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ARTICLE

Studies of Some Risk Factors for Re-Introduction and Spread of Highly Pathogenic Avian Influenza in Two States of Nigeria

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SUMMARY

Highly pathogenic avian influenza (HPAI) occurred in Nigeria about seven years ago affecting a wide range of avian species and human. HPAI being a major emerging zoonosis and a devastating disease of birds occupies the topmost position in the World Organisation for Animal Health list A poultry diseases. It requires emergency responses to speedily detect and control outbreaks, avoid spread and prevent future reoccurrence. Risk assessment links disease ecology with farmer's attitudes and practices in the agent-host-environment relationship. As an example, a qualitative risk assessment was conducted on poultry farmer-risk practices for the introduction and spread of HPAI in two north eastern States of Nigeria. High risk based poultry management and marketing procedures, inadequate poultry housing were areas of major concern in these states. Future high risk of AI reintroduction and spread still existed, early detection enabling prompt implementation of control strategies where given undue attention. Recent global advances in AI control strategies could only be of value with early outbreak detection. Farmers must change attitudes towards adapting biosecurity measures, improvement in early detection skills would assist preparedness in the efforts to rapidly detect and act against future HPAI outbreak in Nigeria.

Key words: Risk factors, avian influenza, spread, Nigeria

INTRODUCTION

Avian influenza (AI) is primarily a highly contagious fatal disease of birds, but had registered about 60% human case fatality rate (Belak et al., 2009). The disease is almost receiving daily scientific investigations, seeking for ways and means of eradicating or at worse containing the virus (OIE, 2008; Belak et al., 2009). The world appears without borders to disease spread, as such no country is protected against pandemic, and no nation remains safe when all others are at risk of AI incursion (Toure, 2007; NADIS, 2008; OIE, 2008; Belak et al., 2009).

The zoonotic implications and risk of possible antigenic shift and drift that might enable effective disease transmission between humans resulted in a high level of global alert in an attempt to prevent a human influenza pandemic. In recent times however, the existence of risk based agro-livestock practices involving trade in live birds, mixed livestock and bird species farming, and paddy rice-fish-pig-poultry integration are common in response to global population growth, and with increasing levels of poverty and food insecurity (Artois et al., 2009; Van den Berg, 2009). These high risk based agro-livestock practices were found to be responsible for maintenance of avian influenza infection, given that H5N1 HPAI thrives in the presence of water bodies, bird faeces, pig populations, domestic and wild water birds as well as live bird markets (LBMs) (Artois et al., 2009; Van den Berg, 2009).

Lack of accurate risk assessment data and early HPAI detection plan in Nigeria was believed to be responsible for HPAI outbreak to spread uncontrolled (Mabbet, 2006). It is on record that HPAI struck the country in 2006 and 2007. Also foci of outbreaks that did not spread were detected in few northern States in 2008 (Brandenburg, 2008; Tesfai, 2008). In other countries of the world, deficient AI knowledge and unacceptable biosecurity practices assisted outbreaks of HPAI infections in animals other than birds (Thiry et al., 2006). In Northern Nigeria, a unique genotype of avian influenza H5N1 that was different from previously circulating clades was first isolated in a LBM (Fusaro et al., 2009). Live bird markets had played major roles in some sustained outbreaks and resurgence of HPAI in many parts of the world (Utterback, 1984; Stegeman and Bouma, 2004; EFSA, 2005; Van den Berg, 2009).

It is obvious that H5N1 HPAI global status is dynamic, influenced by virus ecology and various regional control strategies, making future AI epizootics rarely predictable (Katz, 2004; Domenech, 2007). This study highlighted the need to continuously evaluate and update Nigerian poultry farmer's attitude and practices. It further suggested for effective on-farm diagnostic aids that will enable reliable surveillance approaches for early action and emergency responses to HPAI in Nigeria.

MATERIALS and METHODS

Study type and area

A crossectional study was carried out in Bauchi and Gombe States of North Eastern Nigeria. Bauchi lies between latitudes 10° 10' to 10° 33' N and longitudes 9° 40' to 10°13' E in the Sudan Savannah (BSADP, 2003). Gombe is located in the same ecological zone, but lies between longitude 10° 45' to 11° 45' N and latitude 11° 15' to 9° 30' E. The people are mainly farmers of both crops and livestock. Bauchi State had outbreaks of HPAI in 2006 and 2007 (NADIS, 2006; Tesfai, 2008). Despite closeness, trade in live birds, free animal and human movements between the two States, to date Gombe State had no record of confirmed outbreak of HPAI (NADIS, 2006; 2009).

