



NIGERIAN VETERINARY JOURNAL

ISSN 0331-3026

Nig. Vet. J., March 2023

Vol 44 (1): 12 - 20.

<https://dx.doi.org/10.4314/nvj.v44i1.2>

ORIGINAL ARTICLE

SEROPREVALENCE STUDIES OF INFECTIOUS BRONCHITIS VIRUS (IBV) IN CHICKENS IN SOME AREA COUNCIL IN FCT, NIGERIA

Agbato, A. O^{1*}; Olabode, O. H²; Mailafia, S²; and Agbato, O. A³.

¹Veterinary Diagnostic Laboratory, Animal Care Service Konsult (Nig) Limited, Abuja, Nigeria. ²Department of Veterinary Microbiology, Faculty of Veterinary Medicine, Abuja. ³Federal College of Animal Health and Production Technology, Moor Plantation Ibadan. *Corresponding author: Email: olayinmol@gmail.com; Tel No: + 234 806 262 7359.

ABSTRACT

Avian Infectious Bronchitis (AIB) is a viral disease of serious economic importance characterized by coughing, sneezing, loss of weight and drop in egg and quality. There is paucity of information its occurrence and distribution in Abuja-FCT, Nigeria. Hence this study was conducted to establish the seroprevalence the virus (IBV) among selected poultry types (local chickens, broilers, pullets, and cockerels) in some area councils within FCT. A total of 360 sera were collected and subjected to Enzyme linked immunosorbent assay (ELISA) at Animal Care Laboratory Nyanya, Abuja. The study found an overall prevalence of 80.56% (290/360). While the distribution according location showed the prevalence of 89.17% (107/120) in Kuje area council, 73.30% (88/120) in AMAC, and 79.10% (95/120) in Kwali area council. The distribution according to type of birds showed prevalence of 74.44% (67/90) for broilers, 78.88% (71/90) for cockerels, 71.11%(64/90) for pullets and 97.77% (88/90) for local chicken. The distribution of IBV occurrence according to management showed that the prevalence bird managed under the deep litter systems was 85.88%, while the prevalence in birds managed under cage system 56.00%. In conclusion, this study found an 80.55% prevalence of infectious bronchitis, associated with increased poultry activities. It is therefore recommended that more public education about infectious bronchitis viral disease be carried out in addition to laboratory diagnosis and other preventive measures.

Key words: Prevalence, Virus, Poultry, Analytic method, FCT, Nigeria.

INTRODUCTION

Poultry industry in Nigeria has been rapidly expanding in recent years and is therefore one of the most commercialized (capitalized) Agricultural subsectors (USDA 2013). The fact that poultry has many advantages over other livestock explains its popularity. Poultry birds are efficient at converting feed into usable protein in the form of meat and eggs. The unit costs of production remain relatively low, and the Return on investment (ROI) is high (Aboki *et al.*, 2013). Despite these advantages, poultry production has not kept up with rapidly rising domestic demand, with the domestic shortfall being estimated at 25,000 MT per annum (Rothschild, 2002). Diseases have been reported as major problem of poultry production in Nigeria (Anosike *et al.*, 2018), which reduced gross profit of production and limit the supply of poultry products. They can be broadly categorized into those affecting the general health of the birds such as respiratory and neoplastic diseases, and those that affect the production capacity of the bird in terms of egg and meat production (Cavanagh and Nagi, 1997). While some others affect the reproductive organs of birds, reducing egg production significantly. Such diseases of viral origin include infectious bronchitis (IB) (Shetima *et al.*, 2016), Newcastle disease (ND) (Ameh *et al.*, 2016) and egg drop syndrome (EDS) (Ezeibe *et al.*, 2008). One of the most economically significant diseases is infectious bronchitis. It is an acute, highly contagious chicken disease characterized by tracheal rales, coughing, sneezing, and an excess of mucus in the bronchi (Ramakrishnan and Kappala, 2019). IB is caused by the infectious bronchitis virus (IBV). It is a single-stranded RNA virus with an envelope that belongs to the genus Gamma coronavirus, subfamily Coronavirinae, family Coronaviridae, and order Nidovirales. It has a 90-

