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Serological Evidence of Infectious Bronchitis Virus among Some Poultry Species in Maiduguri, Nigeria

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Abstract

A sero-prevalence study of Infectious Bronchitis Virus (IBV) among some species of poultry (village chickens, broilers, layers, turkeys, ducks and geese) in Maiduguri Metropolis was conducted using Enzyme linked immunosorbent assay. An overall prevalence of 26.6% was observed in the study. The species distribution of the positive samples showed 5/18 (27.8%) broilers, 9/48 (18.8%) village chicken, 12/40 (30%) turkeys, 4/29 (13.8%) ducks, 6/23 (26.1%) geese and 14/30 (46.7%) layers were sero-positive to IBV antibodies. The sex distribution of the IBV positive samples revealed significant difference ($p<0.05$) between male and females. The sero-prevalence of IBV based on management system showed a significant difference ($p<0.05$) among those birds managed under intensive system (39.5%), semi-intensive (23.9%) and free range (18.7%) system. In conclusion, there is prevalence of IBV in the study area and the virus has a wide spread distribution amongst poultry species within the study area.

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1. INTRODUCTION

Infectious bronchitis virus (IBV) is a highly contagious disease of birds, it belongs to group 3 of the genus corona virus of the family corona viridea (Cavanagh and Naqi, 1997) that replicates in the cell cytoplasm and contains an un-segmented, single - stranded, positive sense RNA genome (Casais *et al.*, 2001). The virus causes a highly contagious disease in chickens with significant economic losses globally. The virus spreads rapidly in unprotected bird population (De wit *et al.*, 2010). The virus affects mainly the respiratory tract, causing tracheal rales, sneezing, coughing, reduced weight gain and mortality, particularly in broiler chicken (Poorbagh *et al.*, 2011). In hens, decreased egg production and poor egg quality are often observed. Some strains of the virus are nephropathogenic and produce interstitial nephritis and mortality (OIE, 2008). Collectively, the pathological effect of IBV makes it one of the most important single cause of infectious disease-related economic loss in poultry production (Cavanagh, 2005).The disease can result to high mortality in young chicken when it is complicated with secondary bacterial infection such as Escherichia coli and mycoplasma (Cavangh and Naqi 1997).

The disease is transmitted through the air, hence it is an air-borne infection, direct bird to bird contact and indirectly through mechanical spread have also been indicated to be a route of transmission (Cavanagh and Gelb, 2008). The effects of this disease have been a problem to the poultry industry worldwide and it is a challenge to the livestock industry and producers of specific pathogen free eggs (SPF). The objective of the study is to determine the prevalence of the infectious bronchitis virus(IBV) among some poultry species in Maiduguri, using an ELISA assay.

2. MATERIALS AND METHODS

2.1. Study area

This study was carried out in Maiduguri Metropolis, the capital city of Borno State, Nigeria (Figure 1). The state lies between latitude 10.20^{O}N

and 13.40^{O}N to the north, longitude 9.80^{O}E and 14.40^{O}E to the east and on an area of 69.436sq/km. The State shares border with Republic of Niger to the north, Chad to the north east and Cameroon to the east (Musa and Pindar, 2005). The state has an estimated population of 4.2 million people (NPC, 2006) with an average temperature ranging between 34-40^{o}C.

2.2. Blood Sampling and Storage

A total of 188 blood samples were collected from the Maiduguri live bird market and individual farms and houses through venipuncture into labeled plain vacutainer tubes from chickens, ducks, geese and turkeys. The blood was transported immediately after collection to the Animal Virus Laboratory (AVL) of the Department of Veterinary Microbiology, University of Maiduguri on ice and kept at room temperature to clot. After clotting the blood was centrifuged at 1500 g for 5 minute, the clarified sera was then harvested and transferred into well labeled cryotubes and stored at -20^{o}C until tested.

2.3. Serology

The Elisa test was carried out following procedure outlined by the manufacturer (X-Ovo Flockscreen^{TM} Cat. No. V085, February, 2014-Xnew kit format). Microtitre plates was supplied precoated with the purified viral antigens. Diluted samples were incubated in the wells where antibody specific to IBV bound and forms a complex. Unbound materials were washed from the wells and an alkaline phosphate labeled rabbit anti-chicken IgG conjugate reagent was added, which bound to the chicken antibodies attached to IBV antigens. Unbound conjugate was washed and PMP substrate added to the wells. The degree of color development (optical density) is directly related to the amount of antibody to IBV present in the sample. An OD value of greater than 0.166 was considered positive.

3. RESULTS

The result for the ELISA carried out on the sera of different poultry species in Maiduguri, Nigeria, for infectious bronchitis virus (IBV) prevalence showed an overall prevalence of 26.6% (50/188). Out of the total of 188 sera tested for IBV antibodies, 5/18 (27.8%) broilers, 9/48 (18.8%) village chicken, 12/40 (30%) turkeys, 4/29 (13.8%) ducks, 6/23 (26.1%) geese and 14/30 (46.7%) layers were positive (Table 1).

