

Disease Management of Avian Influenza H5N1 in Bangladesh – A Focus on Maintaining Healthy Live Birds

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1. Introduction

Since March 22, 2007 when the Bangladesh Government declared highly pathogenic Avian Influenza H5N1 present, the disease has become a major public health concern throughout Bangladesh. Avian Influenza (AI) affects all poultry, wild and domestic, including poultry at commercial farms, live bird markets, and in backyard farms, putting many people at risk of contracting the disease. Avian Influenza affects both poultry and humans; therefore efforts in managing the disease necessitate a multi-sector approach.

This chapter provides an overview of selected² aspects of H5N1 disease management efforts in Bangladesh, focusing specifically on prevention efforts that decrease the risk involved with live birds transmitting the virus. An analytic model to examine field-level data is used to explore how using behavioral change communication, social mobilization, and the coordination between human and animal health to maintain healthy live-bird facilities can be used to manage H5N1 in Bangladesh. Specifically, this chapter will provide suggestions for continual disease management with a focus on how multi-sector activities, behavioral change communication, logistics management, interventions impacting live birds, and linking research to practice can contribute to successful disease management programs. Current efforts to reduce the prevalence of AI are addressed, as well as gaps in the effort and future steps to reduce the prevalence of H5N1.

2. An overview of AI in Bangladesh

Highly Pathogenic Avian Influenza (HPAI) is an emerging zoonotic infectious disease, which is caused by the H5N1 subtype of the type A strain of the influenza virus (World Health Organization [WHO], 2006a). The virus is found in, and transmitted through, the feces, saliva, and eye and nasal discharge of infected birds (Centers for Disease Control [CDC], 2008). It is transmitted to healthy birds through contact with infected birds or

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² It is important to note that this chapter does not consider an exhaustive list of all possible aspects of disease management for H5N1. For example, this chapter does not explore the clinical management of H5N1 in Bangladesh. As this chapter will demonstrate, the need for clinical management of AI can be decreased, if not completely eliminated, by managing H5N1 in the live birds.

contaminated droppings. Humans contract HPAI through direct contact with infected birds. Symptoms of human infection include conjunctivitis, sore throat, sore muscles, and severe respiratory diseases such as pneumonia. The mortality rate for humans is high, capable of reaching 100 percent mortality in as few as two days (CDC, 2007).

Some of the factors that contribute to spread of HPAI from birds to humans include slaughtering poultry and preparing the meat in the home, direct contact with sick or infected birds, and the consumption of infected poultry. Poultry farmers sell infected birds in an attempt to mitigate their losses from culling (Otte et al.) and backyard farmers may choose to eat a sick bird, rather than waste limited resources. Human infection may also occur through direct contact with the feces of contaminated birds. For example, when children ingest soil contaminated with the feces of infected birds (WHO, 2006a) or poultry droppings and waste are used as fertilizers. Disposal of infected carcasses in bodies of water that are used by domestic purposes, including drinking, laundry, swimming, and bathing places people at risk as well. Infected carcasses are also fed to other animals, such as pigs, which may also increase the risk of human infection (Otte et al.).

While human-to-human transmission of HPAI infection is rare, scientists believe that under the right conditions, the H5N1 virus may mutate into a form transmissible from person-to-person. The World Health Organization believes the H5N1 virus has already met all of the prerequisites for a pandemic, except the ability to spread from human-to-human. Therefore, the WHO has labeled the H5N1 virus as the most likely virus to start the next pandemic and many people believe that it is only a matter of time until an HPAI pandemic occurs (WHO, 2006a). In light of these forecasts and the unique ability of the influenza virus to spread, it is estimated that human-to-human contagious virus could affect all continents within three months (WHO, 2006a).

Since 2007, AI has become a major public health concern throughout Bangladesh, because it affects poultry at commercial farms, live bird markets, and backyard poultry farms throughout the country, which puts many people at risk of exposure to the disease. Avian Influenza affects the health of both poultry and humans, which necessitates a multi-sector approach to manage the health, social, and economic factors of the disease. Stakeholders from all levels of government as well as the private sector need to work together in the areas of animal health, human health, public awareness, public communication, and capacity building.

