Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Disease

journal homepage:www.elsevier.com/locate/apjtd

Document heading doi: 10.1016/S2222-1808(12)60061-9

Avian influenza in village chickens, its awareness and presence of potential risk practices among rural dwellers

Victor T. Gugong[1*], Ikwe Ajogi [2], Kabir Junaidu[2], Emmanuel C. Okolocha[2], Emmanuel O. Ngbede[3], Maurice N. Abraham4, Sunday E. Hambolu[2]

[1] *Nuhu Bamali Polytechnic, School of Agricultural Technology, Samaru-Kataf, Kaduna State, Nigeria*

[2] *Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, P.M.B 1069 Zaria, Kaduna State, Nigeria*

[3] *Department of Veterinary Pathology and Microbiology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria P.M.B 1069 Zaria, Kaduna State, Nigeria*

[4] *National Veterinary Research Institute (NVRI), South-South Zonal Laboratory Calabar, Cross River State, Nigeria*

ARTICLE INFO

Article history:
Received 15 April 2012
Received in revised form 27 April 2012
Accepted 28 May 2012
Available online 28 August 2012

Keywords:
Awareness
Avian influenza
Antibodies
Nigeria
Risk practices
Rural dwellers
Village chickens

ABSTRACT

Objective: To assess the presence of antibodies to the avian influenza virus H5 subtype in village chickens. **Methods:** A total of 480 sera samples were obtained from apparently healthy local chickens in four local government areas (LGAs). The sera samples were subjected to the haemagglutination inhibition (HI) test using the H5N2 avian influenza antigen. **Results:** An overall prevalence of 2.92% with a mean antibody titre of (7.07$\pm$0.73) log2 was obtained. There was a low level of awareness of avian influenza among the rural dwellers, the electronic and print media were the most common source of awareness. **Conclusions:** This result highlights the important role apparently healthy village chickens may play in virus perpetuation (reservoir) and in the spread of avian influenza to other animals and humans.

1. Introduction

In Nigeria, about 60% of the poultry population are kept under the free range/scavenging system of production[1]. Biosecurity measures are rarely implemented in the rearing of the village chickens especially in the villages. The chickens therefore, roam freely from one property to another, making them more vulnerable to infection. When infected, they may become a perpetual nucleus of virus circulation and become a potential virus source[2].

Local poultry production system has been shown to be an important source of spread and persistence of highly pathogenic avian influenza (HPAI) H5N1[3]. The first outbreak of avian influenza in Nigeria occurred in Kaduna State after which the disease has since spread to 25 out of the 36 states including the Federal Capital territory (FCT)[4].

In spite of the zoonotic and economic impact of avian influenza worldwide, few studies focuse on the local poultry (free range) production system especially in Nigeria where they are considered to have little influence on the emergence, re-emergence and spread of the disease. The intention of this study was therefore to assess the presence of the disease among the village poultry, risk factors and awareness of the disease among rural dwellers.

2. Materials and methods

2.1. Meterials

A total of 480 blood samples were randomly collected from village chickens in four local government areas (Zangon Kataf, Kaura, Jaba and Jema'a) located along the Jos-Abuja

*Corresponding author: Victor T. Gugong-Nuhu Bamali Polytechnic, School of Agricultural Technology, Samaru-Kataf, Kaduna State, Nigeria.
Tel: +2347039663197
E-mail: titagongs@yahoo.com
Foundation Project: Supported in part by the Education Trust Fund (ETF) grant 2010 to the School of Agricultural Technology, Nuhu Bamali Polytechnic, , Samaru-Kataf, Kaduna State, Nigeria.

routes in Kaduna State. 10 samples were collected in each village (2 samples per household). Sera were separated by centrifugation at 4000 r/min for 5 min and stored at – 20 ℃ until used[5].

Avian Influenza (H_5N_2) antigen was obtained from the avian influenza and NewCastle disease reference Laboratory, Padova Italy.

