Risk Factors Associated with Highly Pathogenic Avian Influenza in the Household Sector in Egypt

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Abstract

Influenza epidemics are a major health concern worldwide. Highly pathogenic avian influenza (HPAI) H5N1 viruses in Egypt have been subjected to rapid genetic and antigenic changes since the first outbreak in February 2006 and have been endemic in poultry in Egypt since 2008. The aim of this study was to assess the most prominent risk factors affecting highly pathogenic avian influenza in the household sector in Egypt. For this purpose 80 villages were selected randomly from different Egyptian districts according to the presence of rumors, high density and high morbidity and mortality rate in different poultry species to collect samples for viral detection for this study. In addition, a questionnaire about the hypothesized risk factors was constructed.

The final multivariate logistic regression model showed, a significant association between source of chicken (p<0.05), season (p<0.05), presence of nursery farms (p<0.05), husbandry system (p<0.05), carrying out individual interview for data collection (p<0.05) and respond ability of governmental organizations in data collection (p<0.05).

According to our knowledge, this is the first paper to discuss the risk factors associated with highly pathogenic avian influenza in household sector in Egypt.

Keywords: Egypt; Avian influenza; Risk factors; Household

Introduction

In Egypt, household poultry keeping has been a livelihood strategy since ancient times. Aviculture has been critical for the poor, and represents a cash-income for maintaining the household economy and an important source for animal protein for household keepers. Before the occurrence of HPAI outbreak in Egypt in 2006, poultry diseases weren’t a governmental priority so reporting unusual events among birds were scarce [1].

Avian flu, caused by the influenza virus Type ‘A’, can affect several species of birds (chickens, turkeys, ducks, guinea fowl, etc.), as well as pet birds and wild birds with some strains resulting in high mortality rates. The virus has also been isolated from mammalian species including humans, rats and mice, weasels and ferrets, pigs, cats, tigers and dogs [2]. The Asian origin highly pathogenic H5N1 strain of the avian influenza virus has attracted much attention over the last few years because of significant outbreaks globally in domestic and wild birds. Concern is raised because of the degree of virulence not only in domestic poultry but also in wild birds as well as the ability to infect mammalian species. While AI viruses are species specific, the highly pathogenic H5N1 AI virus has also infected humans [3].

The H5N1 HPAI global disease situation is now relatively stable, but still alarming in some countries where the disease is considered entrenched. In these locations, pockets of infections are closely associated to well-known risk factors, such as high human and chicken densities, large free-grazing duck populations, poor biosecurity in smallholder units and culturally-determined food market habits linked to poultry hygiene.

In 2007, the usage of spatial cluster analysis revealed the presence of more specific risk factors supporting the spread of infections either in birds or to human in selected geographical clusters, such as the higher percentage of surface water which would support higher densities of domestic and wild water birds compared with other adjacent regions [3].

Materials and Methods

Sampling procedure

The sampling of the live birds was carried out from August 2010 to November 2012. About 80 Villages were selected to carry out the study according to presence of rumors, high density, risk factors, high mortality in different poultry species indicating the presence of HPAI (H5N1) positive cases. Different types of samples were collected for different purposes; blood samples from chickens and ducks were collected for serological tests; tracheal and cloacal swabs were collected for detection of AI virus using real time PCR; and the same samples were used for virus isolation.

By approaching the village early in the morning, the teams observed the village for any diseased birds showing any clinical signs, such as respiratory and nervous symptoms, cyanosis in comb and wattles, and diarrhea. The presence of any of these signs was used to select the bird for sampling. In case there were no diseased birds, healthy birds representing the different categories of age, species and sources were selected randomly.

Sampling preparation took place at Gamasah Regional Laboratory and then samples were transported to the National Laboratory in Cairo for further analysis.