Animal health issues require the involvement of veterinarians, commercial poultry farmers and stakeholders, and backyard poultry farmers. These individuals are necessary for disease management because they can directly help minimize threat of H5N1 in humans by controlling infections in poultry, strengthening disease prevention and preparedness capability, strengthening surveillance measures and capacity, strengthening disease surveillance and diagnostic capacity, and improving bio-security in poultry production and trade.

In terms of human health, the involvement of the Department of Health is crucial for coordinating and improving the overall response capacity for disease outbreaks. The Departments of Health workers are necessary to implement and support monitoring for disease and progress evaluation of disease management. In addition, it is important to involve private sector physicians and health professionals to monitor disease outbreaks in the human population.

Multi-sector activities should focus on building capacity and infrastructure to support disease management. This includes training individuals associated with poultry production and poultry marketing about Avian Influenza-related issues and relevant prevention

techniques, providing supplies necessary for improving hygiene-related practices, training relevant individuals on communicating with media personnel and other stakeholders, providing adequate compensation following culling operations, and developing programs for monitoring, evaluating, and implementing technical support for projects.

Raising public awareness and increasing communication to the public about Avian Influenza disease management and outbreaks is crucial. Efforts in this vein should focus on improving communication services and methods for information dissemination. This includes developing materials for communication such as websites, printed materials, and audio/video materials. Additionally, it is important to continue developing new communication technologies, such as a web-based SMS gateway, and creating new strategies to disseminate information to target audiences.

Some of the coordination and planning efforts that have been put in place for Avian Influenza disease management include but are not limited to the following:

- the creation, implementation, and revision of the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan
- creating and training response teams
- performing bio-security audits at commercial farms
- improving bio-security measures of live bird markets through cleaning, spraying, training personnel, improving sanitation, and constructing separate slaughter places
- developing and distributing Commercial Farm Bio-security Guidelines
- obtaining funding from international stakeholders for disease management coordination, prevention, and containment, including strengthening disease management capacity and rehabilitation programs for farmers with infected flocks
- obtaining the cooperation and collaboration of relevant organizations and NGOs
- developing communication materials and methods for the distribution of information for preparedness, protection, reporting, response, and policy compliance

These efforts have primarily focused on the importance of maintaining the health and safety of live birds. Thus far, the efforts from the Bangladesh government and development partners have been effective in enabling the country to prevent the Avian Influenza H5N1 from reaching an epidemic proportion in poultry populations and preventing human infection.

3. Animal health approaches

In order to prevent the spread of HPAI (High Pathogenic Avian Influenza) between birds and to human, biosecurity measures need to be maintained at commercial and backyard poultry farms and at live bird markets. In Bangladesh, poultry production occurs in commercial and backyard farms, and distribution occurs at live bird markets, all of which have been greatly impacted by Avian Influenza.

This is the appropriate time to save the poultry industry. The general population is familiar with Avian Influenza, but they are not properly aware of what they should do to protect human and poultry health from infectious diseases. Biosecurity may be one of the most important elements for prevention and control of Avian Influenza.

3.1 Commercial farms

Commercial poultry farms, both layer and broiler, are situated in risky locations and operated under unhygienic conditions. Commercial farms are not maintaining minimum

biosecurity level with many farms lacking a gate, footbath, and delineated farm boundaries. In addition, many farm workers do not know how to maintain biosecurity to protect the poultry and themselves from disease.

Commercial poultry businessmen are concerned about Avian Influenza and facing many challenges. The government decided to destroy infected farms as well as other adjacent farms that were situated within five kilometers of the affected farm. During this time, many quality farms were destroyed and the owners did not receive adequate compensation. The government compensation was 90 taka for each chicken, although one the market price of one chicken is approximately 150 taka. Finally the government revised their decision to only destroy farms situated within one kilometer of an affected farm. For this reason, many small and medium poultry businessmen left the poultry business and they are engaged in different business opportunities, such as garments factory, or no business at all. This means that many former small and medium poultry businessmen are unable to support their families. In addition, many of them obtained a loan from the bank to cover start-up costs and are now unable to pay the loan (USAID/Bangladesh 2010).

Unfortunately, most of the commercial farms are not maintaining minimum biosecurity. The Department of Livestock Services (DLS) provides technical support to the farms, but the support is inadequate. The situation requires a combined effort from multiple stakeholders to improve biosecurity level for commercial farms. Private and public sectors should work together to achieve sustainable health for both human and poultry populations. In this regard, human health workers and animal health workers should work together to combat Avian Influenza or other infectious diseases.