2.2. Laboratory analysis

1% suspension of chicken red blood cell (RBC) was prepared for use as the indicator in the haemagglution (HA) and haemagglutination inhibition (HI) test[6]. The 1HA unit of the antigen was determined to obtain the 4HA units which was used for the HI. The HA and HI were performed as recommended[6]. HI reaction was read and all serum samples with titres greater than or equal to 1/16 (4 log2) were considered positive[6].

2.3. Data analysis

Questionnaires were used to obtain data on presence of risk factors and awareness of avian influenza from two hundred and forty households.

Antibody titres were expressed as mean ± SEM and data reduced to tables. Chi Square and Fisher's exact test were used to determine association with the aid of SPSS version 17.0. P<0.05 were considered significant.

3. Results

Out of the 480 birds sampled 14 (2.92%) were seropositive for antibodies to avian influenza H5 subtype with a mean antibody titre of 7.07. Jema'a LGA had the lowest prevalence (0.8%) while Zangon Kataf LGA had the highest prevalence (10.00%). There was a significant difference in seropositivity across the four LGAs (Table 1).

Table 1
Prevalence and mean antibody titre of avian influenza in birds sample.

Variables	Jaba LGA	Jema'a LGA	Kaura LGA	Zangon Kataf LGA	Overall total
Number of villages sampled	5	25	12	6	48
Number of birds sampled	50	250	120	60	480
Number of birds seropositive	5	2	5	2	14
MAT ± SEM	8.00±0.95	4.00±0.00	8.00±1.45	5.50±1.50	7.07±0.73
Prevalence (%)	10	0.8	4.17	3.3	2.92

Out of 240 households, 133 (55.42%) inherited their birds, while 89 (37.08%) and 18 (7.50%) respectively get their birds from the live bird markets and as gifts. Ninety eight (40.83%) of the 240 households dispose of the dead birds in the refuse dumps, 13 (5.42%) feed them to dogs, 126 (52.50%) bury them while 3 (1.25%) consume them. Of the 240 households, 145 (60.42%) spread use the faeces as manure on their farms and gardens, 1 (0.42%) dispose it in the dustbin while 94 (39.16%) do not collect the faeces (Table 2).

Table 2
Potential risk factors for the spread avian influenza by birds.

Variables	Number of respondents (%)n = 240
Source of birds	
Inheritance	33 (55.42)
Markets	89 (37.08)
Gifts	18 (7.50)
Disposal of dead birds/offal	
Dispose in refuse dumps	98 (40.83)
Feed to dogs	13 (5.42)
Burying	126 (52.50)
Consume	3 (1.25)
Disposal of faeces	
Spread on farm (manure)	145 (60.42)
Dispose in dust bin	1 (0.42)
Don't collect	94 (39.16)

7 out of the 125 (52.08%) that keep pigs and the 115 (47.92%) that do not keep pigs had birds seropositive for avian influenza but there was no statistically significant difference (P=0.8723) in seropositivity between households that keep pigs or do not keep pigs. Also eight of households out of the 194 (52.08%) households that keep water birds and six out of the 46 (19.17%) of those that do not keep water birds had birds seropositive for avian influenza. There was a statistically significant difference (P=0.0203) in seropositivity between households that keep water birds and those that do not keep water birds (Table 3).

Table 3
Relationship between keeping of reservoir animals and presence of avian influenza antibodies.

Variables	Number of households (%) n = 240	Number of households that have seropositive birds	P value
Keeping of Pigs			0.8723a
Keep	125 (52.08)	7	
Don't Keep	115 (47.92)	7	
Keeping of Water birds			0.0203b
Keep	194 (80.83)	8	
Don't Keep	46 (19.17)	6	

a: no statistically significant difference (P>0.05), b: statistically significant difference (P <0.05)

Out of the 240 respondents, only 108 (45.68%) were aware of AI, out of which 97 (89.81%) were males while 11 (10.19%) were females. Majority (66.67%) of the respondents herd about AI from the electronic media, 4 (3.70%) via the print media, 21 (19.44%) via print and electronic media while 11 (10.19%) heard from friends and other farmers.

