

EFFECTS OF HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1 OUTBREAK IN NEPAL FROM FINANCIAL AND SOCIAL PERSPECTIVES: A CASE STUDY

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ABSTRACT

The outbreaks of highly pathogenic avian influenza (HPAI) H5N1 have serious public health, economic and social implications. After the first two report of HPAI H5N1 outbreak in Nepal in Jhapa in 2009, a third outbreak was reported in Pokhara the following year where more than 11,000 birds were culled to control the disease. However, the financial and social effects of the Pokhara bird flu outbreak were never assessed. The objectives of this study were to evaluate the local financial and social effects of HPAI H5N1 outbreak in Pokhara and to understand farmers and consumers perceptions on bird flu and the control measures implemented by the government. A total of 200 people including poultry farmers, butchers, veterinary drug dealers, feed suppliers, and consumers were interviewed using the semi-structured questionnaire. The result showed that the direct loss of Pokhara bird flu outbreak from the culling of birds was more than 4.5 million Nepali rupees. The small scale commercial and backyard farmers and the butchers were the most affected from this outbreak. A large proportion of the consumers temporarily stopped to consume chicken meat and shifted to other meat sources. Most of the participants in this study had at least heard about the bird flu. The farmers were unhappy by the compensation provided by the government and perceived that the government control efforts were not satisfactory and were provided little assistance for their rehabilitation. In conclusion, there was a momentary local financial and social effect of the Pokhara bird flu outbreak which may not very important from the macroeconomic point of view but is important for the affected small-scale farmers and the butchers. It is recommended that the government review their policy and provide small scale commercial and backyard farmer a compensation that is closer to the market price and promote large-scale poultry farmers to go for insurance.

Keywords: Bio-security, Bird Flu, Economic impacts, Poultry value chain, Small-scale farmers.

INTRODUCTION

Avian influenza (AI) caused by influenza A virus is a disease of wild birds (Alexander, 2000; Stallknecht and Brown, 2007). The AI viruses (AIVs) cause sub-clinical infection in wild birds, but sometimes are responsible for outbreaks leading to massive deaths (Olsen *et al.*, 2006). Occasionally, AIVs cross the species barrier to infect domestic birds, including chicken, ducks, quails, turkeys and pigeons (Alexander, 2001; Swayne and Suarez, 2000). The AIVs have not only infected bird species, but sometimes caused diseases in mammalian species, including tigers (Thanawongnuwech *et al.*, 2005), cats

(Cardona *et al.*, 2009; Songserm *et al.*, 2006), and humans (Maines *et al.*, 2005; Peiris *et al.*, 2004; Peiris *et al.*, 2007). The AIVs can be either a highly pathogenic or low pathogenic based on their ability to cause disease (Lee and Saif, 2009). There are two proteins found on the surface of AIVs namely hemagglutinin (H) and neuraminidase (N) (Alexander, 2000). The Hemagglutinin protein varies from H1 to H9 and the neuraminidase protein range from N1 to N16 (Fouchier *et al.*, 2005). A Highly pathogenic AI (HPAI) is mostly caused by H5 and H7 subtypes though all subtypes in this group are not highly pathogenic (Alexander, 2001). Among the HPAI virus, H5N1 subtype caused the large outbreaks in poultry and sporadic human infections in early decades of 2000 (Alexander, 2007; Gilbert *et al.*, 2006; Songserm *et al.*, 2006; Tiensin *et al.*, 2005; Wan *et al.*, 2008). By February 2016, this HPAI H5N1 virus infection caused 846 human illnesses, out of which 449 people died (WHO, 2016).