Laboratory procedures for different purposes

The procedure for pooling of individual samples for AI detection

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Received April 23, 2013; Accepted June 15, 2013; Published June 17, 2013
Citation: Abou El-Amaiem WE, Abd El-Kareem LM, Awad SA (2013) Risk Factors Associated with Highly Pathogenic Avian Influenza in the Household Sector in Egypt. Poult Fish Wildl Sci 1: 107. doi:10.4172/2375-446X.1000107
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using QRT-PCR was as follows: Cloacal and tracheal swabs were pooled separately and the examined pools were a mix of both. his was done centrally in NLQP (National Laboratory for Quality Control on Poultry Production, Cairo) with samples from five birds together in one pool, according to the following criteria:

Species (chicken pools were separated from the duck pools)

Health status, (diseased birds were pooled separately)

**Procedure for real time PCR for detection of AI**

The method employed was according to Veterinary Laboratories Agency (VLA), using a one-step real time PCR kit; primers and probes were designed according to VLA sequences and the test was conducted with a Stratagene MX3005P real time PCR machine.

**Procedure for antibody detection of avian influenza by using ELISA test**

Detection of AI antibody by using commercial kits (Biocheck, Netherlands) for chicken sera and (ID VET, France) for duck sera.

**Haemagglutination inhibition (HI) test**

Detection of avian influenza antibodies was done according to the 2005 Protocol of the World Organization for Animal Health (OIE).

**Composition of the field teams**

Field teams surveying each village were composed of two members from General Organization of Veterinary Services (GOVS). They were responsible for interviewing peoples, collecting data and sampling of (tracheal, cloacal, blood samples and internal organs) in rapid field test positive cases according to the method described by OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 2.1.14.

**Gathering and analysis of the questionnaires from the villages**

The questionnaires used contained qualitative and quantitative information on the villages, i.e. location, size of the village, species kept, husbandry system, common diseases, time line and seasonal calendar for occurrence of HPAI out breaks. After collecting data, it will be entered into excel sheet and analyzed by using SPSS (statistical software program, version 15, USA).

**Results**

Table 1 shows the Classification and levels of risk factors suggested to affect prevalence of highly pathogenic avian influenza in Egypt, where as Tables 2 and 3 show the distribution range and final multivariate logistic regression model for risk factors associated with highly pathogenic avian influenza respectively.

**Discussion**

Influenza A (H5N1) is a highly pathogenic avian disease which could cause death to birds where Egypt was affected in 2006 [4].

