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Preliminary evaluation of the occurrence of Newcastle disease virus in exotic breeds of chickens in Jalingo, Taraba State, Nigeria

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Abstract

Newcastle disease virus (NDV) is among the important pathogens that cause diseases in poultry, with very high economic implications. Newcastle disease is endemic in many parts of the world. Poultry is one of the most important sectors in agriculture, providing animal protein in form of meat and eggs to humans, as well as contributing to the national income through revenue. This study evaluated the occurrence of Newcastle disease virus (NDV) in selected farms and markets in Jalingo, Taraba State, Nigeria. These included Jalingo Live Bird Market, Mile Six Live Bird Market, Nukkai Farm, Magami Farm and Nature's Gift Agro Business Farm. Fifty cloacal swab samples were collected from chickens for the study. They were inoculated into 9-day old embryonated chicken eggs. Haemagglutination and haemagglutination inhibitions tests were done following standard procedures. Results showed that six out of the 50 (12%) were found to be positive with NDV. Jalingo live bird market showed highest frequency of occurrence with 3 out of 10 (30%) samples found to be positive. This was followed by Mile Six live bird market, with 2 out of 10 samples (20%) found to be positive, and Magami Farm which showed the lowest frequency of 1 out of 10 (10%) positive. It was concluded, based on this preliminary investigation that the occurrence of NDV in Jalingo and environs is 12%, and that NDV occurrence is higher in live bird markets than in farms. Routine and regular Newcastle disease vaccination was recommended.

Keywords: Newcastle disease virus (NDV); Occurrence; Embryonated eggs; Exotic breeds of chickens; Jalingo, Taraba State, Nigeria.

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Introduction

Newcastle disease virus (NDV), also known as Avian Paramyxovirus serotype I (APMV-1), is an important RNA virus in the Avulavirus genus of the Paramyxoviridae family, with global implications for poultry farming (Alexander and Senne, 2008; Shahzad *et al*., 2011; Ahmed and Odisho, 2018). The impact of Newcastle disease caused by NDV is profound, with its associated high morbidity and mortality rates, decreased egg production, egg quality deterioration and compromised overall bird performance (Orsi *et al*., 2009; Yan *et al*., 2011).

Isolates of NDV are classified into three pathotypes – lentogenic, mesogenic and, velogenic, based on virulence, clinical manifestations and mortality in infected birds, mean death time (MDT) of chicken embryos and intracerebral pathogenicity index (ICPI) in day-old chicks (Awan *et al*., 1994; Orsi *et al*., 2009). Lentogenic strains typically cause mild or asymptomatic respiratory infections, while mesogenic strains lead to acute respiratory disease with low mortality rates and sometimes neurological symptoms. Velogenic strains, including neurotropic velogenic NDV (NVNDV) and viscerotropic velogenic NDV (VVNDV) induce severe, often fatal disease (Huang *et al*., 2004).

In Nigeria, the high occurrence of Newcastle disease (ND) is attributed to rapid poultry industry expansion, high stocking densities, and inadequate biosecurity measures, which facilitate its widespread endemicity (Okwor and Eze, 2010). The virus's incubation period ranges from 2 to 15 days, with an average of approximately 5 days (Okwor *et al*., 2007). Transmission primarily occurs through infected birds shedding the virus, including those incubating the infection but not yet exhibiting clinical signs (Nwanta *et al*., 2008a and b).

The agriculture-dependent environment of Jalingo, Taraba State, Nigeria underscores the importance of livestock, with poultry being a key component. However, despite its significance, the supply of animal protein remains inadequate, exacerbating food insecurity and economic challenges (NPC, 2013). Poultry production, being relatively faster and of lower cost in terms of investment, is pivotal in addressing these challenges, especially in rural areas where it serves as a gateway to livestock farming (Illango *et al*., 2013).

Newcastle disease poses a significant threat to poultry farming in Jalingo, with its clinical presentation often resembling that of other avian diseases, often leading to misdiagnosis (Ojok, 2013). Current diagnostic methods rely on clinical history, post-mortem examination, and histopathology, which may lack accuracy (Illango, *et al*., 2003). There is a dearth of information in available literature on the occurrence of NDV in chickens in Jalingo, Taraba State, Nigeria. The present study was a preliminary evaluation of the occurrence of NDV in exotic breeds of chicken in selected farms and markets in Jalingo, Taraba State, Nigeria.