Table 4.
Awareness of avian influenza among the rural dwellers.

Variables	Number of respondents (%)
Awareness	
Not aware	132 (54.42)
Aware	108 (45.68)
Sex distribution of respondents aware	
Male (n=198)	97 (89.81)
Females (n=42)	11 (10.19)
Sources of awareness	
Electronic media	72 (66.67)
Print media	4 (3.70)
Electronic & print media	21 (19.44)
Friends & other Farmers	11 (10.19)

4. Discussion

The presence of avian influenza virus H5 subtype antibodies to in the village chickens indicates natural exposure to the virus, as village chickens are rarely vaccinated in Nigeria[7]. The result of this study are in agreement with findings of other workers[8–11] who detected AI (H5) antibodies in village chickens. Though the prevalence obtained in this study was lower than in previous studies. This may be because the present study was conducted in an area where outbreaks of AI were not reported. The presence of antibodies in apparently healthy local chickens without any clinical sign may be an indication that they are incubating the organism or they are carriers. Previous reports have proposed that village chickens possess the B21 haplotype in the major histocompatibility complex (MHC) class I molecule which makes them resistant to HPAI[12]. Also previous exposure of chickens to LPAI viruses such as H9N2 modulate the lethality of the H5 disease and provides partial protection against lethal challenges. Therefore, reducing the clinical manifestation and detectibility of HPAI infection, facilitating their spread[13].

Poultry infected with avian influenza excrete the virus particles in their feces[14]. Spreading of infected poultry faces as manure on vegetables especially vegetables that are consumed raw[15] may poses a public health threat when consumed also infection could result from inhalation of the virus in aerosols when such infected manure is being gathered or spread on the farm.

Disposal of poultry faeces as manure on farms may also serve as source of infection to other birds directly during scavenging on crop residues in farms after harvest or indirectly when the manure is washed directly into water bodies. The virus contaminates these water bodies and serves as source of infection for water birds (such as ducks) and man during swimming or bathing in such contaminated water bodies. Transportation of infected poultry manure could also serve as a source of disseminating the virus[16].

The disposal of dead birds into refuse dumps is very important in the dissemination of the virus[17]. Other birds and animals such as stray dogs can have access to them and become infected. Dogs have been shown to become infected by consumption of infected chickens and offal in villages[18–20]. Most dogs and cats in the rural areas are stray and may feed on carcasses from infected birds that have not been properly disposed of thus, presenting an opportunity for them to get infected with highly pathogenic avian influenza. Disposal by burying also risk contamination of ground water, if the water table is high especially in areas close to rivers/streams. The infected carcass can also be washed into a stream or pond and serve as source of infection to humans and animals.

Pigs play a crucial role in influenza ecology and epidemiology, primarily because of their dual susceptibility to human and avian viruses[21]. Though, there was no significant difference in seropositivity of birds between households that keep or do not keep pigs. Pigs have been proposed to be a "mixing vessel" in the generation of re-assorted strains[22]. There was a significant difference in seropositivity of birds between keeping of water birds (duck and geese) and not keeping of water birds. Ducks and geese can play a role as reservoir for avian influenza and source of outbreaks[23]. They can become infected without succumbing to disease[24], they excrete viruses into the environment and contribute to virus persistence and spread[24, 25] they also sustain different viral populations allowing opportunity for re-assortment[26].

Awareness creation is one of the activities required for emergency preparedness against future outbreaks of HPAI. It is a key factor for successfully reducing the risk of an influenza pandemic and enhancing reporting of the disease[27,28]. The results of the study show that print and electronic media remain the most effective communication tool in reaching out to the rural communities. This is in agreement with the report of[28–30]. The difference in level of awareness to avian influenza between the sexes might be because men listen to radio, watch television and read newspapers frequently compared to women in these areas.