In addition to the public health risks, the HPAI H5N1 outbreaks have severe economic and social implications due to high mortalities in commercial poultry and culling of birds by the governments to rapidly contain the disease (FAO, 2016). During the outbreaks of HPAI H5N1 in Southeast Asia from 2004 to 2006, millions of birds were culled by their respective governments to control the spread of the disease (Gilbert *et al.*, 2008; Tiensin *et al.*, 2007). Nearly 64 million birds in Thailand (NaRanong, 2007), 50 million birds in Vietnam (McLeod and Dolberg, 2007), were killed for an early containment of HPAI H5N1 spread. These massive culling of birds has negative macroeconomic effects on the national economy as well as a severe loss to the smallholder poultry farmers (FAO, 2016). The smallholder farmers are particularly vulnerable as their livelihoods are highly dependent on the success of their poultry farming (FAO, 2016). A backyard poultry farmer was estimated to lose nearly US\$14 which is equivalent to more than NRs 1,400 due to dead birds and foregone income in bird flu outbreak in the West Bengal India (Hinrichs, 2008).

In Nepal, the first outbreak of HPAI H5N1 was reported from the eastern region of Nepal in the Mechinagar municipality of Jhapa district in January 2009 (Karki *et al.*, 2014). The second outbreak of HPAI H5N1 was reported from the same district in Saranamati Village Development Committee in February 2009 (OIE, 2016). The Government of Nepal culled the birds within a designated area followed by disinfection as per the provision of the Bird Flu Control Order (BFCO), a legal document of Nepali government for the control and containment of HPAI outbreaks. No additional HPAI H5N1 outbreaks were reported in 2009. In January 2010, an outbreak of HPAI H5N1 was reported from the Pokhara Sub-metropolitan ward number 17 of Kaski district in the western region of Nepal (OIE, 2016). In the Pokhara HPAI H5N1 outbreak, 153 adult ducks died on the farm where the outbreak was first recorded (DLSO Kaski, 2011). More than 11,000 apparently healthy birds from the nearby areas were culled to control the disease (DLSO Kaski, 2011).

Several hundred-small scale commercial and backyard poultry farmers and other actors of poultry value chain such as the butchers, feed producers and veterinary drug entrepreneurs were possibly affected by this bird flu outbreak due to the culling of the poultry and poultry products, and a ban period of 45 days imposed by the government to re-operate their poultry businesses. However, there have been no studies being conducted to estimate

the local financial and social impacts of HPAI H5N1 outbreak that occurred in Pokhara in 2010. Further, the awareness level of the farmers and consumers of Pokhara on bird flu and their perception on the government control efforts were unknown. The objectives of this study were to (i) evaluate the local financial and social effects of HPAI H5N1 outbreak in Pokhara, and (ii) to qualitatively understand farmers and consumers perceptions on bird flu and the control measures implemented by the government.

MATERIALS AND METHODS

Study area and approach

The study area was Pokhara Sub-metropolitan ward number 17 and its vicinity in Kaski district in western Nepal (Fig. 1). Pokhara is one of the largest cities of Nepal and is a well-known tourist hub for both internal and international tourists. There are scores of lakes and natural water bodies in Pokhara making it a perfect habitat for various local and migratory bird species.

This study was conducted during May to June 2011. Qualitative and quantitative approaches were used to collect and analyze the data. Qualitative approaches included a semi-structured questionnaire survey, key informant's interview, and an observation by the researcher. Among the quantitative methods, descriptive statistics were used to analyze the collected information. Secondary data on Kaski demographics were obtained from the published technical reports of the District Livestock Services Offices (DLSO), Kaski. The questionnaires were pretested on 10% of the participants.



Fig. 1: Map of the Kaski district showing study area (indicated by lines). The red star on the map is the outbreak location. Map of Nepal with Kaski is shown in the inset.

