Seroprevalence of newcastle disease virus in local chicken in Udu Local Government Area of Delta State, Nigeria


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Newcastle disease virus (NDV) is spread through direct contact between healthy birds and the bodily discharges of infected birds. It poses serious threats to the poultry industry by causing significant losses to both commercial and rural poultry production. Constant monitoring gives insight into its magnitude and help in planning its prevention and control. This study determined the seroprevalence of NDV in local chicken in Udu Local Government Area of Delta State. Five (5) ml of blood was collected from each of 250 adult chickens from five markets (Udu, Ovwian, Alaja, Ajigbela and Otokuto) by exsanguination. The sera obtained were analyzed for anti-NDV antibody by haemagglutination inhibition (HI) test. The result obtained showed that 23.6% of the samples were positive for NDV antibody. This value is significantly (P<0.05) high, indicating that most of the local chickens had come in contact with the virus which may be circulating within the community. HI antibody titres ranging between 4log2 and 7log2 were obtained. The chickens exhibited geometric mean titre (GMT) ranging from 4.8 and 5.8. These findings indicate that this category of apparently healthy birds are carriers of Newcastle disease virus and this poses great threat to commercial poultry production in the study area. Good management practice and clean sanitary measures are required to reduce the incidence of the disease. Local farmers should be educated on proper use of vaccines and biosecurity measures to prevent this disease.

INTRODUCTION

Newcastle disease is a viral disease of birds especially chickens caused by Newcastle disease virus (NDV) (Alexander, 2003). NDV belongs to the avian paramyxovirus type I (APMV-I) serotype of the genus Avulavirus belonging to the sub-family ‘Paramyxovirinae’ and family ‘Paramyxoviridae’. NDV 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 (Olabode et al., 2006).

Virulent strains of NDV could cause deaths of birds without any clinical signs. A death rate of almost 100 percent can occur in unvaccinated poultry flocks. NDV infection and death have been reported in vaccinated poultry (Ohore et al., 2002). The disease results in huge...
economic losses to poultry farmers due to mortality and reduced egg production. Although, the virus is destroyed rapidly by dehydration and ultraviolet rays in sunlight, it can survive for several weeks in a warm and humid environment on birds’ feathers, manure and other materials, and indefinitely in frozen materials (Alexander 2003).

In Nigeria, poultry industry offer the fastest supply of animal protein to man and provide comparatively quickest rate of returns on investment than livestock, hence increase attention is being given to the health care of poultry by farmers (Okwor and Eze, 2010; Ibitoye et al., 2013). Prevalence records exist for various parts of Nigeria for instance, 80.9% for Sokoto State in 2013 (Ibitoye et al., 2013), 51.9% in 2009 and 13.9% in 2013 respectively in local chickens in Jos (Musa et al., 2009; Buru et al., 2013), 30.8% in Yobe State (Garba et al., 2012), 28.1% in Nassarawa State (Salihu et al., 2012), 32.5% in Zamfara State (Jibril et al., 2014) and 3.2% in Nsukka (Okwor et al., 2012).

Data on the prevalence of NDV in Delta State, Nigeria is scarce, thus there is need to determine the seroprevalence rate of NDV in Delta State. Therefore this study aimed to determine the seroprevalence of NDV in local chickens in Udu Local Government Area of Delta State of Nigeria.

MATERIALS AND METHODS

Study area

The study was carried out in 5 markets (Udu, Ovwian, Alaja, Ajigbela and Otokuto) in Udu Local Government Area of Delta State of South-south Nigeria, which covered a total land area of 17,698 km² and has a population of 6,710,181. The State is located between latitudes 5°00’N and 6°30’N and longitudes 5°00’E and 6°30’E. It is bounded in the North by Edo State, in the South by Bayelsa State, in the east by Anambra State. Delta State is generally low-lying without remarkable hills. The State has a wide coastal belt inter-lace with rivulets and streams, which form part of the Niger-Delta.