The presence of H5 in village chickens poses a serious public health threat because of the frequent and close contact between them and members of the household especially during feeding and processing (slaughtering and eviscerating) of these birds. These birds may act as reservoir of the virus and might maintain and spread the virus to commercial poultry. A virological survey should be carried out to ascertain the presence of the virus in the village chickens and in areas where avian influenza outbreaks were not reported so that they don't serve as reservoirs and source of spread of the disease.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

The authors gratefully acknowledge the Ilaria Capua and Matteo of the Avian Influenza and Newcastle Disease Laboratory, Podova, Italy for providing the antigen (H_5N_2), positive and negative control antisera used in this study.

This research was supported in part by the Education Trust Fund (ETF) grant 2010 to the School of Agricultural Technology, Nuhu Bamali Polytechnic, , Samaru-Kataf, Kaduna State, Nigeria.

References

[1] Adene DF, Wakawa AM, Abdu PA, Lombin LH, Khazeem HM, Sa'idu L, Fatihu MY, et al. Clinicopathological and husbandry features associated with maiden diagnosis of avian Influenza. *NVJ* 2006; **27**(1):32-38.

[2] Capua I, Morangon S. The use of vaccination to combat multiple introductions of Notifiable Avian Influenza viruses of the H5 and H7 subtypes between 2000 and 2006 in Italy. *Vaccine* 2007; **25**(27):4987-4995.

[3] Tiensin T, Chaitaweesub P, Songserm T, Chaisingh A, Hoonsuwan W, Buranathai C, Parakamawongsa T, et al. Highly pathogenic avian influenza H5N1, Thailand, 2004. *Emerg Infect Dis* 2005; **11**(11):1664-1672.

[4] Fasina FO, Rivas AL, Bisschop SPR, Slegeman AJ, Hernandez JA. Identification of risk factors associated with highly pathogenic avian influenza H5N1 virus infection in poultry farms, in Nigeria during the epidemic of 2006 - 2007. *Prev Vet Med* 2011; **98**(2-3): 204-208.

[5] Colle J-R, Duguid JP, Fraser AG, Marmion BP. Practical Medical Microbiology. 13th ed. UK: Mackie and Mccartney: Churchill Livingstone;1982, p.37-39.

[6] OIE. World Health Organization for Animal Health. Terrestrial animal health code, 14th ed. Chapter 2.7.12.1 Avian influenza. 2008; www.oie.int/eng/normes/mcode/en_chapter_2.7.12.htm.

[7] Durosinlorun A, Umoh JU, Abdu PA, Ajogi I. Serologic evidence of infection with H5 subtype influenza virus in apparently healthy local chickens in Kaduna State, Nigeria. *Avian Dis* 2010; **54**(s1): 365-368.

[8] Alam J, Koike L, Gasuddin M, Rahman MM. Seroprevalence of poultry disease in native chickens in Bangladesh (abstract). *BSVER* 2006; **24**:26.

[9] Wakawa AM, Abdu PA, Umoh JU, Lawal S, Miko RB. Serological evidence of mixed infections with avian influenza and newcastle disease in village chickens in Jigawa State, Nigeria. *Vet Arhiv* 2009; **79**:151-155.

[10] Biswas PK, Barua H, Uddin GMN, Biswas D, Ahad A, Debnath NC. Serosurvey of five viruses in chickens on small holdings in Bangladesh. *Prev Vet Med* 2009; **88**:67-71.

[11] Trenvennec K, Chevalier V, Grosbois V, Garacia JM, Thu HH, Berthouly-Salazar C, et al. Looking for avian influenza in remote areas: a case study in Northern Vietnam. *Acta Trop* 2011; **120**(3):160-166.

[12] Boonyanuwat K, Thummabutra S, Sookmanee N, Vatechavalkhu V, Siripholvat V. Influence of major histocompatibility complex class 1 haplotypes on avian influenza virus disease traits in Thai indigenous chickens. *Anim Sci J* 2006; **77**:285-289.

[13] Khalenkov A, Perk S, Pashin A, Golender N, Webster RG. Modulation of the severity of highly pathogenic H5N1 influenza in chickens previously inoculated with Israeli H9N2 influenza viruses. *Virology* 2009; **383**(1):32-38.