3.2 Backyard farms

In rural areas, 80 to 90 percent of households raise backyard poultry. Poultry meat is a major source of nutrition, and it is an income source for the majority of impoverished women. Generally, the practices used to rear backyard poultry are unhygienic. Many households keep the birds inside the home or bedroom. Chickens and ducks are kept together in one shed, constructed from bamboo or muddy soil. This makes it difficult to clean the shed properly. Many communities are still unaware of Avian Influenza and how the disease can be spread between poultry or from poultry to humans. Large portions of the population lack knowledge regarding biosecurity, poultry, and human health (USAID/Bangladesh 2010).

In addition, backyard poultry farming methods and scavenging (free-ranging) poultry may put commercial poultry at risk, especially given the lack of biosecurity at commercial farms. The backyard and commercial farmers should be aware of this additional risk. Backyard poultry, which have a greater likelihood of coming into contact with wild, infected fowl, should not enter into the commercial farm premises. If backyard poultry enter a commercial farm property, the disease can enter the commercial poultry population and the virus can spread from chicken to chicken.

The national assessment of backyard poultry rearing practices in Bangladesh aimed to describe poultry raising practices over time, specifically as it relates to human-poultry interaction and hygiene practices. It has sought to describe the contribution of poultry production to income and nutrition and describe the epidemiology of poultry illness in terms of incidence, seasonality, clinical signs, outcomes, and pathogens responsible for poultry illness.

Since March 22, 2007, there have been a series of outbreaks of Avian Influenza in Bangladesh, which have resulted in the deaths of a large number of poultry. This has had both a social and

economic impact on the population of Bangladesh. Many backyard poultry and mini-farm holders (100-1,000 birds) are particularly vulnerable. As of October 2010, the government had culled almost 2 million chickens and destroyed almost 26 million eggs.

Although there is a policy to provide compensation for all species of poultry culled and the eggs destroyed, the compensation is not equivalent to what the farmers could have received from healthy birds. Even though compensation rates have increased, the compensation provided to these farmers is not enough money to be able to re-establish themselves in the poultry practice. The main objective of a rehabilitation program for the farmer at the community level is to help restock and repopulate their flocks, bringing them back into the poultry practice. These programs raise awareness about Avian Influenza and biosecurity practices, as well as leads to the mobilization of resources between the public and private sectors.

To implement the rehabilitation program, the Ministry of Fisheries and Livestock (MoFL) developed and approved rehabilitation policy guidelines. District committees and six selected NGOs implemented the program as per the rehabilitation policy guidelines to assist a total of 14,000 backyard poultry holders and 2,240 mini farmers. The NGOs were involved in the assessment of the situation as the policy affected farmers and their families, the submission of a field assessment report to the district committee, assistance in training, procurement, distribution as well as utilization of inputs (new birds, feed, funds for renovations, medical services) as well as supervision, monitoring, follow-up and reporting of the rehabilitation program. The backyard poultry holders received ten fowl of improved variety at the age of 4-5 months, twenty five kilograms of poultry feed, money for renovations or the replacement of a poultry house, medical services like vaccinations and de-worming for one year, and a two-day long awareness and skills development training. Mini farmers received two hundred one-day-old broiler chicks and fifty kilograms of poultry feed (USAID/Bangladesh 2010).

This rehabilitation program has helped restore confidence among the affected community and has helped small entrepreneurs re-enter the poultry trade. The rehabilitation policy is a unique approach to public-partnerships to re-engage community members in poultry rearing, while decreasing the threat of Avian Influenza. The policy is also complimentary to the Avian Influenza containment program, restocking and repopulating with healthy poultry. To make the policy a success in terms of sustainability, improved biosecurity and preventative measures are need, as well as increased awareness and social commitment of the community.

Additionally, backyard poultry holders have been working on identifying risk factors for characterizing the dispersion of Avian Influenza in backyard flocks. This work has included identifying risk factors for the susceptibility of backyard poultry flocks to Avian Influenza H5 virus as well as assessing the dispersion of the virus within 10km of affected farms.