200 nm-diameter envelope with spikes that are club-shaped surface projections. IB affects all ages of chickens as well as pheasants (Britton and Cavanagh 2007; Cavanagh *et al.*, 2002). The disease spreads via the air, direct chicken-to-chicken contact, and mechanical transmission (contaminated poultry equipment or egg packing materials, manure used as fertilizer, farm visits, etc.). Infectious Bronchitis is Characterized by decrease in weight gain, feed efficiency, egg production and quality (Hassan and Abdul-Careem, 2020) which lead to serious economic loss. Hence, the occurrence and distribution of infectious bronchitis is poorly understood and under estimated. The IB clinical signs mimics Newcastle disease, Egg drop syndrome and Chronic respiratory disease (Emikpe *et al.*, 2010). Serological evidence for the prevalence of IBV in Eastern Nigeria was shown early in the 1990s (Komolafe *et al.*, 1990), followed by (Ducatez *et al.*, 2004; Owoade *et al.*, 2006) where a sero-prevalence of 84% was detected in 1059 commercial chickens in the south-western part of the country. Over 1000 chickens from commercial farms, live bird markets, and backyard farms in Nigeria and Niger were tested for the presence of the infectious bronchitis virus (IBV) genome between 2002 and 2007 by Ducatez *et al.* (2009). According to Emipke *et al.* (2010) research, the prevalence of IB in commercial birds was 90.91% in breeders, 91.67% in layers, and 63.0% in growers. He attributed the prevalence in his study to vaccination against IB virus, which is usually administered to breeders in the first week of life, whereas the prevalence in layers and growers may be due to field infection with IB virus, as maternal antibodies are expected to have waned between three and four weeks of

life (Cavanagh and Nagi, 1997). In his study, the prevalence of IB in indigenous chickens was 78.32%. This was lower than the 91.3% found in a study of indigenous chickens in Kano (Oyejide *et al.*, 1988). According to his study, IB prevalence rates in Lagos and Ogun states are 96.97% and 91.30%, respectively. This is due to the high concentrations of poultry farms in these states. Adebisi *et al.* (2017), also conducted research on IBV. In the southwest Nigerian states of Oyo and Osun, researchers looked for infectious bronchitis antibodies in free-living pigeons, free-range indigenous chickens, and intensively reared Japanese quails. A total of 184 apparently healthy unvaccinated birds were sampled, including 61 captured free-living pigeons, 60 free range indigenous chickens, and 63 intensively reared Japanese quails. These birds' sera were tested for IB virus antibodies using a commercial ELISA kit (IBV). The birds came from the Nigerian states of Oyo and Osun in the southwest. Overall, 63 (34.2%) sera were positive for IBV, with pigeon sera accounting for 3.3% (2/61), 95.0% (57/60) from indigenous chickens, and 6.3% (4/63) from Japanese quails, respectively. This implies that the infection was more prevalent in indigenous chickens than in quails and pigeons. This lends credence to indigenous chickens' potential role in virus transmission, particularly to commercial poultry (Adene *et al.*, 1985) and possibly to other birds. Musa *et al.* (2017) detected antibodies to avian infectious bronchitis virus in three states in northern Nigeria; he proposed natural exposure to this virus because no vaccination is given to these bird species. The level of poultry activities is on the increase in Abuja and characterized by losses due to respiratory related disease categorized either as Mycoplasma, Newcastle viral disease and or undiagnosed etiology. These groups of undiagnosed outbreak may likely constitute possible occurrence of IB since its clinical signs

mimics Newcastle viral disease and in addition to unpopular use of IB vaccine by some famers. The purpose of this study was to use an ELISA assay to determine the prevalence of the infectious bronchitis virus (IBV) among some poultry bird types in relation to their management in the Federal Capital Territory.