Sample size and sampling design

In total, 200 individuals were interviewed using a semi-structured questionnaire. The major participants included in this study were key players in the value chain of poultry production that included local commercial and backyard poultry farmers, butchers, Veterinary drug suppliers, feed suppliers, and consumers. As there are different actors in the value chain of poultry production and consumption, a stratified sampling design was used to select the participants. A total of five strata namely, poultry farmers, butchers, Veterinary drug suppliers, feed suppliers and consumers were chosen. Individual participants within each stratum were selected to represent a wide geographic coverage within the study area and their willingness to participate in the study. The number of people interviewed in each category included 100 poultry farmers, 30 butchers, 10 Veterinary drug suppliers, 10 feed suppliers and 50 consumers. The Veterinary drug and feed suppliers were used as a key informant because of their connections with the farmers from their surrounding areas.

Data analysis

The data obtained from the questionnaires were processed in Microsoft Excel 2007 (Microsoft, Redmond, Washington, USA). Descriptive statistical analyses were performed in the software Epi Info version 3.5.4. (CDC, Atlanta, Georgia, USA).

RESULTS

Demographic information and knowledge on bird flu

Farmers

Most of the farmers (n=100) in this survey were middle-aged persons. More than 60 percent of the farmers were below 40 years of age, and remaining 40 percent were above 40 years of age (minimum 18 years, maximum 68 years). Fifty-seven percent of the respondents were male and 43% were female. More than 95% of the farmers were Hindus followed by Buddhist (4%) and Islam (1%).

In terms of poultry farming, 53% and 47% of the farmers were commercial and backyard poultry farmers respectively. Nearly 70% of the farmers reared only chickens, while about 20% had mixed farming and remaining 10% reared ducks. Ninety-two percent of the farmers had heard about the bird flu disease and the outbreak that occurred in Pokhara. The small fraction of the farmers who had not heard about the bird flu and outbreak in Pokhara were backyard poultry farmers. Eighty-four percent farmers said that poultry was culled from their house during the outbreak. In total, 98% of the farmers responded that they continued to consume poultry and poultry products after the bird flu outbreak. Half of the farmers responded that they improved the bio-security conditions of their farm after the outbreak, and 98% of total farmers respondent that they did not get any support from the government to rehabilitate their poultry business.

Consumers

Among the consumers (n=50), nearly half of the participants were under 30 years of age (minimum 18 years, maximum 65 years). Sixty-two percent of the total consumers

interviewed were females, and 38% of them were male. Ninety percent were Hindu followed by 10% Buddhist.

Out of the total respondents, 96 percent of the consumers had heard about the bird flu disease and the outbreak that occurred in Pokhara. Among the consumers who consume meat (84% of total consumers), 62% of the respondent left to consume poultry meat temporarily after bird flu outbreak in Pokhara while 38% said that they continued to consume the poultry meat after the bird flu outbreak. Eight percent of the consumers responded that they slaughter poultry at their house. Nearly 86% of the respondent cooked poultry meat for 30 minutes or more while 14% cooked for less than 30 minutes. Fifty-five percent of the consumer consumed egg by either boiling, making a pouch, half boiled or frying while 27% only consumed boiled eggs and other 18% only consumed fried eggs. Ninety-four percent of the consumers responded that there were no programs from the government to boost up their confidence for poultry consumption.

Financial losses due to the bird flu outbreak

In Pokhara bird flu outbreak, a total of 153 ducks died in an index farm and an additional 11,128 birds were culled during the stamping out operation to contain the outbreak. Among the total birds culled, 7,606 were broilers, 2,739 were backyard birds, 491 were ducks, 190 were layers, and 102 were other birds (quails and pigeons) (DLSO Kaski, 2011). From our key informant's interview, we found that the general market rate at the time of the outbreak was NRs 300 for a marketable broiler, NRs 500 for layers birds, NRs 1,200 for an adult duck, NRs 500 for backyard adult bird, and around NRs 200 for other birds.