3.3 Live bird markets

Live bird markets are an important consideration in disease management for Avian Influenza because infectious diseases are easily spread from one market to another, exposing many animals and humans to the disease. The live bird markets of Bangladesh are very dirty and unhygienic. Vendors, transporter, slaughterers, processors and even consumers are not aware about spreading of disease and contamination. It might be one of the sources of infectious diseases like avian influenza.

Once a virus develops in one market, it can easily be transported to other markets and farms by way of contaminated equipment, birds, people, and vehicles. In addition to animal infections, many human infections around the world have been traced to live bird markets, including the single human case of Avian Influenza, which was identified in Bangladesh on May 22, 2008. Consequently, there is great need for biosecurity in the live bird markets.

Live bird market surveillance for Avian Influenza in Bangladesh has involved identifying Avian Influenza subtypes and strains that are circulating in domestic waterfowl in live bird markets in Bangladesh, exploring every day practices of poultry rearing, particularly human interactions with poultry, exploring poultry raisers' perceptions and practices regarding sick poultry, and exploring human and poultry interactions in the local poultry markets.

Currently, the biosecurity in live bird markets is low. Slaughterers and poultry processors do not use protective gear such as masks and gloves. Birds are processed and slaughtered in the same place, rather than using the more hygienic process of completing these two processes in separate locations. After processing the birds, the waste (offal, blood, and feathers) are not properly stored and disposed of. Vendors throw the waste from their stalls elsewhere on the market premises. Cleaning crews are not aware of the need to use proper protective gear or the need for spraying and disinfection methods. Additionally, consumers come to the markets without wearing masks or gloves, and are, therefore, exposed to the hazards that result from the unhygienic practices (USAID/Bangladesh 2010).

The United States Agency for International Development's (USAID) Stamping Out Pandemic and Avian Influenza (STOP AI) helps countries prepare for, respond to, and recover from HPAI outbreaks. The project delivers technical assistance and training, and promotes collaboration between animal and human health professionals. STOP AI aims to mobilize public and private sector partners as well as NGOs to implement systematic and sustained behavioral changes that will result in measureable improvements in biosecurity. Stop AI has put forth a framework in which the public animal health system, private sector poultry industry, public health system, civil society, as well as donors and NGOs work together to provide and implement a systematic, commercially-viable Avian Influenza surveillance, biosecurity, and outbreak response program/plan. This framework includes developing public-private partnerships and providing on-demand national level assistance. In developing this framework, STOP AI conducted a baseline market survey in Bangladesh, held stakeholder workshops to share survey data and an action plan, and adopted training materials for ground-level stakeholders such as farmers, veterinarians, and cleaners. Recommendations include renovating, upgrading, cleaning, and disinfecting live bird markets. In order to carry out these activities, capacity building is required to train stakeholders and acquire supplies such as sprayers, pressure washers, detergents, masks, and gloves (USAID/Bangladesh 2010).

Implementing effective biosecurity is not without challenges and requires the combined efforts of stakeholders in both the public and private sectors. One challenge is that differing political views can delay development work. People in the private sector engaged in biosecurity endeavors tend to do so for personal interests, and may not be motivated or willing to make concessions not within their personal interest. Similarly, the poultry industry-related stakeholders want and need to see direct benefits in order to become engaged in practicing biosecurity. The industry stakeholders also need training on how to apply the biosecurity measures.

Another difficulty lies in the cost-sharing of funds; direct spending of cost-share funds without a sub-contract is difficult to manage within municipality regulations. As such, it

is easier to work in a private live bird market than in a public market. In a private market, there are fewer hoops to jump through than in the public sector because it only requires dealing with the owner for making decisions regarding cost-sharing. However, the public sector is needed for developing the necessary infrastructure to sustain effective biosecurity at the live bird markets. Additionally, collecting cost-share money from stakeholders can be difficult because they rely on donors to pay all funds. For the sustainability of the program, it is necessary to have a plan regarding who will pay for live bird market cleaners and disinfection operations. It is also important that enough time be given for training cleaners after the renovations of live bird markets are complete (USAID/Bangladesh 2010).