Figure 1. Map showing the study location

Table 1: Distribution of IBV positive sera among some poultry species in Maiduguri, Nigeria.

Species	Total No. Tested	ELISA Positive(%)
Village chicken	48	9(18.8)
Broilers	18	5(27.8)
Layers	30	14(46.7)
Turkeys	40	12(30)
Ducks	29	4(13.8)
Geese	23	6(26.1)
Total	188	50(26.6)

Table 2: Sex distribution of IBV positive sera among some poultry species in Maiduguri, Nigeria.

Species	Total No tested	No (%) Male Positive	No (%) Female Positive
Village chicken	48	6(12.5)	3(6.3)
Broilers	18	5(27.8)	0(0)
Layers	30	0(0)	14(46.7)
Turkeys	40	4(10.0)	8(20.0)
Ducks	29	4(13.8)	0(0)
Geese	23	0(0)	6(26.1)
Total	188	19(10.1)	31(16.5)

Table 3: Sera prevalence of IBV among some species of poultry under different management system in Maiduguri, Nigeria

Management System	No Tested	No (%)Positive
Intensive	48	19(39.6)
Semi-intensive	92	22(23.9)
Free range	48	9(18.8)
Total	188	50(26.6)

The distribution of sex of the IBV positive samples revealed significant difference($p<0.05$) between males and females of each species .The village chicken; male 6(12.5%), female 3(6.3%), turkeys; male 4(10%), female 8(20%), layers; male 0(0%) female 14(46.7%), broilers; male 5(27.8%), female (0%) , ducks; male 4(13.8%), female (0%) and geese ; male 0(0%) female 6(26.1%). (Table2).

The prevalence of IBV based on management system showed a high prevalence among those birds raised under intensive system (39.6%), while semi-intensive (23.9%) and free range (18.8%) had the lower prevalence rates (Table 3).

4. DISCUSSION

The result of the Sero- prevalence study of IBV among some poultry species in Maiduguri Metropolis showed an overall prevalence of 26.6%. This tallies with 26% prevalence reported in the South-western Nigeria (Owoade *et al.,* 2006) and similar to 31% in Grenada (Sabarinath *et al.,* 2011) . The results obtained in this study for commercial chicken(27.8% Broilers) and (46.7% Layers) is higher when compared with the reports from previous studies in other parts of Nigeria where prevalence rates were 2.9% in yobe (Garba *et al,.* 2012), 15.3% in Jos and 3.3% in Nssuka, but comparably lower than 42.5% prevalence reported in Ibadan (Emikpe *et al., 2010).*This differences might be associated with an increase in the activity of IBV among chickens and birds in the study area.

In this study the prevalence rate in village chicken is quite low(18.8%) as compared with previous reports from south western Nigeria where a prevalence of 78% was recorded (Emikpe *et al.,2010)* and 91.3% in Kano (Oyejide *et al.,*1988), this slant differences might be connected with a lower sample size which is 48/188 used in this study. However, the reports of this study is in harmony with the study conducted by Ducatez *et al* (2009) who reported that IBV is less common in live bird markets in northern Nigeria and in backyard poultry in Niger Republic . Ironically, higher prevalence were reported in Jordan(92.9%) (Rousson *et al.,* 2009) and in Pakistan with 88% in the commercial poultry(Ahmad *et al.,* 2007).

Furthermore , the present study revealed the prevalence of IBV based on poultry types, turkeys(30%), ducks(13.8%) and geese(26,1%) were also positive for IBV antibodies, this result is quite high as compared with the study reported in Grenada, turkeys(10%) and ducks(2%) (Sabarinath et al,. 2011) and also agrees with previous finding by Liu *et al.,*(2005), were IBV was isolated from domestic birds. This differences can be associated with the environmental differences .The result of this study also revealed significant difference ($p<0.05$) in IBV infection between male and female

in all species of poultry involved in the present study, this could be due to the fact that more female were sampled than the male.

The prevalence of IBV based on management system in the different poultry types in the study area revealed a high prevalence of 39.5% among those birds raised under intensive and 23.9% under semi-intensive management systems. Domestic birds in Borno state that include village chicken, turkeys, ducks and geese commonly raised in rural communities are mainly under semi –intensive management system where birds have little or no Veterinary care and scavenge for feed most part of the day. This is the practice in most African and Asian countries and this practice encourages easy spread of infectious agents (Adene 2007; Gueye 2007).

Vaccination against IBV is not practiced in the study area as confessed by many poultry farmers, therefore, the result of this study could be an indication of natural infection of the birds. The high prevalence obtained for the different types of birds in the study area suggests an urgent need for the development of preventive and control policies against IBV in poultry farms within the study area. Future studies should include isolation and serotyping of IBV from the study area and Nigeria at large so that a suitable vaccine candidate can be developed to protect against IBV infection. Famer education on the socio economic impact of IBV should also be encouraged.

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