Sample collection

About five millilitre (5ml) of blood was collected into a sample bottle containing acid citrate dextrose (ACD) from each of two hundred and fifty (250) local adult chickens by exsanguination (Orajaka et al., 1999) in five markets (Udu, Ovwian, Alaja, Ajigbela and Otokuto) in Udu Local Government Area, Delta State, Nigeria. Efforts were made to prevent discomfort to the chickens. Sera were prepared by centrifugation and transported to the Avian Viral Research Unit (now Regional Laboratory for Avian Influenza and other Trans-boundary Avian Diseases), National Veterinary Research Institute (NVRI), Vom, Plateau State, for laboratory analysis.

Haemagglutination inhibition (HI) test

Antibody titer for NDV was determined from each serum sample using the OIE HI test protocol as described by Alexander (2003). Briefly, 0.025ml of phosphate-buffered saline (PBS) was dispensed into all wells of a plastic 96-well microtitre plate (v-bottomed wells) and 0.025ml of serum was placed in the first well. 0.025ml of the positive control serum (with known HI titre) and negative control sera were added to two respective wells of the microtitre plates. With the aid of a multi-channel micro pipette aid, two fold dilutions of the sera were made across plate (A1-A12). The last 0.025ml was discarded and 0.025ml of antigen containing 4 HAU was added to all the wells except row H which serve as back titration. NDV (Very virulent Kudus strain) was used as antigen. Back titration was carried out; thus 0.025ml of antigen suspension containing 4 HAU was added into each of the first two wells of row H (4HAU control from H1-H6) and two fold dilution was made from H2 to the H6 and the last 0.025 ml was discarded in order to obtain 4, 2, 1, 0.5, 0.25, 0.25 HAU. 0.025 ml of PBS and albumin was added in all wells of row H and mixed by tapping gently, and the plates were placed on the bench at 20°C for 30 min. 0.025 ml of 1% washed chicken-RBC was added to each well. Mixing was done gently by tapping and the plates placed on the bench at 20°C for 30 min after which they were observed for HI.

Data analysis

Geometric mean of HI antibody titre and percentages of detectable NDV HI antibody titre were calculated. The Statistical Package for Social Sciences (SPSS) Programme (version 13) was used to compare if there was any significant difference between the prevalence rates as well as the geometric means of the HI antibody titre.

RESULTS

Haemagglutination (HI) inhibition titre of newcastle disease virus (NDV) antibody from Udu market

Results of samples from Udu market showed that seven (7) samples were negative (2\(^2\)) for HI titre, ten (10) samples had 2\(^2\) titre, Nine (9) samples each had 2\(^3\) and 2\(^4\) respectively, while titres of 2\(^4\) to 2\(^7\) were fifteen (15) samples with prevalence of 30% (Table 1).
Haemagglutination inhibition titre of Newcastle disease virus antibody from Ovwian market

Results from Ovwian market showed that seven (7) samples were negative ($2^0$) for anti-NDV antibodies, thirty (30) samples had $2^1$ to $2^3$ antibody titre while antibody titres of $2^4$ to $2^7$ were thirteen (13) samples with prevalence of 26% (Table 2).

Haemagglutination inhibition titre of Newcastle disease virus antibody from Alaja market

Results from Alaja market showed that eight (8) samples were negative for anti-NDV antibodies, forty one (41) samples had titres of $2^1$ to $2^3$ while three (3) samples had titres of $2^4$ to $2^8$ (Table 4).

Haemagglutination inhibition titre of Newcastle disease virus antibody from Ajigbela market

Results from Ajigbela market showed that eight samples were negative for anti-NDV antibodies, fourteen (14) samples had titres of $2^1$ to $2^6$ while eleven (11) samples had titres of $2^4$ to $2^7$ (Table 5).

Haemagglutination inhibition titre of Newcastle disease virus antibody from Otokuto market

Results from Otokuto market showed that eleven (11) samples were negative for anti-NDV antibodies, twenty eight (28) samples had titres of $2^1$ to $2^3$ while eleven (11) samples had titres of $2^4$ to $2^7$ (Table 6).
DISCUSSION

The present study revealed the occurrence of NDV antibodies by HI in chickens sold in 5 markets in Udu local government area of Delta state. The chickens studied have no history of vaccination and as such the prevalence rate of NDV antibody is lower than is usually observed in commercial chicken where vaccination is practiced. The isolation of NDV and higher antibody titres in regions where vaccination is widely used has been confirmed by the results reported by Alexander and Gough (2003), who observed that vaccine protects birds from clinical disease where virus replication and excretion may occur, even though in low levels.

