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RESEARCH ARTICLE

EPIDEMIOLOGICAL IMPLICATION OF NEWCASTLE DISEASE VIRUS IN LOCAL CHICKENS AT LIVE BIRD MARKETS IN JOS, NIGERIA

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ABSTRACT

We investigated local chicken at sale points for antibodies against Newcastle Disease Virus (NDV) in some live bird markets in Plateau State, Nigeria. Our aim was to determine the degree of endemicity of NDV in the target population and to evaluate the attendant epidemiological implication. A total of 300 samples were collected from two markets. Standard method for Haemagglutination Inhibition (HI) test was adopted for screening the samples. Results showed that 245 (81.5%) of the samples tested positive for the agent. The distribution of antibodies (log_2) showed that 4 samples (1.5%) had a titre of 1, 8 samples (2.5%) had a titre of 2, 15 samples (5.1%) had a titre of 3, 28 samples (9.3%) had a titre of 4, 42 samples (13.8%) had a titre of 5, while 42 samples (14.2%) had a titre of 6, 48 samples (16%) had a titre of 7 which was the second most frequently encountered titre, 57 samples (19%) had a titre of 8, which was the most frequently encountered titre 35 samples (11.7%) had a titre of 9, while the highest titre obtained was 10, in (6.8%) samples. Overall HI (log_2) in all samples collected ranged from1-10. The highest positive sample was observed in Bukuru with 124 (82%) positive while for Jos 120 (80%) was positive. The result obtained was subjected to statistical analysis using statistical package for social science (SPSS version 16) for statistical difference at 95% confidence interval and there was no significant difference in the percentage of the two sites.

INTRODUCTION

Newcastle disease (ND) is a highly contagious zoonotic disease of birds affecting many domestic and wild avian species. Its effect is most notable in domestic poultry due to their high susceptibility and potential for serve in the poultry industries (Nelson *et al.,* 1952). The disease was discovered in Java, Indonesia in 1926, but was named after Newcastle upon Tyne, England, where it was rediscovered a year later in 1927 (Nelson *et al.,* 1952). It occurs in domestic fowls, turkeys, pigeons, quails and guinea fowls and many species of wild birds, ducks and geese are also susceptible but severe disease is rare. Human infection via exposure of humans to infected birds can cause mild conjunctivitis and influenza-like symptoms and in severe cases it may lead to some lasting impairment of vision (Beard and Hanson, 1984). Newcastle disease in human is an occupational hazard limited to laboratory workers and poultry workers handling infected birds (Jawetz *et al.,* 2005). The causal agent, Newcastle Disease Virus, is a negative sense single stranded RNA virus. Transmission occurs by exposure to faecal and other excretions from infected birds and through contact with contaminated feed, water, equipment and clothing (Nelson *et a1.,* 1952). Newcastle disease is endemic in Nigeria. The first documented outbreak of the disease occurred in Ibadan in 1952, since then the disease has been the most important disease of chickens in Nigeria. The disease has been reported in guinea fowls and a highly velogenic strain of NDV has been isolated from apparently healthy ducks (Echeonwu *et al.,* 1993). A suspected outbreak of ND in young ostrich was also reported by Sa'idu *et al,* (1999). To date, there has only been serological evidence of NDV infection in pigeons in Nigeria (Oladele *et al.,* 1996). Newcastle disease is a dreaded virus disease of poultry which reduces the hatchability and fertility of eggs, production and impaired egg shell and albumen quality. The virus causes high mortality and morbidity in the flock and produces teratogenic defects and early mortality among experimentally infected embryos (Blattner and Williamson 1951). Infection is through direct contact between healthy body discharges from infected birds, and the commonest portal of entry is the respiratory tract. The incubation period for the disease ranges from 2 to 15 days. The clinical symptoms in infected birds depend on the strain of the virus and the age of the bud and range from mild respiratory infection to severe enteritis and paralysis resulting in death (Pang *et al.,* 2003). No treatment for NDV exits, but the use of prophylactic vaccines and sanitary measures reduce the likelihood of outbreaks. Very recently, some herbs have been investigated and found to be good candidates for ethno-veterinary intervention in ND outbreaks (Chollom *et al*., 2012) Confirmatory diagnosis requires the isolation and characterization of the virus involved. Laboratory diagnosis is by viral isolation using embryonated chickens eggs after which the allantoic fluid is harvested and tested for haemagglutination (HA) activity and confirmation by HI. Other tests are conventional assessment using in-viro technique, Enzymes linked irnmunosorbent Assay (ELISA), Polymerase Chain Reaction (PCR), Agar Gel

