	33.6	3.6	62.8
two children	68	22.1	4.4	73.5
three or more	66	18.2	1.5	80.3
Annual household income: ns				
< 10000 B	57	26.3	1.8	71.9
10000-19999 B	95	23.2	1.7	76.8
20000-49999 B	87	28.7	3.0	71.3
50000 or higher	26	42.3	7.7	50.0
Total	271	26.9	3.3	69.7

Notes:

$ Includes government officials, traders, entreprenuers

\- Statistical test excludes those who sometimes boiled water

* Association was statistically significant ($p < 0.05$)

** Association was statistically significant ($p < 0.01$)

*** Association was significant different ($p < 0.001$)

ns Association was not statistically significant ($P < 0.1$)

APPENDIX F6

SELECTED SOCIOECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF MOTHERS BY SOURCES OF DRINKING WATER

Characteristics	Number of mothers	Type of drinking water (%)	
		rain water	open well $
Age of mothers: ns			
< 25 yrs	91	45.1	54.9
25-29 yrs	81	43.2	56.8
30-34 yrs	57	43.9	56.1
35 + yrs	42	33.3	66.7
Education of mothers: *			
lower elementary	211	38.4	61.6
upper elementary	26	46.2	53.8
secondary or higher	34	64.7	35.3
Occupation of mothers: ns			
agriculture	225	40.9	59.1
labour	11	45.5	54.5
housewife	20	40.0	60.0
others #	15	66.7	33.3
No. of living children: **			
one child	137	48.9	51.1
two children	68	38.2	61.8
three or more	66	33.3	66.7
Annual household income: **			
< 10000 B	57	47.4	52.6
10000-19999 B	98	34.7	65.3
20000-49999 B	90	42.2	57.8
50000 or higher	26	61.5	38.5
Total	271	42.4	57.6

Notes:

$ Includes open well and borewell
# Includes government officials, entreprenuers and traders
* Association was statistically significant ($p < 0.05$)
** Association was statistically significant ($p < 0.1$)
ns Association was not statistically significant ($p < 0.1$)