Respond ability of Governmental organizations (GO) in data collection has a serious role in combating infectious diseases through: (1) Sharing information in an open, timely and transparent manner, (2) Adopt an integrated and comprehensive approach that incorporates animal and public health aspects in managing avian influenza outbreaks and influenza pandemics, (3) Ensure coordination on all aspects of emergency management for an avian influenza outbreak or a human influenza pandemic, by building on existing mechanisms of cooperation and strengthening these mechanisms as required [5].
| Variable                                                                 | Positive cases | Normal         |
|-------------------------------------------------------------------------|----------------|----------------|
|                                                                         | Number (20)    | %              | Number(60)    | %              |
| Number of visits to each village to collect data                        |                |                |
| 1                                                                       | 0              | 0              | 39            | 65             |
| 2                                                                       | 0              | 0              | 16            | 26.66          |
| 3                                                                       | 20             | 100            | 5             | 8.334          |
| Rapid field test                                                        |                |                |
| 0                                                                       | 0              | 0              | 26            | 43.333         |
| 1                                                                       | 20             | 100            | 34            | 56.667         |
| Respond ability of non governmental organizations in data collection    |                |                |
| 0                                                                       | 0              | 0              | 0             | 0              |
| 1                                                                       | 20             | 100            | 0             | 0              |
| Respond ability of governmental organizations in data collection        |                |                |
| 0                                                                       | 5              | 25             | 33            | 55             |
| 1                                                                       | 15             | 75             | 27            | 45             |
| Number of interviews in each visit                                      |                |                |
| 1                                                                       | 6              | 30             | 7             | 11.67          |
| 2                                                                       | 14             | 70             | 1             | 53             |
| 3                                                                       | 1              | 20             | 60            | 68.33          |
| Presence of key informants                                              |                |                |
| 0                                                                       | 0              | 0              | 21            | 35             |
| 1                                                                       | 20             | 100            | 39            | 65             |
| Carrying out individual interviews for data collection                  |                |                |
| 0                                                                       | 4              | 20             | 0             | 0              |
| 1                                                                       | 16             | 80             | 60            | 100            |
| Carrying out group interviews for data collection                       |                |                |
| 0                                                                       | 0              | 0              | 0             | 0              |
| 1                                                                       | 20             | 100            | 0             | 0              |
| Presence of rumors                                                      |                |                |
| 0                                                                       | 0              | 0              | 0             | 0              |
| 1                                                                       | 20             | 100            | 0             | 0              |
| Presence of farms in the vicinity of villages                           |                |                |
| 0                                                                       | 0              | 0              | 0             | 0              |
| 1                                                                       | 20             | 100            | 0             | 0              |
| Presence of intensive duck breeding                                     |                |                |
| 0                                                                       | 4              | 20             | 10            | 17.67          |
| 1                                                                       | 16             | 80             | 50            | 83.33          |
| Presence of intensive geese breeding                                    |                |                |
| 0                                                                       | 17             | 85             | 51            | 85             |
| 1                                                                       | 3              | 15             | 9             | 15             |
| Husbandry system                                                        |                |                |
| 1                                                                       | 1              | 5              | 13            | 21.667         |
| 2                                                                       | 1              | 5              | 26            | 43.333         |
| 3                                                                       | 9              | 45             | 18            | 30             |
| 4                                                                       | 9              | 45             | 5             | 3              |
| Presence of nursery farms                                               |                |                |
| 0                                                                       | 12             | 60             | 7             | 11.667         |
| 1                                                                       | 8              | 40             | 53            | 88.333         |
| Season                                                                  |                |                |
| 1                                                                       | 17             | 85             | 12            | 20             |
| 2                                                                       | 1              | 5              | 17            | 28.333         |
| 3                                                                       | 1              | 5              | 24            | 40             |
| 4                                                                       | 1              | 5              | 7             | 11.666         |
| Restocking season for chickens                                          |                |                |
| 1                                                                       | 0              | 0              | 27            | 45             |
| 2                                                                       | 0              | 0              | 6             | 10             |
| 3                                                                       | 14             | 70             | 27            | 45             |
| 4                                                                       | 6              | 30             | 0             | 0              |
Unregistered, unlicensed nursery farms in Egypt are considered as a reservoir for HPAI infection due to poor biosecurity. So, strict biosecurity is required to prevent dissemination of the infection from certain nursery to another [7].

After 25th January Egyptian evolution, there were a significant shortage of energy sources required by poultry farms to; (1) achieve the optimal temperature required by the chick in winter (2) to enhance the work of ventilators. This shortage let the chick in the worst environmental conditions that enhanced the appearance of many disease conditions such as infectious bronchitis (IB), mycoplasmosis

| Source of chicken | 0 | 0 | 21 | 35 |
|------------------|---|---|----|----|
| Source of ducks  | 0 | 0 | 0  | 0  |
| Education level of householders | 0 | 0 | 3  | 5  |
| Presence of disposal areas | 0 | 0 | 0  | 0  |
| Presence of live bird markets | 0 | 0 | 0  | 25 |
| Presence of Migratory birds | 0 | 0 | 0  | 0  |
| Presence of water and drainage canals | 0 | 0 | 0  | 0  |
| Co-changing of ducks for mating | 0 | 0 | 0  | 0  |
| usage of live birds as gifts | 0 | 0 | 0  | 0  |
| Vaccination | 0 | 0 | 0  | 20 |
| Mixing between different species | 0 | 0 | 0  | 16 |
| Authority notification of expected cases | 0 | 0 | 0  | 16 |
| Hygienic disposal of infected birds | 0 | 0 | 0  | 4  |
| Biosecurity | 0 | 0 | 0  | 5  |