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Precipitating Test (AGPT) (Pang *et al.*, 2003). The study was meant to ascertain the endemicity of the disease in the targeted locations and emphasize on the potential hazard local birds posed to poultry production in the country.

MATERIALS AND METHOD

Standard Antigen and Hyper immune sera

Lyophilized Newcastle Disease (ND) agent and hyper immune sera were obtained from Virology Division, National Veterinary Research Institute, Vom.

Sample Collection

2ml of blood was collected from 300 birds via the brachial vein into well labelled clean sample bottles. The blood was allowed to clot, serum was separated and stored at -20^{0}C as described by Allan and Gough, (1974a).

Treatment of Samples

Sera were inactivated in water bath at 56^{0}C for 30minutes prior to use, to remove non specific inhibitors.

Haemagglutination (HA) Test

This was done according to the method of Young *et al*., 2000 as earlier documented by Chollom *et al.* (2012). The HA titre was recorded as the dilution of the virus showing 50% haemagglutination (Allan and Gough, 1974a; Allan *et al*., 1978). The resulting titre was used to calculate the 4 Haemagglutination unit (4HAU) for HI test

Haemagglutination Inhibition (HI) Test

This was carried out according to the method of Young *et al.* (2000). Briefly:

i. To each row of eight wells on microtitre plate 1 volume of PBS was added using a micro dropper pipette into wells in the row.
ii. To each first well of each row, 1 volume of particular test sera was added.
iii. A micro diluter calibrated to carry same volume as the micro dropper pipette was used to make a two – fold dilution of the sera as in antigen dilution in HA titration, leaving the 11th and 12th well as control .
iv. Using another micro dropper pipette, 1 volume of the standard antigen was added to wells 1 - 10.
v. The contents were mixed gently by tapping the plate and incubated at room temperature for 45 minutes.
vi. To each well again, 1 volume of 1% washed chick red blood cell was added, mixed and incubated at room temperature for 30 minutes.
vii. The same procedure was used to treat control sera.
viii. The titre was read as the highest dilution showing heamagglutination inhibition.

RESULTS

The study shows that 245 (81.7%) of the screened population had antibodies against Newcastle Disease Virus. The breakdown according to location showed that Bukuru market had a seroprevalence of (82.7%) while Jos market had 80.3%. Table 1/SPSS version 16 at 95% confidence interval showed that x_2 = 0.542 df = 1 P-Value = 0.462 (Not significant). HI $\log_2$ titre of sample distribution in relation to location in Bukuru and Jos respectively was shown in table 2/SSPS showed that x2 = 0.688, df =1 P-Value = 0.709 (Not Significant). The overall frequency of the titre in HI ($\log_2$) shows that, the highest antibody titre ($\log_2$) of 141 (19.0%) was found in 57 samples while others had < 1(1.5%), 2(2.5%), 3(5.1%), 4(9.3%). 5(13.8%) 6(14.2%) 7(19%), 9(11.7%), and 10(6.8%) as shown in Table 3.