3.4 Waterfowl

Thus far, the affected domestic poultry seems to be limited to chickens. However, there has been an investigation by the Department of Forestry to determine whether H5N1 is infecting wild waterfowl in Bangladesh. This work has focused on investigating if contact between wild and domestic waterfowl is associated with H5N1 in wild migratory birds as well as determining whether infection with influenza A impairs flight or migration using satellite. This study plans to examine 600 wild waterfowl and shorebirds to be tested by Rapid Test, PCR, and ELISA. Thus far, 34 birds of 11 species have been sampled, and there have not been any reported outbreaks in waterfowl (USAID/Bangladesh 2010).

Prevention efforts examining wild migratory birds is vital to preventing the spread of infection among domestic poultry populations. Migratory birds may transport the disease along migration paths and infect poultry along those routes.

4. Human health approaches

Integrating human health as part of Avian Influenza disease management requires coordination between stakeholders at all levels and involves multiple components. Although the clinical aspects of human health management of Avian Influenza are beyond the scope of this chapter, it is important to note that is an imperative part of disease management. We will address the following 6 components related to human health in this section: planning, surveillance, laboratory work, research, capacity building, and communications.

Planning for both preparedness and response to an outbreak in Bangladesh has involved developing and implementing the National Avian Influenza and Pandemic Influenza Preparedness Plans and Pandemic Contingency Plan by a national multi-sectoral planning team. The goal of the plan is a comprehensive and coordinated response to address H5N1 in domestic poultry and minimize transmission to humans. The plan addresses multiple sectors and works to strengthen capacity among many other aspects of H5N1 prevention.

Surveillance efforts on Avian Influenza have focused on high-risk group surveillance, hospital-based surveillance, population-based surveillance, drug trials, and the previously discussed surveillance at live bird markets. For example, the Avian Influenza Contact Follow-Up Monitoring Committee regularly follows up in affected districts with people exposed to poultry. People involved in culling infected poultry or in close contact (less than 1 meter) with infected poultry were given a single dose of anti-viral tablets for 7 days and followed up for 14 days. People with household contacts (more than 1 meter) and health care worker contact (unprotected) or other contact were followed up for 14 days without

any anti-viral tablets. Follow up was done daily by health care workers to detect influenza-like illness, which was defined as fever, cough and respiratory distress. Suspected cases were reported to the Institute of Epidemiology, Disease Control & Research (IEDCR) and necessary follow-up steps were taken (USAID/Bangladesh 2010).

Other human-health related approaches to managing Avian Influenza include laboratory-based research, such as pharmaceutical development and testing. For example, a drug trial based in Kamalapur has been evaluating the effectiveness of treatment with Oseltamavir on interrupting the transmission of influenza (May 2008- December 2010). Oseltamavir is the generic version of Tamiflu, an anti-viral that slows the spread of the influenza virus between cells.

Hospital-based influenza surveillance has been increasing. In 2007, twelve hospitals participated in surveillance efforts. Six of the 12 hospitals were run by the government, and six were privately-run hospitals. The hospitals were distributed among six divisions in Bangladesh. By 2010, fourteen hospitals distributed in all seven divisions of Bangladesh participated in the influenza surveillance program (USAID/Bangladesh 2010).

Population-based surveillance has involved collecting both epidemiological and biological data. Samples were collected from cullers and poultry workers to examine the seroprevalence of antibodies for H5N1. Additionally, there has been a longitudinal assessment of the effect of influenza on the cognitive development of urban poor children in Bangladesh. For this surveillance, a certain amount of laboratory capacity is necessary to analyze the samples and data. IEDCR has been a WHO-accredited lab since 2007, and IEDCR regularly participates in activities involving H5N1.

It is important to note that Avian Influenza is not easily transmitted to humans. If we were able to prevent and/or manage the disease among the live birds, many of the human-health related aspects of disease management would not be needed. As such, efforts should focus on capacity building, logistics management, and communication for behavior change that will help prevent, manage, or even eradicate Avian Influenza in live birds.

5. Capacity building

Capacity building is crucial for disease management strategies at all levels. If the necessary human resources, infrastructure, and commodity supplies are not in place, behavioral change for Avian Influenza disease management and prevention will not be sustainable, or in some cases even be able to occur.

Community-level capacity building includes training and education for community members and local disease surveillance. Capacity building at live bird markets is one of the most crucial aspects of disease prevention. For capacity building at the live bird market, it is crucial that the management and ground-level workers be trained in and implement bio-security measures. In order for that to happen, there needs to be a supply of hygiene and cleaning commodities, such as soap, clean towels and sprayers, as well as a supply of clean water, which requires government assistance. Thus, the infrastructure and capacity for logistics management, which is discussed later in this chapter, must be built-up.