MATERIALS AND METHODS

Study area

The research was conducted in Abuja, the Federal Capital Territory (FCT). FCT is located between latitude 7° 25' N and 9° 20' North and longitude 5° 45' and 7° 39' East. FCT is part of the West African sub-savannah region's zone vegetation. Abuja has a land area of 8,000 square kilometers and is located in the center of Nigeria. It is bordered by Kaduna state on the north, Niger state on the west, Nasarawa state on the east and south-east, and Kogi state on the south-west.

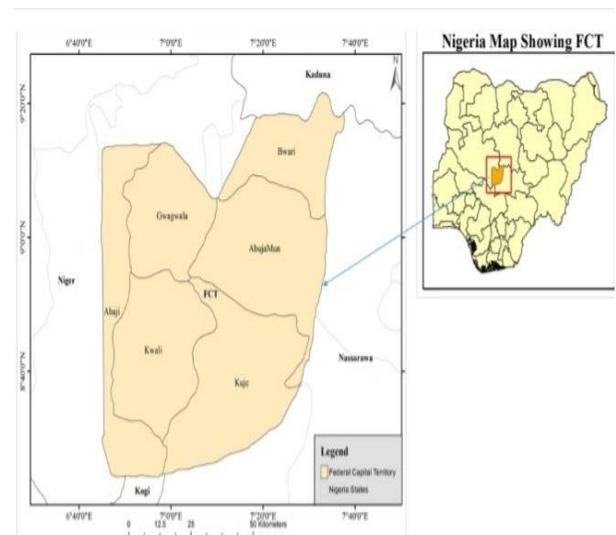


Figure 1: Map showing the study location.

Sample Size Determination

The sample size for the sero-survey study was calculated using the formula by Thrusfield (2005) at 95% confidence interval level, 26.6% prevalence gotten by Shettima *et al* (2016) in surveillance carried out in Bornu state was used for this study.

$$N = \frac{Z^2pq}{d^2}$$

Where:

n = sample size

Z appropriate value for the standard normal deviate for the desired confidence = 1.96

P = prevalence (26.6 % prevalence for *infectious bronchitis* obtained by shettima *et al.*, 2016).

q = 1-p

d = desired absolute precision = 0.05

Therefore, 26% (0.266) prevalence for Infectious bronchitis (Shettima *et al.*, 2016)

$$n = \frac{1.96^2 \times 0.266 \times (1-0.266)}{0.05^2}$$

$$n = \frac{3.8416 \times 0.266 \times 0.734}{0.0025}$$

n = 300

For more accuracy and precision, the sample size was increased to 360

Blood Sampling and Storage

Blood samples (360 samples) were collected from Abuja's live bird market, farms, and homes, from birds that were above 4 weeks old with no prior history of vaccination against infectious bronchitis or with an unknown history of vaccination. Random sampling technique via convenience was used for this study. Each bird was sampled via venipuncture (using the wing vein) the area around the bleeding site was disinfected, and the needle was inserted inside the vein in the direction of blood flow; once inside the vein, the plunger was gently pulled, and blood flowed into the syringe). Also blood samples were collected at slaughter point into labeled plain sample tubes from chickens (Local chicken, Broilers, Pullets and Cockerels) samples were labeled based on area council name and little history about the flock except for those collected at the live market. The distribution of the sample collected is shown in table 1.

Table I: Showing Distribution of Samples Collection across the Area Council

Area Council	Broilers	Cockerel	Pullets	Local chicken
Kuje	30	30	30	30
AMAC	30	30	30	30
Kwali	30	30	30	30

The blood was transported on ice from the collection point to the Animal Care Laboratory in Abuja and kept at room temperature to clot. After clotting, the blood was centrifuged at 1500rpm for 5 minutes to separate the clarified sera for use in the serological test. The sera were kept in a refrigerator with a constant power supply prior to analysis. (Emikpe *et al.*, 2010).