Materials and Methods

The study was done in Jalingo metropolis, the capital city of Taraba State, Nigeria. Jalingo LGA is located between latitudes $8^{o}47'$ to $9^{o}01'$N and longitudes $11^{o}09'$ to $11^{o}30'$E. It is bound to the North by Lau LGA, to the East by Yorro LGA, to the South and West by Ardo Kola LGA). It has a total land area of about 195.071 km^2. Jalingo LGA has a population of 139,845 people according to the 2006 population census, with a projected growth rate of 3% (Shawulu *et al*, 2008). Presently, it should have a projected population (2022) of 550,000 based on the 2006 population census figure of 140,318 at 2.83% annual growth rate. The LGA has 10 wards (Turaki 'A', Turaki 'B', Sintali 'A', Sintali 'B', Majidadi, Sarkin Dawaki, Kachalla Sembe, Barade, Kona and Yelwa). The

major ethnic groups of Jalingo LGA are the Fulani, Jibu Kona and Mumuye. Other ethnic groups include Hausa, Jenjo, Wurkum and Nyandang. Hausa language is widely spoken as a medium of communication for social and economic interactions (Oruonye and Abbas, 2010).

In Jalingo there are several poultry farms and live bird markets; they include the Jalingo live bird market, Nature Gift Agric Business Farm, Magami Farm, Mile six live bird market and Nukkai Farm. Fifty (50) cloacal swab samples were randomly collected from exotic breeds of chicken from these locations. The consent of the owners of the chickens were sought and obtained before using them for the study. The chickens were humanely handled and well cared for during the study.

The cloacal swabs were collected with sterile swab sticks, and introduced into sterile containers, which contained phosphate buffered saline (PBS pH 7.0), with penicillin (100µ/ml), streptomycin (50µg/ml), gentamicin (30 µg/ml) and fluconazole(25 µg/ml) (PSGF) in order to prevent contamination from bacteria and fungi. The samples were transported in ice pack, to the Microbiology Laboratory, College of Agriculture Science and Technology, Jalingo Nigeria, for analysis.

The samples were homogenized with 5ml of phosphate buffered saline (pH 7.0) containing PSGF. They were centrifuged at 3,000 rpm for 10 minutes. Nine-day old embryonated chicken eggs were used for the inoculation. The procedure of Abubakar *et al* (2020) was followed, and the procedure was carried out aseptically. The inoculated eggs were observed after 24 hours for unspecific death, while percentage mortality after 48 hours and 72 hours were recorded. Haemagglutination test was carried out to confirm the presence of Newcastle disease virus in the suspension using the method of Young *et al*., (2002). A drop of 1% chicken red blood cells was mixed with a drop of allantoic fluid stock on a tile and was gently rocked for visible agglutination which was an indication of viral activity. Observations were recorded. The mean death time in 9-day old embryonated chicken eggs was based on the procedure of Chollom *et al* (2013). The positive samples from haemaglutination test were confirmed by haemagglutination inhibition (HI) test according the procedure of Alexander and Chettle (1977).

Results

Occurrence of Newcastle Disease Virus in the study area: Out of 50 cloacal swab samples collected from the chickens, six (12%) was found to be positive for NDV (Table 1). There was higher occurrence of NDV in the live bird markets (Jalingo and Mile six Live Bird Markets) when compared to the farms (Magami farm, Natures Gift Agric Business farm and Nukkai farm) [Table 1].

Discussion and Conclusion

This finding in the present study of 12% occurrence of NDV in Jalingo Taraba State, Nigeria is relatively lower than the 12.5% occurrence reported by Hamisu *et al* (2016) in Kaduna State Nigeria and the 21% reported by Shitu *et al* (2016) in Gombe, Nigeria. It is thought that the differences may be due to the season of the year during which the study was conducted.

The higher occurrence recorded in live bird markets relative to farms in this study is thought to be as a result of the fact that live bird markets constitute a congregation point for birds from different locations and there are no biosecurity measures in place at such markets, but most farms have biosecurity measures in place to protect the farms.

It was concluded that the occurrence of NDV in Jalingo and environs was 12%, though the

study was constrained by the small number of samples (50) evaluated. Further and more extensive survey work is recommeded, and increasing public awareness on ND and its control measures is advocated.

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Table 1. Occurrence of Newcastle Disease Virus (NDV) in live bird markets and farms in Jalingo, Taraba State Nigeria.

S/No	Farm/Live bird market	No. of samples collected	No. of samples that were positive (HA & HI)	Percentage of samples that were positive
1.	Jalingo live bird market	10	3	30
2.	Mile Six live bird market	10	2	20
3.	Magami Farm	10	1	10
4.	Nature's Gift Agric Business Farm	10	0	0
5.	Nukkai Farm	10	0	0
	Total	**50**	**6**	**12%**

Conflict of Interest

The authors of this manuscript hereby certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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