Table 1. Distribution of HI LOG2 titre in different location

Location	No samples	No positive (%)	No positive (%)
Bukuru	150	124	82.72
Jos	150	120	80.3
Total	300	489	-

X^2 = 0,542 df = 1 P – Value = 0,484 (Not Significant)

Table 2. Percentage distribution of titre ranges

Location	1 – 4	5 – 7	8 – 10	%	%
Bukuru	52	136	112	300	-
(%within location)	17.3	45.4	37.3	-	100
JOS	59	128	113	300	-
(% within location)	19.7	42.6	37.7	-	100

X^2 = 0.688 df = 1 P- Value = 0.709 (Not significant)

DISCUSSION

The sudden boom in poultry production in Nigeria and indeed Africa as a source of supply of animal protein suggests that awareness in disease control measures be correspondingly increased. In Nigeria for instance, the population of local chickens that wander about as scavengers is high and control of the disease difficult (Okeke and Lamorde, 1998). These birds are hardly ever vaccinated and roam about acting as reservoirs and carrier of diseases to commercial farms and to themselves (Olabode *et al*., 1992). One of the most important poultry diseases of economic importance in Nigeria is Newcastle Disease (ND) which is highly fatal to young chicks and causes severe drop in eggs production among layers. All birds of all ages are susceptible to ND. In man, Newcastle Disease can give rise to acute unilateral or bilateral conjunctivitis (Okeke and Lamorde, 1998). Based on the result of this work, which shows that 96% tested positive, the prevalence of HI antibodies is high when compared with Newcastle disease seroprevalence studies conducted in village chickens *z*- 34 different parts of Nigeria which shows variable prevalence rate: in Kaduna State, 73.8% (Ezeokoli *et al*., 1985), *74.3%* (Nwanta, 2003) in Maiduguri Bomo State, 54.0% (Baba *et al*., 1998) in Plateau State, 41.0% (Abdu *et al.*, 1985) and Kubuwa villagepwari area council 1 a& FCT Abuja (44,3%) (Olabode *et al*., 2006). The high prevalence rate documented in this study probably may be due to more frequent contacts of these birds with wild and domestic virus carriers (Vui *et* al., 2000). Furthermore, poultry butchers have direct contact with apparently healthy and sick birds for slaughter, most of these birds are brought to the slaughter point sick. As a result, poultry butchers became contaminated. They may not necessarily become infected but may serve as vehicle of transmission of the virus (Pary *et al.*, 2003).

These people also have close contact with healthy unvaccinated flocks either by keeping or selling and those flocks are susceptible to Newcastle disease infection. Consequently, the rate of transmission increases resulting in high disease prevalence with attendant economic loss. The movement of live infected village birds is probably seen to be the main source of virus transmission (Nawathe, 1999; Ibrahim and Abdu, 2002). Village poultry are mobile and may pass through markets and the birds will spread the virus and disperse. Chicken purchased for consumption is brought life and may mix for a while with the home flock. Experience has shown that outbreak of Newcastle disease may follow the introduction of newly-purchased chicken (Nwanta *et al., 0*.L- 2006). Sick birds or suspected contacts are slaughtered for consumption or sold in the pretext of salvaging the bids by the owners (Nawathe, 1988; Ibrahim and Abdu, 1992). The sale of such infected birds aid the spread of infection (Nwanta *et al*., 2006). The findings of this work shows that chickens has an HI antibody titre of > 4 $\log_2$ which is enough to boost the immunity level, hence presumed to be protected (Nwanta, 2003). The higher titre of these species may be due to their nature of mobility is higher than the rest species used in this study, which suggests that they also harbour and shed the virus, acting as source of infection for chickens (Onunkwo and Momo,1981; Alders and Sprabrow, 2001). With regards to the sources of samples used in

this study, Bukuru had the highest numbers of positive samples while lowest had the lowest positive samples but the numbers are close to each other. The wider range of NDV titre as obtained in this study may also be due to natural infection which is known to produce higher antibody titres than vaccination (Luc *et al.*, 1992). The variations of immune responses and protection observed from location to location may be due to variable environmental condition such as ambient temperatures, humidity, rainfall and heath status of the chicken as well as human factors in the vaccine administration which may also vary from location to location (Echeonwu *et al.*, 2008).

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