Serology

The sera were screened for infectious bronchitis virus antibodies using an indirect enzyme-linked immunosorbent assay (ELISA) as previously used by Shetimma *et al.*, (2016). Prior to assaying, samples were diluted five hundred times (1:500) with sample diluent. 100µL of UNDILUTED Negative Control was dispensed in duplicate wells. 100µL of UNDILUTED Positive Control was also dispensed into duplicate wells. 100 µl of diluted sample was poured into appropriate wells and incubated for 30 minutes at 18-26°C. All wells' liquid content was aspirated into the appropriate waste reservoir, and the well was washed 3-5 times with approximately 350 µl of distilled water before being completely aspirated. Following that, 100 µL of Conjugate was dispensed into each well and

incubated for 30 minutes at 18-26°C. All well liquids were aspirated into the appropriate waste reservoir, and the well was washed 3-5 times. All wells' liquid content was aspirated into the appropriate waste reservoir, each well received 100µl of TMB Substrate, which was incubated for 15 minutes at 18-26°C before being stopped with 100 µl of Stop Solution. The plate's absorbance was measured at 650nm.

RESULTS

Out of the 360 sera 80.56% (290/360) were positive for Infectious bronchitis virus antibodies and 19.44% were negative. The overall prevalence in Kuje area council was 89.17% (107/120) and that of AMAC was 73.30% (88/120) while Kwali area council had 79.10% (95/120). Broilers screened had the prevalence of 74.44% (67/90), while cockerel had 78.88%, (64/90) , pullets had 71.11% (64/90) and local chicken had 97.77%(88/90). Birds managed on deep litter had prevalence of 85.88% and Birds managed on cage system had 56% as shown in Tables II, III and IV.

Table II: Distribution of detected IB antibodies using indirect ELISA according to bird types.

Bird type	Total Number	No of Positive Sera	No of Negative Sera
Broilers	90	67(74.44%)	23(25.55%)
Cockerel	90	71(78.88%)	19(21.11%)
Pullets	90	64(71.11%)	26(28.88%)
Local chicken	90	88(97.77%)	2(2.22%)

Table III: Distribution of IB antibodies according to Area Council.

Name of Area Council	Total number of samples	No of positive sera	No of Negative Sera
KUJE	120	107(89.12%)	13(10.83%)
AMAC	120	88(73.33%)	32(26.66%)
KWALI	120	95(79.17%)	25(20.83%)
TOTAL	360	290(80.56)	70(19.44)

Table IV: Distribution of IB antibodies in Birds according to housing types

Housing type	Total number	No of positive sera	No of Negative sera
Floor	170	146(85.88)	24 (14.12%)
Cage	100	56(56.00%)	44 (44%)

DISCUSSION

In this study, the overall sero-prevalence of infectious bronchitis in Abuja was 80.56%. This is slightly lower compared to what was recorded in the southwestern part of Nigeria (82.7%) (Emikpe *et al.*, 2010), and that of 84% from Sokoto (Mungadi *et al.*, 2015), and 82.95% from Plateau state (Ijoma *et al.*, 2020) this could be due to high level of poultry farming in southwestern part of Nigeria and more of backyard and indigenous chicken farming in Sokoto and Plateau . However, the finding is comparably higher than the 26.6% reported by Shettima *et al.*, (2016). The reason for this might be associated with an increase in the activity of IBV among chickens and birds in the study area and also the sample size as the total samples analyzed by shettima was 188 compared to 360 samples used for this study.

The sero prevalence in the area council has Kuje with the highest prevalence 89.17% while Abuja area council has the lowest prevalence which was 73.30%, this high level of prevalence in kuje area council could be due to high level of poultry activities at the area council as there are lots of farm settlements at Kuje compared to the other area councils. Prevalence distribution according to housing system shows that birds reared on the floor has prevalence of 85.88% which is higher than those raised on the cages which has 56.00% prevalence, this shows that housing system has effect on the management and spread of this disease, as the rate of contact between the birds is higher on the deep litters and the aerosol and droplets from the mouth could contaminate the water in the drinkers and encourage the rapid spread of the disease as reported by (Ignjatović and Sapats, 2000).

