Application of a healthy food markets guide to two Indonesian markets to reduce transmission of “avian flu”

Gina Samaan, Ferra Hendrawati, Trevor Taylor, Tangguh Pitona, Dini Marmansari, Ratna Rahman, Kamalini Lokuge & Paul M Kelly

Abstract: The World Health Organization (WHO) developed a guideline with 10 control measures to reduce transmission of A(H5N1) avian influenza virus in markets in low-resource settings. The practical aspects of guideline implementation have never been described.

Introduction

Live bird markets have been implicated in the circulation of avian influenza A(H5N1) virus and are a potential source of viral transmission among humans and animals. In 2006 the World Health Organization (WHO) developed a guideline – A guide to healthy food markets – to reduce contamination with and transmission of A(H5N1) virus in live bird markets. The guideline lists 10 control measures for the poultry area of markets, the main aims of which are to improve the environment and ensure safe food-handling practices. The 10 control measures involve education and awareness of how avian influenza is transmitted; monitoring of conditions and food-handling practices; visual inspection of fowl to look for signs of infection; use of personal protective equipment (masks, gloves, disposable aprons, rubber boots, etc.); market zoning to prevent public access to potentially contaminated areas; use of potable water for cleaning and hand-washing; appropriate cage design and holding practices; appropriate cleaning practices; properly designed utilities, such as drainage systems, and batch processing. This study reports on the lessons learnt from implementing the guideline in two live bird markets in Indonesia, a low-resource country with areas where avian influenza A(H5N1) virus infection is endemic in fowl.

Problem and local setting

The site of the study was the city of Makassar (population 1.6 million), where 80 000 birds are slaughtered daily and where avian influenza A(H5N1) virus infection is endemic in birds. Makassar has 22 live bird markets under the purview of the municipal market authority. All of them have dilapidated infrastructure, no health services and an inadequate operational environment. Two markets were selected for this study based on the management teams’ readiness to undergo the interventions. Market A had 186 kiosks, 17 management and sanitation staff, and 5 poultry kiosks that received and slaughtered a daily total of 500 birds; Market B had 247 kiosks, 17 management and sanitation staff, and 13 poultry kiosks that received and slaughtered a daily total of 2700 birds.

Before the intervention, an assessment was conducted to determine the extent to which WHO’s 10 control measures were being practised. The assessment showed that only one of the measures – batch processing – was being followed as recommended in the WHO guideline, which calls for separating poultry batches, cleaning between batches and at the end of the trading day, and having the capacity to trace back poultry through the use of regular suppliers. The other nine control measures were not met. For example, each poultry kiosk held, slaughtered and sold birds without separate zoning for these different processes; drainage, bins, electricity and water supplies were limited; work surfaces, cages and floors were hard to clean; and no regulated inspection or sanitation programmes were in place.

Approach

A municipal-level taskforce was established. It was composed of the finance and operations staff of the municipal market authority, general managers and sanitation teams of the live bird market, and members of the nongovernmental organization (NGO), CHF International, that was funded to implement the

References

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and provided the training. Information was discussed and monitoring protocols and logs were developed during these 18 sessions.

Progress in implementing the intervention was evaluated through a post-intervention inspection, interviews with market managers, sanitation teams and poultry vendor surveys. These activities were conducted by a two-person team composed of one external evaluator (GS) experienced in avian influenza control in live bird markets and one NGO officer responsible for overseeing guideline implementation at both markets. GS developed the necessary evaluation tools based on the WHO guideline and provided one day of training to the NGO officer on questionnaire administration and data collection and recording.

An unannounced one-day inspection was conducted at each market by the team one month after the intervention. The team used a checklist to confirm that the necessary goods had been installed and that the protocols and logs developed were in use. Interviews with market managers and sanitation teams were conducted using semi-structured questionnaires developed with guidance from WHO and field tested locally. The questions explored the presence of any roadblocks to guideline implementation and the adequacy of the change process and the interventions. Answers to each question were summarized and differences in perspectives identified.