Questionnaire design and administration

Structured questionnaires were designed to address basic poultry farm biosecurity measures and farm/household hygienic practices. A total of 170 questionnaires were administered to flock owners in various households, commercial poultry farms and live bird marketers. Transect walk was conducted to observe poultry production/marketing and processing premises in the study areas of the two States.

Table 1: Levels of biosecurity practices in farms in the six LGAs of Bauchi and Gombe States

Biosecurity measures in use	No. of responses	Percentage (%) responses
Fencing	15	9
Traffic control	9	5
Adequate sanitation and disinfection	12	7
Keeping of multi-age birds	137	81
Keeping of mixed bird-species	90	53
Adequate housing provision	69	41
Multiple sources of stock	105	62
Other animals kept with poultry	90	53
Access to LBMs	105	62
Wild bird contact with poultry	90	53

Table 2: Basic AI knowledge, attitude and hygienic practices in poultry farms and households

Attitudes and practices	No. of responses	Percentage (%) responses
Ability to recognize AI infection	2	1.2
Ability to report AI cases	50	20
Dead bird disposal		
Burial	17	10
Incineration/burning	10	6
Left to rotten	120	71
Fed to dogs	23	13
Use of protective clothing	15	9
Use of disinfectants	69	41

Statistical analysis

Simple descriptive statistics (percentage) was used for the analysis of the data generated using statistical package for social sciences (SPSS) version 17.0

RESULTS

In table 1 the following were observed: 81% and 53% of respondents kept multi-age and multi- specie of rural and commercial poultry households and commercial poultry farms respectively. It further showed 53% of rural households had other animal species notably dogs, pigs, goats, sheep and cattle in close proximity to poultry. 62% of rural poultry keepers had multiple sources of birds notably from LBMs, as gift from relatives and friends, and few others from hatcheries as breeding stocks. However hatchery was the sole source of stock for the commercial poultry. 62% of both commercial and rural poultry producers had relationship with the LBMs in terms of live bird trading. Poultry housing in the rural setup was inadequate (41%), and where provided was in very close proximity to

Fig. 1: Mixed species of poultry in a rural weekly live bird market in Gombe State

Fig. 2: Multi-species farm, contaminated surface water and tall tress in Bauchi State

Figure 3: Fish pond and wild bird site in a commercial poultry farm in Gombe

humans. Most commercial poultry farms were not adequately fenced (only 9% were adequately fenced), and no movement restrictions (only 5%) had human traffic control) in and out of the farms.

Sanitary and hygienic conditions of most farms were inadequate (Table 2) because 71% of farms had dead birds thrown away in to open fields or fed to dogs (13%). Only 9% of respondents used protective clothing on-farm, and 41% routinely used disinfectants. 100% mixture of different bird species (domestic, captive and wild birds) in all the LBMs visited was noticed (Fig.1). Domestic poultry in LBMs originated from far and within the states, while wild birds were hunted from far bush lands that their origins were unknown. Mixture of birds and other domestic animal species were also observed in most households and some commercial poultry farms (Fig. 2). Ponds, streams and wet lands were seen in many rural areas and served as major source of drinking water to rural birds and possible humans. Transect walk revealed fish ponds to be common in some established commercial poultry farms (Fig. 3) and wild birds were often attracted to such farms.

DISCUSSIONS

Historically, HPAI first appeared in Southeast Asia and gradually spread to 60 countries of the world, causing significant human mortality and economic losses in the poultry industry. The major concern is the emergence of mutant or variant viruses (after circulating in different susceptible animal-bird species) that could cause sustained human to human transmission (FAO, 2010). Therefore, attitude and practices of circumstances that may lead to the introduction, persistence and spread of HPAI using lessons from previous outbreaks must be looked into with a view to controlling it (Sims and Narrod, 2011).