| Table 2: Distribution of risk factors associated with highly pathogenic avian influenza and normal cases |
|---|---|---|---|---|
| Source of chicken | 0 | 0 | 21 | 35 |
| Source of ducks  | 0 | 0 | 0  | 0  |
| Education level of householders | 0 | 4 | 20 | 16 |
| Presence of disposal areas | 0 | 0 | 0  | 0  |
| Presence of live bird markets | 0 | 0 | 0  | 25 |
| Presence of Migratory birds | 0 | 0 | 0  | 0  |
| Presence of water and drainage canals | 0 | 0 | 0  | 0  |
| Co-changing of ducks for mating | 0 | 0 | 0  | 0  |
| usage of live birds as gifts | 0 | 0 | 0  | 0  |
| Vaccination | 0 | 0 | 0  | 0  |
| Mixing between different species | 0 | 0 | 0  | 0  |
| Authority notification of expected cases | 0 | 0 | 0  | 0  |
| Hygienic disposal of infected birds | 0 | 0 | 0  | 0  |
| Biosecurity | 0 | 0 | 0  | 0  |
and HPAI moreover, many people prefer to purchase baby chicks in winter season due to their adequate growth rate [8].

Hatcheries distribute many live birds either directly or through peddlers. When they hatch, these chicks are not infected with HPAI but may become infected between hatching and distribution if the virus is being brought to the hatchery through contaminated products or maintained if other birds are present. Disposable cardboard trays should only be used once but this is not always the case. Plastic egg trays are designed to protect eggs but their structure makes cleaning and subsequent disinfection very difficult. This is equally true of the trolleys on which the flats are usually stacked [7].

**Conclusion**

From the previous mentioned results we conclude that there were main six factors initiating the occurrence of HPAI (H5N1) in the household sector in Egypt which include source of chicken, season, presence of nursery farms, husbandry system, carrying out individual interview for data collection and respond ability of governmental organizations in data collection. Further investigations should be carried out to study other risk factors affecting the occurrence of HPAI (H5N1) in the household sector in Egypt.

**References**

1. FAO (2009) Highly pathogenic avian influenza: a rapid assessment of its socio-economic impact on vulnerable households in Egypt, ArHBL- promoting strategies for prevention and control of HPAI.
2. Fernandez P, White W (2011) Atlas of Transboundary animal diseases, Animales Transfronterizas.
3. FAO (2010) Risk factors of highly pathogenic avian influenza out breaks in domestic poultry, Situation update: 69
4. Kaoud HA (2008) Eco-epidemiological impacts of HPAI on avian and human health in Egypt. International journal of poultry science 7: 72-76.
5. (2005) U.S. National Strategy for Pandemic Influenza.
6. Onwuegbuzie AJ, Leech NL, Collins KMT (2010) Innovative data collection strategies, qualitative research 15: 696-726.
7. FAO (2008) Biosecurity for highly pathogenic avian influenza. Electronic publishing policy and support branch communication division.
8. Geerlings E, Albrechtsen L, Rushton J (2007) Highly pathogenic avian influenza: a rapid assessment of its socio-economic impact on vulnerable households in Egypt.

| Variable                                      | β   | 2SE   | Odds  | P     | CI   |
|-----------------------------------------------|-----|-------|-------|-------|------|
| Respond ability of governmental organizations in data collection | 1.299 | .578  | 5.054 | .025  | 3.667 |
| Carrying out individual interviews for data collection | -2.097- | .767  | 7.467 | .006  | .123 |
| Husbandry system                              | 1.686 | .432  | 15.208 | .000  | 5.399 |
| Presence of nursery farms                     | -2.430- | .608  | 15.955 | .000  | .088 |
| Season                                        | -1.573- | .427  | 13.572 | .000  | .207 |
| Source of chicken                             | -1.009- | .470  | 4.605 | .032  | .365 |

β: Regression coefficient
2SE: Standard error
3CI: Confidence interval at 95%

**Table 3:** Final multivariate logistic regression model for risk factors associated with highly pathogenic avian influenza.