Table 1 shows that in Udu market, 30.0% (15/50) of samples had HI titre to NDV-Ab of $2^2$ to $2^7$. This is comparable to 31.2% of anti-NDV antibodies observed by Salihu et al (2012) in a similar study in local chickens in Lafia, Nassarawa State. HI antibody titre of log$_2$4 to log$_2$8 observed among these apparently healthy birds indicated that they might have survived clinical or subclinical NDV infection and produced neutralizing antibodies against the virus, hence presumed to be protected (Nwanta, 2003). Musa et al. (2009) in a similar study reported that among chickens studied in Plateau State, 51.9% had detectable antibodies to NDV but only 14.1% of the chickens had HI antibody titre of $>\log_24$ which was considered protective.

From Table 2, 26.0% (13/50) of the chickens from Owian market were positive for anti-NDV antibodies. This result is comparable to 28.8% and 24% reported by Salihu et al. (2012) for Akwanga and Keffi in a similar study. The climatic condition could have affected it.

From Table 3, chickens from Alaja market had a prevalence rate of 34% (17/50) of antibody to NDV. Salihu et al. (2012) also obtained a prevalence rate of 31.2% in Lafia, Nassarawa State. These high rates of prevalence could be due to poor management practices by owners of these chickens.

Table 4 showed prevalence rate of 6.0% (3/50) for chickens from Ajigbela market. This value was the lowest obtained in this study. The low rate of prevalence of the virus could be due to proper management of the poultry and also conducive weather condition for the chickens.

Otokuto market has a prevalence rate of 22.0% (11/50) (Table 5). The prevalence rate is low ($p<0.05$) compared to the overall seroprevalence in the study area. Orsi et al. (2010) reported varied isolation percentage by flock from 1.0 to 7.6%, and by region from 6.5 to 58.4% and an overall seroprevalence of 39.1%.

The result further showed an overall NDV seroprevalence of 23.6% with samples from Alaja market having the highest prevalence and Ajigbela having the lowest prevalence rate (Table 6). Geometric mean titre of NDV HI antibody in this study ranged from 4.8 to 5.8. This is an indication of endemic exposure and prevalence of the virus in local chicken in the area. Salihu et al. (2012) reported variation in prevalence rate (31.2, 28.8 and 24%) for different location in a similar study involving Lafia, Akwanga and Keffi respectively. Other researchers also reported similar observations in other parts of Nigeria; for example, Abdu et al. (1985) reported a prevalence of 34.6% in Zaria, Saidu et al. (2006) observed a prevalence of 68.4% in Zaria; Nwanta (2003) reported a prevalence of 47% in the Southeast area of Nigeria. The seroprevalence of NDV in these apparently healthy birds shows that they might have either survived clinical disease or subclinical infections and could thus act as reservoirs of the virus (Olabode et al., 1992; Orajaka et al., 1999). Delta State has forest/swamp vegetation with heavy rainfall throughout (every month) the year, which is likely to lessen the air-borne transmission of the disease (Ibitoye et al., 2013). Suitable climatic factors and high poultry farm concentrations favours air-borne transmission. Dry windy harmattan air current also encourages the spread of the virus. Cold weather induces stress on chickens and subsequently lowers their immunity to ND (Alexander, 2001; Saidu et al., 2006; Musa et al., 2009; Ibitoye et al., 2013).

The HI test is still the most widely used assay that requires cheap reagents, easy interpretation and it is a conventional serological method for measuring anti-NDV antibody levels in poultry sera and considered the standard laboratory method for diagnosis of NDV. Birds showing symptoms of Newcastle disease should be quarantined immediately. New birds should also be vaccinated before being introduced to the flock. There is
an inactivated viral vaccine available as well as various combination vaccines. Good bio-security can help prevent Newcastle disease in poultry flocks. Flocks should not be allowed to contact domesticated poultry of unknown health status, any pet birds (Alexander, 2001).

Conclusion

The study revealed the circulation of NDV in local chickens in the study area. There is also some level of protective antibody produced, indicating resistance to the circulating strains. This observation poses a threat to commercial poultry production because of close proximity between the chickens under the free range systems and commercial.

REFERENCES