The direct loss associated with the killing and culling of birds would be 153 ducks in index case* NRs 1200 + 7,606 broilers*NRs 300 + 2,739 backyard birds*NRs 500 + 491 ducks* NRs1200 + 190 layers *NRs 500 + 102 other birds * NRs 200= NRs 4,539,500. Though the direct losses farmers suffered were above NRs 4.5 million, Government of Nepal compensated the farmers with only NRs 1.1 million at the rate of NRs 100 per bird for 11,128 birds culled as per the legal provisions of Bird Flu Disease Control Order, 2064 and its amendment 2065. This means that farmers directly lost more than NRs 3.4 million due to the killing and culling of birds.

In addition to the direct losses, there were indirect losses associated with the bird flu outbreak due to the effect in the poultry market. The survey indicated that the demand for poultry and poultry products in our study area decreased by 80% for 2 weeks after bird flu, and took about two months to recover. It was found that a small scale commercial farmer rearing 500 broilers, on an average, lost nearly NRs 10,000 of their income due to the outbreak. This loss was observed mostly among the farmers who marketed their birds within one month of the outbreak. Backyard farmers on an average lost their income by NRs 1,200 to NRs 2,000 for about 1 month. Layers farmers who participated in this survey were minimally affected economically as there was no reduction in the price of eggs and sales were also comparable to pre-outbreak level.

In this survey, butchers (n=30) were affected severely for 2 weeks and partially for about 1 month during which the demand for meat was extremely low. The price of live broiler bird went down from NRs 160 per kg broiler to NRs 100 per kg broiler after the bird flu outbreak. The price of dressed chicken went down from NRs 300 per kg to NRs 190 per kg. Butchers in this study on an average used to earn NRs 10,000 to NRs 50,000 per month before the outbreak. After the outbreak, they lost 80% of their income for first two weeks and gradually recovered within a month.

Feed suppliers and veterinary drug suppliers experienced a short-term direct financial loss but recovered within a month to cover the losses of a previous month. Their sales decreased for about one month but then immediately peaked. During that time period, they took less order from the company or stocked them for some time.

Social effects of the bird flu outbreak

It was difficult to quantify the social effects of bird flu outbreak in Pokhara. However, qualitative observations during the interviews and farms visit indicated that there was some psychological panic going on among some of the farmers and consumers. The government personnel involved in the stamping out operation were wearing the personal protective equipment as per the scientific guideline which is a good practice. This led some of the people to think that this disease is dangerous and was wondering if it is safe to be around the community with a lot of chickens and ducks. Some of the farmers shared the story that their neighbour was treating them differently as they could be potential risks for them to transmit the disease.

DISCUSSION

This study evaluated the local effects of HPAI H5N1 outbreak on the actors of poultry value chain in Pokhara from economic and social perspective. Smallholder poultry farmers and butchers were comparatively most affected, while feed and veterinary drug suppliers were least affected largely due to their resiliency. The direct losses estimated was over 4.5 million Nepali rupees, which may not be a high amount from a macroeconomic perspective, but is important for the affected smallholder farmers.

All the actors of the poultry value chain included in this survey had heard about the bird flu disease and the outbreak that occurred in Pokhara with few exceptions. Less than five percent of the farmers, primarily backyard farmers, had never heard about the bird flu disease. The result is like the findings of other studies conducted in Nepal to assess the awareness level of farmers and other poultry value chain actors about the bird flu disease, specifically Rupandehi (Neupane *et al.*, 2012), Kathmandu (Paudel *et al.*, 2013), Kaski (Poudel, 2013) and Bhaktapur (Manandhar *et al.*, 2014). This indicated that the awareness campaign for HPAI in the future needs to be focused on backyard farmers.