Prevalence of the local chicken (97.77%) is slightly higher than the report of the study on indigenous chicken from Kano, reported by (Oyedeji *et al.*, 1988), Adebisi and Fagbohun, (2017) reported 95.0% in indigenous chicken in southwest, which almost tally with what was recorded in this study. Increase in poultry trading activities could be reason for increase in activities of the virus as the years goes by, suggesting a rapid increase in the virus's activities in our indigenous chickens because the prevalence is increasing with times. Studies on indigenous birds show that 78.32% (Emikpe *et al.*, 2010) was previously recorded in southwest before the 95.0% recorded by Adebisi and Fagbohun (2017). Research conducted on indigenous chickens in Plateau state had a prevalence of 82.95% (Ijoma *et al.*, 2020), indicating a progressive increase in the virus when compared to the 18.8% reported by Shettima *et al.*, (2016). This also lends credence to indigenous chickens' potential role in virus transmission, particularly to commercial poultry (Adene *et al.*, 1985). The occurrence of detectable antibodies to IB in these groups of apparently healthy birds with no history of prior vaccination against IB indicates that they have been exposed to the virus naturally.

CONCLUSION

This study established the presence of Infectious bronchitis Virus antibodies in poultry especially indigenous chicken in FCT. Indigenous chicken can serve as carrier that shed the virus around which might make the eradication and control of this disease very difficult.

REFERENCES

- ABOKI, E., JONGUR, A.A, AND ONU, J.I (2013). Productivity and Technical Efficiency of Family Poultry Production in Kurmi Local Government Area of Taraba State, Nigeria. *Journal of Agriculture and Sustainability* 4(1):52-66.
- ADEBIYI, A., AND FAGBOHUN, A.F., (2017). Infectious bronchitis virus in captured free-living, free-range and intensively reared birds in southwest Nigeria. *Folia Veterinaria*, 61(1): 23–26.
- ADENE, D. F., OYEJIDE, A., OWOADE, A. A., (1985). Studies on the possible roles of naturally infected Nigerian local chickens and vaccine virus in the epidemiology of infectious bursal disease. *Revue D'élevage et de Médecine Vétérinaire Des Pays Tropicaux*.38: 122—126.
- AMEH, J.A., MAILAFIA, S., OLABODE, H. O., ADAH, B.M. J, GODSPOWER, R.O, OGBOLE ,M.E., AND ALALADE , D. (2016) .Seroprevalence of Avian Newcastle disease virus antibodies in Gwagwalada FCT Nigeria. *Journal of Veterinary Medicine and Animal Health* 8(11): 193-198
- ANOSIKE, F. U., REKWOT, G. Z., OWOSHAGBA, O. B., AHMED, S. AND ATIKU, J. A. (2018). Challenges of poultry production in Nigeria: A review. *Nigerian Journal of Animal Production* 2018, 45(1): 252 – 258.

