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Occurrence of Newcastle disease virus antibodies in free range local chickens in Bokkos Local Government Area of Plateau State, Nigeria

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Abstract

Newcastle Disease (ND) has been recognized as one of the major health constraints in poultry production in Nigeria and other parts of the world. There have been reports of ND outbreaks in commercial farms in Bokkos Local Government Area (LGA) of Plateau State Nigeria, but the epizootiogical status of the disease in free range scavenging local chickens in this LGA is unknown, and outbreaks are usually not reported. A cross-sectional serological survey of Newcastle disease virus antibodies was carried out on free range scavenging local chickens in six districts of Bokkos Local Government Area of Plateau State, Nigeria. A total of two hundred serum samples were collected from the free range scavenging local chickens. Haemagglutination inhibition test was carried out on the serum samples collected. Haemagglutination inhibition titre for each screened serum sample was determined and titres ≥ 1: 16 was considered positive. The overall occurrence of Newcastle disease virus antibodies in the sample population of free range scavenging local chickens was 55%. The occurrence of ND virus antibodies was highest at Mangor (71.4%), followed by Daffo (66.7%), then Butura (62.5%), Kwatas (58.9%), Mushere (45%) and lastly Toff (27.5%). Females (58.8%) had a higher occurrence of ND virus antibodies than males (47.8%). This result of this study suggests that Newcastle disease virus antibodies is circulating in more than half of the free range scavenging local chickens in the study area, and thus ND may pose a serious threat to the commercial poultry industry in Bokkos LGA, Plateau State, Nigeria. It is recommended that the free range scavenging local birds in the study area be vaccinated against ND.

Keywords: Newcastle disease; Occurrence; ND virus antibodies; Haemagglutination inhibition; Bokkos LGA; Plateau State, Nigeria.

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Introduction

Newcastle disease (ND) is a viral disease of economic importance in poultry production because it causes high morbidity and mortality (Anosa and Adene, 2007, Oladele, 2003). It is one of the major constraints to rural poultry production in Nigeria and other developing countries. All species of birds of different ages are susceptible to ND. The acute and virulent form of the disease may cause up to 90% mortality or more in affected flocks (Alexander and Allen, 1974). The disease occurs worldwide, and it is caused by the Newcastle disease virus, a single stranded RNA Paramyxovirus serotype I virus of the genus Avulavirus, belonging to the family Paramyxoviridae (OIE, 2009).

In Nigeria, Newcastle disease was first documented in 1953 in and around Ibadan (Hill *et al.,* 1953), and later in other parts of the country (Fatumbi and Adene, 1979; Ezeokoli *et al*., 1984; Baba *et al*., 1995). The disease is more common during the harmattan period of the year (Saidu *et al*., 1994; Abdu *et al*., 2005). Newcastle disease has been reported in both local and exotic chickens in Nigeria (Fatumbi and Adene, 1979; Abdu *et al.*, 1985; Echeonwu *et al*., 1993; Baba *et al*., 1995). The disease has also been reported in guinea fowls and turkeys (Okaeme, 1983; Ezeifeka *et al*., 1992; Echeonwu *et al*., 1993). A suspected case of ND was also reported in ostriches (Sa'idu *et al*., 1999). The ND virus (NDV) has also reportedly been isolated from apparently healthy ducks in and around Jos, Nigeria, but there had been no report of clinical ND in ducks (Majiyagbe and Nawathe, 1981; Echeonwu *et al*., 1993).

The disease (ND) has become a threat to the poultry industry in Nigeria, because it causes high mortality in different species of birds. Since 1953 the disease has been reported to be endemic in both domestic and exotic birds with annual epidemics being recorded in highly susceptible flocks (Adu *et al.,* 1986; Saidu *et al.,* 1994; Orajaka *et al.,* 1999). There had been reports of serological evidence of NDV infection in Nigerian local chickens; Adu *et al.* (1986) reported a prevalence of about 41%. In Tanzania, 13.3% of the chickens were seropositive when HI test was performed prior to vaccination against ND (Minga *et al*., 1989). In central Ethiopia a seroprevalence rate of 32.22% was reported in local scavenging chickens raised under a traditional management system in three selected agricultural-climatic zones (Tadesse *et al.,* 2005). Also a serological study conducted in the three ecological zones of Benin (South, Central and North) showed a seroprevalence in chickens of 56%, 75% and 69%, respectively (Bell, 1992). There are no reports in available literature on the seroprevalence of ND in free range local chickens in Bokkos LGA, Plateau State, Nigeria. The present study is a cross-sectional survey of the occurrence of Newcastle disease virus antibodies in free range local chickens in Bokkos Local Government Area of Plateau State, Nigeria.

Materials and Methods

Study Location: Bokkos is one of the local government areas of Plateau State, Nigeria. It is situated in the north-east area of North Central State of Nigeria. It lies between latitude 9^{o} 55' N and longitude 8^{o} 46' E of the Greenwich Meridian. Plateau State is in Guinea Savannah area of Nigeria. The area is characterized by rocky hills and many captivating rock formations. The climatic condition is greatly influenced by its strategic location on the Plateau, making Bokkos climate relatively cold, akin to what obtains in the temperate climate. Temperature ranges from 11°C to 30°C with an annual rainfall of 150 cm, lasting between 6 to 7 months.

Sampling Method: Convenience sampling method was adopted for this study because of the security situation in the area, and samples were collected from apparently healthy free

range scavenging local chickens from Daffo, Toff, Kwatas, Magor, Butura, and Mushere districts of Bokkos Local Government Area of Plateau State, Nigeria.