Changes in vendor knowledge, attitudes and behaviour before and after the intervention were measured using a field-tested, structured survey instrument containing 38 close-ended questions. The survey was conducted verbally in the local dialect. The NGO officer conducted the pre- and post-intervention surveys among 34 and 29 poultry vendors, respectively (Table 1). These numbers represent all vendors present in the market on the days the interviews were conducted. Changes in vendors’ knowledge, attitudes and behaviours before and after the intervention were analysed using $\chi^2$ or Fisher’s exact tests, as required.

Ethics approval for the study was obtained from the Health Research Ethics Committee at the Indonesian Ministry of Health and from the Australian National University Human Research Ethics Committee.

Findings

Education and awareness

Poultry vendors’ knowledge and attitudes surrounding avian influenza A(H5N1) virus transmission improved after the intervention. Six vendors from both markets continued to slaughter sick chickens and to sell sick or dead chickens (Table 1). They stated that they sold these chickens as feed for fish farms, but no follow-up was conducted to verify this information.

Monitoring

With the aid of municipal agriculture officers, both markets developed disease-
Table 1

<table>
<thead>
<tr>
<th>Market A</th>
<th>32 m</th>
<th>Slaughter area</th>
<th>Cages</th>
<th>XXX</th>
<th>Store</th>
<th>Toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Void</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market B</th>
<th>23.5 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry delivery area</td>
<td>Cages</td>
</tr>
<tr>
<td>Toilets</td>
<td>Void</td>
</tr>
<tr>
<td>Carcass sale area</td>
<td>Void</td>
</tr>
<tr>
<td>to vegetable sale area</td>
<td></td>
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</tbody>
</table>

Note: Pre-intervention layout not shown because each poultry kiosk operated all aspects of the workflow inside the kiosk without zoning.

monitoring protocols. These protocols provided for simple visual inspection of incoming birds, a cost-free intervention. Monitoring logs were filled daily by market managers in both markets and kept in the communal poultry holding zone.

Visual inspection
Posters and protocols for poultry inspection and disease notification were developed and placed in a visible location in the poultry area of each market. More poultry vendors could correctly identify signs of avian influenza A(H5N1) virus infection in birds after the intervention than before it ($P = 0.09$) (Table 1).

Personal protective equipment
Poultry vendors rejected face masks and goggles because they made them feel too hot when worn during poultry slaughter. However, the use of plastic aprons increased after the intervention ($P = 0.001$).

Market zoning
The poultry area was completely reconstructed within a four-month period in both markets. The new structures adhered to zoning and unidirectional workflow, as per the WHO guideline (Fig. 1). Of the 29 poultry vendors surveyed after the intervention, 25 (86%) expressed satisfaction with the changes. The remaining vendors indicated that they had fewer buyers because the area where poultry is sold to the public had been isolated. Eleven vendors (38%) mentioned a dip in sales after the interventions, but seven of these vendors (64%) still felt satisfied with the changes.

Water
In both markets, existing water wells were closed and city water was piped to the poultry areas. Toilets with hand-washing facilities were installed, with easy access for all workers and customers.

Cleaning
Market sanitation teams were provided with high-pressure hoses. Easy to clean stainless-steel work surfaces were installed. Cleaning logs were filled daily by the market sanitation teams. Cleaning practices by poultry vendors improved after the intervention (Table 1).

Utilities
The poultry areas were provided with electricity, and an anaerobic wastewater treatment system that decreases organic matter was installed in them. Composting bins and rubbish bins with lids were provided and placed in visible locations, and drains were covered and sloped. One vendor who was unhappy with the intervention claimed that drainage was slow. On verification, market managers suggested that this vendor was unhappy with his corner location in the sale area as he felt that it was isolated. No other vendor complained about the drainage.

Conclusion
Behavioural change was critical to the adoption of hygienic practices and the implementation of the WHO guideline. Since people tend to resist changes in their work routines, we achieved success in this respect by applying the participatory approach consisting of regular consultations, educational sessions and by making infrastructural changes that facilitated and provided an incentive for behaviour change.