Similarly, manpower and logistics management of the Veterinary Service need to be further developed to carry out surveillance and respond to outbreaks of Avian Influenza. Additionally, illness surveillance centers and active surveillance measures among high risk groups need to be developed. This will involve training workers and volunteers, as well as increasing community awareness of Avian Influenza.

Another important aspect of disease management is building the capacity for appropriate laboratory and epidemiological work, which includes developing the physical laboratories and training personnel, as well as stocking the laboratories with necessary supplies.

6. Logistics management

In addition to building capacity and infrastructure support for disease management, it is important to take into the account the logistics of implementing the various aspects of disease management. Logistics management considers issues pertinent to implementing disease management strategies such as space and equipment availability, staffing and human resource skills, supplies of relevant commodities, recordkeeping and reporting, and transportation.

In the case of Avian Influenza in Bangladesh, USAID's DELIVER Project has aimed to coordinate plans to "meet the challenges presented by existing and emerging pandemic threats by establishing and operating a secure, reliable global mechanism to store, transport, rapidly deliver, and track in-country distribution of current and future USAID Avian Influenza International Stockpile (AIIS) and outbreak response assets." To achieve these objectives, it has been necessary to work in close partnership with stakeholders from the planning process to implementation, develop a sustainable project design, emphasize the ownership of the stakeholders, gradually phase in the project and stakeholder involvement, and prepare stakeholders to take over by building capacity in private sector to sustain the project (USAID/Bangladesh 2010).

In conjunction with various stakeholders, DELIVER has been able to create a dedicated storage floor in the Department of Livestock Services (DLS), introduce warehousing best practices as well as a uniform logistics recording and reporting system, and design, develop and introduce a digital livestock management system. Additionally, DELIVER has trained personnel on logistics management, computer inventory management, and online reporting. As a result, they have been able ensure proper warehousing, distribution and in-country stock of Avian Influenza commodities (detergent, sprayers, decontamination kits, flu detection kits). Similarly, they have cooperated with Directorate General of Health Services (DGHS) and WHO to ensure proper storage and supply of H1N1 vaccines. Sufficient inventory is kept at a central warehouse and commodities are positioned in proximity to potential outbreak areas. DLS has the ability to respond quickly within a few hours to a reported outbreak in any upazila (district). Additionally, DLS can see the current report and inventory online at any time and use it to make supply decisions (USAID/Bangladesh 2010). DELIVER was able to establish a regular field logistics monitoring system for problem solving, capacity building, and troubleshooting. Sustaining the inventory management and web-based reporting system within DLS is challenging though because DLS is an environment of frequent staff turnover. Another challenge is using the available data in forecasting, procurement, and supply decisions. The goals for the future are all focused on sustaining and continuing to build the capacity to sustain and strengthen these efforts (USAID/Bangladesh 2010).

7. Communication

Communication is a crucial aspect of disease management. It includes all forms of communication from daily media surveillance to the distribution of printed materials aimed at raising awareness of Avian Influenza control measures (e.g. hygiene, cleaning/washing, and waste disposal).

The majority of the communication messages have focused on five target audiences: slaughter at home, restaurants, consumers, truckers, and vendors at live bird markets. Additionally, there have been regular press briefings issued, as well training and orientation sessions for the media personal reporting on Avian Influenza issues. As a result of improved communication, people have better access to accurate information on prevention and treatment of H5N1. People are also better informed on basic bio-security and hygienic preventive measures, where to receive services in the case of an outbreak, and the government policy on H5N1 as it relates to the compensation, bio-security, and rehabilitation plans (USAID/Bangladesh 2010).

In an attempt to improve communication and information access for the public, current communications efforts are looking to establish and implement web-based SMS communications plans. This technology has the potential to be used to update the relevant stakeholders at all levels with information regarding Avian Influenza. This includes everything from the current market price of birds to outbreak alerts to best practices (USAID/Bangladesh 2010).