Sample Collection: A verbal consent from the owners of the free range scavenging local chickens were first obtained, and the history of vaccination were also obtained before samples were collected. Blood samples were aseptically collected from the wing vein of 200 apparently healthy free range scavenging local chickens. One millilitre of the blood sample was collected from each bird using a needle and syringe. The collected blood samples were kept in the syringes and allowed to clot. The clotted blood was left overnight at room temperature for complete serum separation. The separated serum was harvested and frozen at - 20°C for subsequent antibody immune profiling using haemagglutination inhibition (HI) test. The number of samples collected from the free range scavenging local chickens in the specific districts were: Daffo – 48, Toff – 40, Kwatas – 39, Mangor – 21, Butura – 32, and Mushere – 20. Before collecting the blood samples, ethical clearance was obtained from the Ethical Committee of National Veterinary Research Institute, Vom, Nigeria.

Serology: A one percent suspension of chicken red blood cells (RBCs) was prepared and used for the hemagglutination (HA) and hemagglutination inhibition (HI) tests according to Office International des Epizootics procedure (OIE, 2010). The HA titres of standard Newcastle disease virus (NDV) antigen was determined as described by Allan and Gough (1974) and diluted to contain 4 HA units. The reconstituted antigen containing the 4 HA units was used in the determination of test sera titres in the HI test. The HI titre for each screened sera was determined, and the geometric mean titre was calculated for each district that was sampled. Haemagglutination inhibition titres ≥ 1: 16 were considered positive.

Statistical Analysis: The mean titre values obtained from the HI test was subjected to descriptive statistics to determine the frequency and distribution of positive NDV antibody titres in Daffo, Toff, Kwatas, Magor, Butura, and Mushere district areas of the Bokkos LGA. The SPSS statistical software package (version 23.0) was used for the analysis.

Results

The overall seroprevalence of Newcastle disease virus antibodies in the study area was 55% (Table 1). The occurrence of ND virus antibodies based on the location from which samples were collected was as follows: Daffo – 66.7%, Toff – 27.5%, Kwatas – 58.9%, Mangor – 71.4%, Butura – 62.5% and Mushere – 45% (Table 1). The occurrence of Newcastle disease antibodies in females (58.8%) was higher than what was recorded for the males (48.8%) (Table 2), though the differences in occurrence between the sexes was not statistically significant ($p > 0.05$).

Discussion and Conclusion

With a seroprevalence of 55%, the result of this study showed that Newcastle disease is really endemic in free range scavenging chickens in the study area. It is believed that the antibodies detected in the free-range local chickens was probably as a result of natural infection since there was no history of vaccination of these free range local chickens in the study area. The high occurrence recorded in this study for the free range scavenging chickens is thought to be due to the free range management system that allows the birds to move from one place to another, and which makes them prone to acquire infection from both domesticated and wild birds and possibly from waste depots. The results of the present study concurs with earlier reports by Salihu *et al*. (2012), which

showed an ND virus antibody seroprevalence of 54.69% in rural household birds in Nasarawa State, Nigeria, and that of Anzaku *et al*. (2017) that reported 57% seroprevalence of ND virus antibodies in free ranging local chickens in the Federal Capital Territory Abuja, Nigeria.

In the present study, Mangor district area had the highest occurrence of Newcastle Disease antibodies of 71.4%, Daffor 66.7%, Butura 62.5%, Kwatas 59%, Mushere 45% while Toff had the least occurrence of 27.5%; these differences in the occurrence of Newcastle disease antibodies in the free range local chickens in the districts of Bokkos Local Government Area of Plateau State may be due to different levels of exposure of the chickens to Newcastle disease. Mangor has the highest occurrence of Newcastle Disease antibodies (71.4%) because most of the household in the district reported experiencing a suspected outbreak of Newcastle disease about 4 months before this study was done.

The finding in this study of Newcastle disease virus antibodies in these apparently healthy free range scavenging chickens suggests that the birds have either recovered from clinical Newcastle disease or had sub-clinical ND virus infection (Bell and Mouloudi, 1988; Olabode *et al*., 1992; Orajaka *et al*., 1999). The presence of Newcastle disease virus in free-range local chickens in the study area may pose a threat to chickens in commercial poultry farms in the area.

Based on the results of the study, it was concluded the occurrence of Newcastle disease virus antibodies in free range chickens in Bokkos LGA of Plateau State, Nigeria is 55%, and that there were variations in the occurrence across the districts and between the sexes. It was recommended that the free range chickens be vaccinated, probably with food-borne thermostable ND vaccine, which has been demonstrated to be efficacious and easy to administer for rural populations (Echeonwu *et al*., 2007; Echeonwu *et al*., 2008).

Table 1. Occurrence of Newcastle disease virus antibodies in free range local chickens sampled in the six districts of Bokkos Local Government Area of Plateau State, Nigeria. [Antibody titres ≥ 1:16 were considered positive]

Location from which samples were collected.	Total Number of samples collected.	Number of samples Positive (Titre ≥ 1: 16).	Percentage of samples that were Positive (%)
Daffo	48	32	66.7%
Toff	40	11	27.5%
Kwatas	39	23	59.0%
Mangor	21	15	71.4%
Butura	32	20	62.5%
Mushere	20	9	45.0%
Total	200	110	55%

Table 2. Sex based distribution of the occurrence of Newcastle disease virus antibodies in free range local chickens sampled at Bokkos Local Government Area of Plateau State, Nigeria. [Antibody titres ≥ 1:16 were considered positive]

Sex	Total Number of samples collected.	Number of samples that were Positive (Titre ≥ 1: 16).	Percentage of samples that were Positive (%)
Females	131	77	58.8%
Males	69	33	47.8%
Total	200	110	55%

Conflict of interest

The authors declare no conflict of interest.

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