[14] Capua I, Morangon I. The use of vaccination as an option for the control of avian influenza. *Avian Path* 2003; **32**(4):335-342.

[15] Okiki PA, Edafiahde WE, Ogbimi AO. Use of poultry manure in vegetable cultivation and influenza pandemic. *Adv Appl Sci Res* 2010; **1**(3): 1-7.

[16] Bird Life, (2007). Bird life statement on avian influenza. www.birdlife.org/action/science/species. accessed on the 31th August, 2011, at 1:23pm.

[17] Spradbrow PB. Newcastle disease in village chickens. *Poul Sci Rev* 1993; **5**:57-96.

[18] Oluwayelu DO, Aiki-Raji CO, Che N, Ahmadu O. Prevalence of avian origin H5 and H7 influenza virus antibodies in dogs in Ibadan and Sagamu, Southwestern Nigeria. *Afr J Biomed Res*, 2011; **14**(1): 23- 26.

[19] Song D, Kang B, Lee C, Jung K, Ha G, Kang D, et al. Transmission of avian influenza virus (H3N2) to dogs. *Emerg Infect Dis* 2008; **14**(5):741-746.

[20] Henning J, Henning KA, Morton JM, Long NT, Ha NT, Vu L, et al. Highly pathogenic avian influenza (H5N1) in ducks and in-contact chickens in backyard and smallholder commercial duck farms in Viet Nam. *Prev Vet Med* 2011; **101**(3-4): 229-240.

[21] Kalthoff D, Globig A, Beer M. (Highly pathogenic) avian influenza as a zoonotic agent. *Vet Microbiol* 2010; **140**:237-245.

[22] Yee KS, Carpenter TE Cardona CJ. Epidemiology of H5N1 avian influenza. *Comp Immunol Microbiol Infect Dis* 2009; **32**: 325-340

[23] Shortridge KF, Zhou N N, Guan Y , Gao P, Ito T, Kawaoka Y, Kodihalli S, Krauss S, Markwell D, Murti K G, Norwood M, Senne D, Sims L, Takada A, Webster RG. Characterization of avian H5N1 influenza viruses from poultry in Hong Kong. *Virology* 1998; **252**(2):331-42.

[24] Hulse-Post D J, Sturm-Ramirez K M, Humberd J, Seiler P, Govorkova EA, Krauss S, Scholtissek C, Puthavathana P, Buranathai C, Nguyen TD, Long HT, Naipospos T S, Chen H, Ellis TM, Guan Y, Peiris JS, Webster RG. Role of domestic ducks in the propagation and biological evolution of highly pathogenic H5N1 influenza viruses in Asia. *Proc Natl Acad Sci USA* 2005; **102**(30):10682-7.

[25] Lee C, Saif YM. Avian influenza virus. *Comp Immunol Microbiol Infect Dis* 2009; **32**: 301-310.

[26] Marinos G, Vasieiou I, Katsargyris A, Klonaris C, Georgiou C, Griniatos J, et al. Assessing the level of awareness of avian influenza among Greek Students. *Rural and Remote Health* 2007; **7**:739.

[27] Leslie T, Billaud J, Mofleh J, Mustafa L, Yingst S. Knowledge, attitudes and practices regarding avian influenza (H5N1), Afghanistan. *Emerg Infect Dis* 2008; **14**(9):1459-1461.

[28] Musa OI, Aderibigbe SA, Salaudeen GA, Oluwole FA, Samuel SO. Community awareness of bird flu and the practice of backyard poultry in a North Central State of Nigeria. *J Prev Med Hyg* 2010; **51**:146-151.

[29] Bawa GS, Bolorunduro PI, Orumunyi M, Ajala MK, Peter A. Farmers perception of the avian influenza (Bird flu) epidemic in some parts of northern Nigeria. *Am-Euras J Sci Res* 2010; **5**(3):170-175.