Market managers and the municipal market authority assumed important leadership roles in overseeing adoption of the guideline. All stakeholders recognized the need to regulate market sanitation practices and utilities to maintain consumer interest and sustain live bird markets as points of municipal revenue. This resulted in a commitment by the municipal market authority to use funds already allocated by the local government to provide maintenance and uninterrupted supplies of electricity and water, without additional cost to vendors in the two markets. We believe this commitment will ensure the intervention’s sustainability. It may also provide impetus for the municipal market authority to roll out the intervention in Makassar’s other 20 live bird markets over the next 5 years using municipal funds.
An anaerobic wastewater treatment system and composting reduces the risk of contamination with the A(H5N1) virus and are cheap and easy to maintain.\textsuperscript{12} Composting also enables sanitation staff to supplement their income by turning poultry waste into a marketable commodity. Such economic incentives increase compliance with interventions, especially in low-resource settings.\textsuperscript{13}

The intervention did not result in any increase in kiosk fees, since it was funded through CHF International. Although cost-sharing would have been favourable, initial buy-in from authorities and vendors was limited by the fact that WHO's guideline had never before been applied in Indonesia. Therefore, this experience was treated as a proof-of-concept. Future applications of the guideline in Indonesia should explore other funding models (e.g. public-private co-contributions).

The fact that the two bird markets chosen were because their management teams showed readiness to implement the interventions may have increased the likelihood of success. However, the intervention should yield similar results in other low-resource settings, since the workflow in markets is generic. Furthermore, managers of other live bird markets may be motivated by the lessons learnt from this experience (Box 1).\textsuperscript{6}

Since the WHO guideline prioritizes certain interventions more than others, managers of markets with limited resources may choose to implement the interventions having higher priority.

### Acknowledgements

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### Competing interests

None declared.

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**Box 1. Summary of main lessons learnt**

- The interventions outlined in the World Health Organization’s guide to healthy food markets can be implemented in low-resource settings endemic for avian influenza A(H5N1) virus.
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Résumé

Application d’un guide des marchés d’alimentation saine à deux marchés indonésiens afin de réduire la transmission de la "grippe aviaire"

Problème L’Organisation mondiale de la Santé (OMS) a conçu un guide avec 10 mesures de contrôle permettant de réduire la transmission du virus de la grippe aviaire A(H5N1) sur les marchés à faibles ressources. Les aspects pratiques de l’application du guide n’ont jamais été décrits.

Approche Le guide de l’OMS a été appliqué à deux marchés indonésiens dans la ville de Makassar afin de tenter de réduire la transmission du virus A(H5N1). Le guide a été utilisé à l’aide d’une approche participative pour présenter une combinaison de changements infrastructuraux et comportementaux.

Environnement local La grippe aviaire est endémique chez les oiseaux à Makassar. Deux des 22 marchés à oiseaux délabrés et pauvres de la ville ont été choisis pour l’étude. Avant l’intervention, aucun des deux marchés ne suivait les 10 mesures de contrôle recommandées par l’OMS, à l’exception du traitement des lots.

Changements significatifs Les connaissances des parties prenantes des marchés sur le virus de la grippe aviaire A(H5N1) se sont améliorées après les interventions. Les recommandations du guide de l’OMS en matière d’inspection visuelle, de nettoyage et de pratiques de conservation de la volaille, ainsi que les exigences infrastructuraux pour le zonage et pour les équipements et l’alimentation en eau ont commencé à être conformes au guide de l’OMS. Des solutions nécessitant peu de maintenance, comme l’installation de systèmes de traitement des eaux usées, ainsi que des incitations économiques comme le compostage ont été bien accueillies et s’adaptaient parfaitement au système à faibles ressources.

Leçons tirées Combiner les changements infrastructuraux aux interventions de changements des comportements était essentiel à l’application du guide. Malgré une première résistance au changement comportemental, l’approche participative impliquant des consultations mensuelles et des sessions de formation ont facilité l’adoption d’une hygiène publique et de pratiques de gestion d’une alimentation saine. Les autorités des marchés ont joué un rôle de leader important lors des interventions, ce qui a aidé à modifier les attitudes envers la réglementation et les besoins en maintenance des marchés. Ce changement peut améliorer la durabilité des interventions.

Резюме

Реализация указаний по охране здоровья на продовольственных рынках на двух индонезийских рынках в целях снижения передачи “птичьего гриппа”

Проблема Всемирная организация здравоохранения (ВОЗ) разработала указания, содержащие 10 мер, направленных на снижение передачи вируса птичьего гриппа A(H5N1) на рынках в условиях с ограниченными ресурсами. Практические аспекты реализации инструкций ранее никогда не были описаны.