This study indicated that the habit of poultry meat consumption was affected by the bird flu outbreak. Consumers were found to be the most sensitive as 62% of them who used to consume meat left to eat poultry meat, at least temporarily for about a month. They switched to other meat sources such as the goat meat, buffalo meat, and fish. However,

only two percent of the farmers left to consume poultry meat temporarily after the bird flu outbreak. Decrease in the poultry meat consumption during and after the bird flu outbreak was also observed in other countries such as Egypt (Yalcin, 2006) and Vietnam (Figuie and Fournier, 2008). The consumer's practices on meat cooking and egg consumption were found to be safe mostly. About 8% of the consumers were still slaughtering poultry at their home which needs to be discouraged. Enactment of the Slaughter House and Meat Inspection Act, 1999 would be an important step to minimize the risk of exposure of bird flu virus to general consumers. A large proportion of the farmers, consumers and other actors of poultry value chain were unsatisfied with the government compensation scheme and believed that the government did not do enough to support the rehabilitation process.

Smallholder farmers and butchers were most affected financially in Pokhara bird flu outbreak. The government compensated only about one-fourth of the total direct loss and affected farmers lost more than NRs 3.4 million from the government imposed culling of their apparently healthy birds. In addition, smallholder farmers lost about NRs 10,000 on an average during the Pokhara outbreak from the ban imposed on poultry farming for about a month. Butchers, who mainly sold chicken meat, lost nearly 80 percent of their income from the pre-outbreak income of NRs 10,000 to NRs 50,000 per month for the first two weeks of the outbreak and then bounced back to normal business. In Jhapa, NRs. 1,154 million per year were estimated to be lost to entire poultry value chain operating in that district from 2000/01 to 2009/10 (Ghimire *et al.*, 2012). Financial analysis at this scale was not conducted for Pokhara outbreak in this study, which made it difficult to compare it with the loss estimated for Jhapa. As the veterinary and feed suppliers were minimally affected in Pokhara bird flu outbreak, it is estimated that the loss was lower compared to that estimated in Jhapa. The other discrepancy for this difference may be associated with more poultry being culled in Jhapa outbreak and higher cost for stamping out operation as it was the first outbreak of HPAI in Nepal. Nevertheless, the scale of stamping out operation in Nepal was very low compared to Southeast Asian countries, such as Thailand where about 63.8 million birds (NaRanong, 2007), and Vietnam where 50 million birds were culled (McLeod and Dolberg, 2007). This led to much lower macroeconomic impacts in Nepal compared to those countries.

The limitation of this study was that the detailed indirect costs including the costs of stamping out operation were not considered in this study. In addition, the effects of bird flu outbreak in the tourism industry and fast food businesses were also not included. A detailed economic analysis needs to be conducted to unravel the full picture of the impacts of bird flu outbreak in Pokhara.

CONCLUSION

This study highlighted the local financial and social effects of bird flu outbreak in Pokhara in 2010 on the poultry value chain actors. Socially, middle-aged farmers were most affected which corresponds to the population structure in that area. In total, smallholder farmers directly lost more than NRs. 4.5 million due to the culling of apparently healthy birds, out of which only about NRs 1.1 million were compensated by the government. Mainly, the smallholder poultry farmers and butchers selling chicken were the most

affected. The overall effect of bird flu outbreak in Pokhara was very transient and lasted for less than two months. Farmers were highly unsatisfied with the government compensation scheme and perceived that the government did not do enough to support the rehabilitation of the poultry business. A recent study on the cost-benefit analysis of avian influenza control in Nepal indicated the continuation of the control programs or shifting to other approaches such as vaccination would be economically beneficial than doing nothing (Karki *et al.*, 2015). Therefore, the government should keep on continuing the control efforts they are doing during the outbreak time with some modifications to address the farmers concerns. It is recommended that the government increase the compensation rate to the backyard and small-scale farmers, and come up with the rehabilitation programs for the affected poultry chain actors. Enforcement and promotion of a government supported insurance scheme to the commercial poultry farmers might be an alternative for the larger poultry industries to minimize their losses. A public-private partnership approach in surveillance activities and improving bio-security in the poultry farms would be helpful to prevent or reduce the future bird flu outbreaks. Additionally, the government should continue the public awareness programs which might help to reduce the psychological trauma they go through during the bird flu outbreaks.

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