One example of disease management from a communication-based approach is illustrated through the piloting of an intervention to reduce the risk of transmission of Avian Influenza to humans in rural Bangladesh. This intervention involved developing, modifying and disseminating a set of culturally appropriate messages on slaughtering and handling practices for sick and dead poultry. Once the original communications materials were developed, their acceptability and feasibility in the community was explored and the message was disseminated at five courtyard meetings. Using observation, informal conversation, in-depth interviews, and group discussions to collect data, researchers found that villagers verbally expressed willingness to follow the messages if their poultry have "bird flu." However, in practice, they were unwilling to avoid slaughtering or selling sick poultry as they would lose household income(USAID/Bangladesh 2010).

Research has shown that barriers to practicing AI preventative measures fall into two categories. The largest barrier that prevents the practice of AI preventive measures is the attitudes of the population. While people may express a willingness to follow the practices, in practice, the perceived risk of AI infection in humans is too low to outweigh the immediate cost of losing income from the poultry. In addition, there is little value given to the prevention of AI. In general, the cost of prevention for any poultry farmer is greater in the short term and the benefits are reaped over the long term. This leads to negligence and carelessness towards the practice of AI preventive measures. The second barrier that prevents the practice of AI preventive measures is a lack of awareness. The lack of awareness begins with a failure to initially identify the disease in backyard and semi-commercial farms. Populations also lack awareness about high-risk behaviors that can lead to the contraction of the disease in humans and the prevention measures for the points of contraction. Finally, there is a lack of awareness about AI vaccination for poultry (USAID/Bangladesh 2010).

8. Conclusion

The lessons learned from current and past AI initiatives are invaluable. Stop AI found that backyard farmers and women were the most likely to follow bio-security practices than other groups and men. Other initiatives found that containing the disease is much more challenging than assumed and bio-security of farms should be given the highest priority.

Coordination among donors and agencies is critical and an area that needs to be further strengthened. In addition, prudent communications has the potential to reduce the risk of market collapse due to infection of AI and prevent more cases in both humans and animals. While many lessons have been learned, there are still many gaps that need to be addressed to the problem of AI in Bangladesh. There needs to be a clear understanding of the epidemiology of the H5N1 virus. Research on the development of cheap and easily available quick diagnostic techniques needs to be expanded. In addition, more manpower is needed to improve the logistics of the Veterinary Service to carry out surveillance and respond to outbreaks of AI. Finally, improved coordination between stakeholders and donors is required to adequately address the problem of AI.

The need for clinical management of AI H5N1 may be decreased and possibly eliminated by managing H5N1 in live birds.

To achieve this goal, there are further steps that need to be taken. First a coordination, information, and cooperation model should be developed focused on increasing common understanding to prevent the threat of emerging and re-emerging zoonotic diseases of economic importance in the region. In addition, more emphasis should be placed on "risk" oriented communication rather than "fear" oriented communication. A cost-effective method for diagnosis and response should be developed, as well as increased capacity building. In spite of the challenges, with hard work, transparency, strong coordination, and willingness, focusing efforts on improving and sustaining animal health is a feasible approach for managing AI.

The current public health approach to avian influenza focuses on control and management after an outbreak has already occurred. However it would be possible to utilize resources more strategically by adopting a prevention-centered approach. By preventing an outbreak before it occurs, resources can be directed toward broader improvements in sanitation and hygiene practices that will positively affect not only avian influenza control efforts, but those of many other communicable diseases. In addition, focusing resources on prevention can avert significant morbidity and mortality.

Efforts to support a prevention-centered approach to pandemic avian influenza can be used to strengthen the nation's public health infrastructure, more broadly, which will ultimately result in greater public health and security gains than any reactionary response could possibly hope to. While the necessity has previously been to control and mitigate outbreaks once they have occurred, we are in a strategic position to move towards a more sustainable focus on prevention. It is time to seize the opportunity to get ahead of the threat and to focus resources on stopping outbreaks before they occur.

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The development in our understanding of health management ensures unprecedented possibilities in terms of explaining the causes of diseases and effective treatment. However, increased capabilities create new issues. Both, researchers and clinicians, as well as managers of healthcare units face new challenges: increasing validity and reliability of clinical trials, effectively distributing medical products, managing hospitals and clinics flexibly, and managing treatment processes efficiently. The aim of this book is to present issues relating to health management in a way that would be satisfying for academicians and practitioners. It is designed to be a forum for the experts in the thematic area to exchange viewpoints, and to present health management's state-of-art as a scientific and professional domain.

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