A total of 81% of the studied farms and households kept multi-age birds. Based on the multi-specie of poultry kept in farms and households observed in this study, it is a known fact that multispecies farms of chickens and waterfowls have played a crucial role in the genesis and reservoir role of current outbreaks of HPAI in many countries of the world (Sims and Narrod, 2011). Areas with multi-species and multi-age flocks kept together have assisted disease transmission and outbreaks were reported to be common (Stubbs, 1965; Shane, 1999).

Aquatic birds for long have been known to be the natural reservoirs of influenza type A in the subclinical enteric form (Webster and Hules, 2004). The H5 and H7 virus subtypes have the tendency to infect terrestrial poultry and mammals to produce new genotypes. In fact, the first HPAI H5NI virus was isolated from a dead goose in China which later affected poultry and humans (Xu et al., 1999). In the recent past, water fowls sharing environment with other poultry species especially in LBMs or managed extensively with poor biosecurity in the presence of water bodies presented a high risk of HPAI H5N1 spread and maintenance in nature (Sims and Narrod, 2011).

Improperly constructed commercial poultry houses and free ranging rural poultry was could have direct contact with wild birds. It is well known that wild birds are capable of carrying a variety of diseases and parasites, consequently leading to disease transmission.

The observation those other animals (sheep, goat, cattle, and pigs) and other poultry species (ducks, turkeys, geese, quails and pigeons) kept in close proximity to rural and commercial poultry have some implications. Susceptible animal species could get infected with different AI virus subtypes (especially pigs) which could serve as mixing vessels to enable genetic exchange between different influenza subtypes. This has been predicted to consequently produce new mutant viruses that it modes of transmission may not be easily known (Karl et al., 2003).

Access to LBMs directly or indirectly have been a major challenge to veterinary authorities in most developing countries as their role in the maintenance and spread of avian influenza has long been appreciated. Ducks especially are natural reservoirs AI virus and could pass it undetected on to live poultry in such LBMs or enable transborder transfer especially during long distance trade of mix poultry species (Xu et al., 1999; Li et al., 2003). In fact, LBMs have been tagged avenues where viruses tend to travel to and spread out into new areas that had not been previously exposed (Tesfai, 2008). In the recent past, a distinct genotype of avian influenza H5N1 virus that never before occurred in Africa was isolated in a duck in a LBM in Gombe Nigeria (Fusaro et al., 2009). Multispecies of birds in LBMs provide opportunities for cross species infection (Sims and Narrod, 2011).

Introduction of AI viruses into poultry flocks have been suggested to usually originate from wild waterfowl or LBMs that are infected with low pathogenic avian influenza virus, which may later mutate to a highly pathogenic type (Stageman and Bouma, 2004).

Leaving dead birds to rot in the field implies that carcases remain a source of infection to pen mates and other poultry on the same or other farms. More recently, HPAI H5N1 virus has been identified as a canine pathogen (Thiry et al., 2006), therefore feeding dead birds to dogs is an unacceptable practice. Deep burial, composting or burning in incinerators of dead or infected depopulated birds, infected poultry litter and contaminated wastes at the infected sites are the recommended approaches to safe disposal (FAO, 2006).

It is sad to note that very low level of hygienic and sanitary practices were put in to operation in farms and households of the study areas despite 2006 HPAI outbreak in

Nigeria, and equally to note that traffic control in to poultry farms are highly neglected. In fact there was complete breach of biosecurity measures in most farms and households visited. This means high risk of disease transmission and spread to and within flocks. Improved biosecurity and disease awareness have been reported to reduce losses and further limited dissemination of AI among farms and within integrations (Shane, 1999).

From the risk factor determination point of view, it has been shown that the mode of entry and spread of HPAI could be sum up to include live poultry, poultry products, vehicles, objects, materials (including feed and water) use on farms or in the markets contaminated with virus, people (with contaminated hands, clothing or foot wear), wild birds and trade in other types of birds (Sims and Narrod, 2011). It is notable but surprising, that the transmission and spread risks are considerably high with a lot of uncertainties; this may be a factor of limited understanding of the underlying ecology of HPAI by most farmers.

CONCLUSION

The purpose of risk assessment is to inform policy makers in an objective manner about key factors important for the occurrence of outbreaks, and outputs of risk analysis provide important factors to be considered in the development of risk management strategies.

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