Подход Указания ВОЗ были реализованы на двух индонезийских рынках в городе Макассар в целях уменьшения передачи вируса A(H5N1). Реализация указаний была осуществлена с использованием активного подхода и была нацелена на совместное внедрение инфраструктурных и поведенческих изменений.

Местные условия Птичий грипп является эндемическим для птиц в Макассаре. Для исследования были выбраны два из 22 ветхих и плохо организованных птичьих рынков. До реализации мероприятий ни один из рынков не выполнял ни одной из 10 рекомендуемых ВОЗ мер контроля, за исключением контроля партий товара.

Осуществленные перемены Осведомленность заинтересованных лиц, участвующих в работе рынка, о птичьем гриппе A(H5N1) после реализации мероприятий улучшилась. Рекомендации ВОЗ, касающиеся визуального осмотра, чистки и содержания птиц, а также инфраструктурные требования к зонированию, водоснабжению и системам коммунального обслуживания стали соответствовать указаниям ВОЗ. Такие решения снизили эксплуатационные расходы, установив систему очистки сточных вод, а также такие экономические стимулы, как, например, компостирование, были хорошо приняты и подходят для условий с ограниченными ресурсами.

Выводы Сочетание инфраструктурных изменений с мерами, направленными на изменение поведения, имеет решающее значение для реализации указаний. Несмотря на первоначальное сопротивление изменению поведения, подход, предполагающий активное участие и включающий ежемесячные консультации и учебные занятия, способствовал принятию практик безопасного обращения с пищевыми продуктами и санитарии. Руководство рынка в течение проведения мероприятий приняло на себя важную направляющую роль, что помогло склонить заинтересованных лиц к усвоению необходимой регуляции и содержания рынка в надлежащем состоянии. Такое изменение отношения может повысить устойчивость результатов от реализации мероприятий.
Resumen

Aplicación de la guía para mercados de alimentos saludables en dos mercados indonesios con el fin de reducir la transmisión de la «grippe aviar»

Situation La Organización Mundial de la Salud (OMS) desarrolló una guía con 10 medidas de control para reducir la transmisión del virus de la gripe aviar A(H5N1) en mercados en entornos con escasez de recursos. Nunca se describieron los aspectos prácticos de la aplicación de dicha guía.

Enfoque La guía de la OMS se aplicó en dos mercados indonesios de la ciudad de Makassar con el fin de intentar reducir la transmisión del virus A (H5N1). La guía se hizo más funcional a través un enfoque participativo para introducir una combinación de cambios tanto en las infraestructuras como en los comportamientos.

Marco regional La gripe aviar es endémica en las aves de Makassar. Para este estudio se eligieron dos de los 22 mercados de aves deteriorados y mal gestionados de la ciudad. Antes de la intervención, ninguno de los dos mercados seguía ninguna de las 10 medidas de control recomendadas por la OMS, exceptuando la de procesamiento en lotes.

Cambios importantes Tras la intervención, se observó una mejora considerable de los conocimientos de los participantes en el mercado sobre el virus de la gripe aviar A (H5N1). Empezaron a aplicarse las recomendaciones de la guía de la OMS en cuanto a inspección visual, limpieza y prácticas de explotación avícola. Del mismo modo, los requisitos infraestructurales de distribución en zonas, suministro de agua y servicios públicos empezaron a adherirse a la guía de la OMS. Las soluciones de bajo mantenimiento como la instalación de sistemas de tratamiento de aguas residuales y los incentivos económicos como el del compostaje fueron bien recibidos y adecuados para este entorno con escasez de recursos.

Lecciones aprendidas La combinación de intervenciones para realizar cambios en las infraestructuras y en el comportamiento resultó fundamental en la puesta en práctica de la guía. A pesar de la resistencia inicial a los cambios de comportamiento, el enfoque participativo con consultas mensuales y sesiones educativas facilitó la adopción de unas prácticas seguras de manipulación de alimentos y de saneamiento. Las autoridades competentes asumieron un importante rol de liderazgo durante las intervenciones, lo que ayudó a cambiar actitudes respecto a las necesidades de regulación y de mantenimiento de los mercados. Este cambio podría potenciar la sostenibilidad de las intervenciones.

References