- CAVANAGH, D, NAGI, S.A, CALNEK, B.W, BARNES, H. J, BEARD, C.W, MCDUGALD, L.R, SAIF, Y.M (1997). Infectious bronchitis. In: *Diseases of Poultry, Iowa State University Press*, 511-526
- CAVANAGH, D. AND GELB, J. (2008). Infectious Bronchitis. *Diseases of Poultry* 12:117-135.
- CAVANAGH, D., CASAIS, R., ARMESTO, M., HODGSON, T., IZADKHASTI, S., DAVIES, M., LIN, F., TARPEY, I., AND BRITTON, P. (2007). Manipulation of the infectious bronchitis coronavirus genome for vaccine development and analysis of the accessory proteins. *Vaccine*, 25(30), 5558-5562.
- CAVANAGH, D., MAWDITT, K., WELCHMAN DDE, B., BRITTON, P. AND GOUGH, R.E. (2002). Coronaviruses from pheasants (*Phasianus colchicus*) are genetically closely related to coronaviruses of domestic fowl (infectious bronchitis virus) and turkeys. *Avian Pathology* 31(1):81-93.
- DUCATEZ, M. F., MARTIN, A. M., OWOADE, A. A., OLATOYE, I. O., ALKALI, B. R., MAIKANO, I., AND MULLER, C. P. (2009). Characterization of a new genotype and serotype of infectious bronchitis virus in Western Africa. *Journal of General Virology*, 90(11), 2679-2685.
- DUCATEZ, M. F., OWOADE, A. A., AMMERLAAN, W., & MULLER, C. P. (2004). Serological evidence of infectious bronchitis virus in commercial chicken flocks in Nigeria. In *IV. International symposium on avian corona-and pneumovirus infections, Rauschholzhausen, Germany, 20-23 June 2004* (pp. 87-92).
- EMIKPE, B.O., OHORE, O.G., OLUJONWO, M., AKPAVIE, S.O. (2010). Prevalence of Antibodies to Infectious Bronchitis Virus (Ibv) In Chickens in Southwestern Nigeria. *African Journal of Microbiology Research*. 4(1) 092-095
- EZEIBE, M.C, OKORAFOR, O. N (2008). tropical animal health production 40(2): 137-140.
- HASSAN M.S.H., ABDUL-CAREEM M.F. (2020). Avian viruses that impact table egg production. *animals* (basel). 2020 sep 25;10(10):1747. doi: 10.3390/ani10101747. pmid: 32993040; pmcid: pmc7601732.
- IGNJATOVIC, J., D. F. ASHTON, R. L. REECE, P. C. SCOTT, AND P. HOOPER.(2002). Pathogenicity of Australian strains of avian infectious bronchitis virus. *Journal of Comparative Pathology*. 126:115-123.
- IJOMA, S. , SHITTU, I. ,CHINYERE ,C., OLAWUYI, A., (2020). Sero-prevalence and serotypes of infectious bronchitis virus in free-range chicken in Plateau state, Nigeria . *Sokoto journal of veterinary science*. 18 (4): 221-225.
- JONES, R. C., (2010) Viral respiratory diseases (ILT, aMPV infections,IB): are they ever under control? *British Poultry Science*. 51:1—11.

- KOMOLAFE, O. O., OZEIGBE, P. C., & ANENE, B. M. (1990). A survey of avian infectious bronchitis antibodies in Nsukka, Nigeria. *Bulletin of Animal Health and Production in Africa*, 38(4), 471-472.
- MUNGADI, H. U., MERA, U. M., ADAMU, Y. A., MUSA, U., AND ACHI, C. R. (2015). Sero-prevalence of infectious bronchitis antibodies in local chickens in live bird markets in Sokoto State, Nigeria. *Scientific Journal of Biological Sciences*, 4(7), 53-56.
- MUSA, W. I., ABDULLAHI, B. Y., LAWAL, S., BELLO, M., AND ABDU, P. A. (2017). Detection of antibodies to avian influenza, infectious bronchitis and Newcastle disease viruses in wild birds in three states of Nigeria. *Sokoto Journal of Veterinary Sciences*, 15, 28-35.
- OWOADE, A. A., DUCATEZ, M. F., AND MULLER, C. P. (2006). Seroprevalence of avian influenza virus, infectious bronchitis virus, reovirus, avian pneumovirus, infectious laryngotracheitis virus, and avian leukosis virus in Nigerian poultry. *Avian diseases*, 50(2), 222-227.
- OYEJIDE, A., DEMANGAM, V.L., AKINYEMI, J.O. (1988). Serological survey of antibodies to infectious bronchitis in commercial and indigenous Nigerian chickens using ELISA. *Bulletin of Animal Health and Production in Africa* 3: 259-262.
- RAMAKRISHNAN S, KAPPALA D. (2019). Avian Infectious Bronchitis Virus. Recent Advances in Animal Virology. Jun 6:301–19. doi: 10.1007/978-981-13-9073-9_16. PMID: PMC7120852.
- ROTSCHILD, J. (2002). Nigeria Poultry and Products Poultry Update. Gain Report #Ni2025.
- SHETTIMA, Y.M., EL-YUGUDA, A.D., ZANNA, M.Y., ABUBAKAR, M.B. (2016). Serological Evidence of Infectious Bronchitis Virus among Some Poultry Species in Maiduguri, Nigeria. *Alexandria Journal of Veterinary Sciences*. 51(1): 135-139
- UNITED STATES DEPARTMENT OF AGRICULTURE (USDA). (2013). International Egg and Poultry Report.