SHORT COMMUNICATION

Sokoto Journal of Veterinary Sciences

(P-ISSN 1595-093X: E-ISSN 2315-6201)

http://dx.doi.org/10.4314/sokjvs.v16i1.13

Shettima *et al*./*Sokoto Journal of Veterinary Sciences*, **16**(1): 90 - 94.

Seroprevalence of infectious bursal disease virus antibodies in some species of poultry in Maiduguri, Nigeria

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Publication History:
Received: 04-06- 2017
Accepted: 24-11-2017

Abstract

This study was aimed at determining the antibodies of IBDV in some poultry species in Maiduguri, Nigeria. A total of 944 serum samples were collected from village chickens, broilers, layers, ducks, turkeys and geese in Maiduguri and tested for IBDV antibodies using inzyme linked Immunosorbent assay (ELISA) and a seroprevalence of 46.6% was recorded. The species distribution showed that 33.4% of local chickens (134/401), 67.3% of layers (35/52), 50.8% of broilers (159/313), 60.6% of turkeys (77/127), 65.5% of ducks (19/29) and 72.7% of geese (16/22) sampled were positive for IBDV antibodies. Males showed a seroprevalence of 70% while females recorded 30%. IBDV seropositive sera showed that samples from broilers reacted with 31.5% middle OD values and turkeys with 9.4% middle OD values. Samples from other species reacted with lower OD values. Samples from other species reacted with lower OD values. Presence of IBDV antibodies in species other than chickens suggested that different bird species might have IBDV and could serve as reservoirs for IBDV transmission. Because of this threat to poultry industry, there is need for continuous surveillance of IBDV in all poultry species so as to institute effective preventive measures against the disease.

Keywords: ELISA, Infectious bursal disease virus, IgG, Poultry species, Serum samples

Introduction

Infectious bursal disease IBD) also called Gumboro, avian infectious bursitis or avian phrosis-nephritis, is an acute contagious disease of young birds 3-6 weeks and even 8 weeks of age (El-Yuguda & Baba, 2004) characterized by destruction of lymphoid cells in the bursa of fabricius (Abdu *et al*., 1986; Oluwayelu, 2010). Infectious bursal disease is caused by infectious bursal disease virus, a bisegmented double stranded RNA belonging to the genus *Avibirnavirus* in the family *Birnaviridae* (Parkhurst, 1964; Lukert & Saif, 1997). Both village and commercial chickens are equally affected (Akoma & Baba, 1995; El-Yuguda & Baba, 2002). The virus can be transmitted mainly from infected to susceptible birds through water, feeds, droppings and formites (Akoma & Baba, 1995). Other means of transmission such as through the intermediary role of vermines like the lesser meal worm, mites and mosquitos have also been reported (Abdu *et al.,* 1986). The disease is characterized by a short incubation period of 2-3 days (Awolaja & Adene, 1995). Clinical signs include depression, mucoid or watery diarrhoea,

dehydration, rapid loss of weight, high morbidity of up to 100% and a mortality of 20-30% with a rapid recovery in 5-7 days (Lasher & Davis, 1997). The cloacal bursa and spleen are used for the isolation of the virus (Lukert & Saif, 2003). The virus can be found in other organs such as thymus, liver and bone marrow but in significantly low quantities than in bursa (Cheville, 1967; Tanimura & Sharma, 1997). Primary cell structures of chicken embryo fibroblasts (CEF), bursa, and kidney have been used to propagate the virus. McFerran *et al.* (1980) reported that embryonating eggs have also been used with good result. Serological tests generally used for the detection of IBDV antibodies are ELISA, viral neutralization and agar gel imunodiffusion test. However, ELISA is the most commonly used test for the detection of antibodies to IBDV (Lukert & Saif, 2003). No treatment has been found to have an effect on the course of IBD and in addition, there are no reports of the use of antiviral compounds and interferon inducers for the treatment of IBD (Lukert & Saif, 2003). Consequently, proactive measures must be in place to prevent and control IBD occurrence. To achieve this, a regular and sustained surveillance of the disease is needed to know the current status in the study area and this is what this research was aimed to achieve.

Materials and Methods

Study area

This study was carried out in Maiduguri, Borno State, Nigeria. Maiduguri is the capital city of Borno State and lies between 10.20^{O} & 13.40^{O} North and 9.80^{O} & 14.40^{O}East and occupies an area of $69.436km^{2}$. Borno state shares international borders with Niger to the north, Chad to the north east and Cameroon to the east (Waziri *et al*., 2009).

Study population

A total 944 birds comprising local chickens (401), broilers (313), layers (52), turkeys (127), ducks (29) and geese (22) were used in the study. The male broilers were separated from females by their noticeable nature of big and brighter combs and wattles and thicker legs and feet.

Sampling

Blood samples were collected from different species of poultry using convenient sampling technic. The samples were collected from poultry at slaughter slabs at the point of slaughter (554); live bird markets (60); commercial farms and backyard poultry (330) using 23G sterile hypodermic needles and 2ml syringes. The blood samples were collected into plain vacutainer tubes and allowed to clot at room temperature. The sera were harvested into appropriately labeled cryotubes and stored at $-20^{o}C$ until used.

Serology

The sera were tested for the presence of IBDV antibodies using commercial ELISA kit (X-Ovo Flockscreen^{TM}) following the manufacturer's protocol in Virus Research Laboratory, Department of Veterinary Microbiology, Faculty of Veterinary Medicine,University of Maiduguri. Briefly, 50µl of diluted serum was added to each well using multichannel automated pipette and incubated at $37^{o}C$ for 30 minutes and then washed to remove excess unbound antibodies. An alkaline phosphate labeled rabbit anti-chicken IgG conjugate was added and then incubated at $37^{O}C$ for 30 minutes. The plates were washed four times with wash buffer (300µl per well) to remove unbound conjugate and phenophthalene monophosphate (PMP) substrate was added to the wells and then incubated at $37^{o}C$ for 30 minutes. The reaction was then stopped using the stop solution (sodium hydroxide). The degree of colour development (optical density) greater than 0.306 is considered positive while less than that is considered negative. In general, optical density value less than 0.306 is considered low OD value, while OD values equals and greater than 0.306 are considered middle and high respectively.

Results

The result of this study showed that IBDV antibody was detected in 440 (46.6%) of the 944 serum samples collected from some species of poultry. The species distribution showed that the sera of 33.4% of local chickens, 67.3% of layers, 50.8% of broilers, 60.6% of turkeys, 65.5% of ducks and 72.7% of geese were positive for IBDV antibodies (Table 1).

The sex distribution of IBDV seropositive samples showed prevalence of 70% among males and 30% among females (Table 2). IBDV seropositive sera showed only the broiler samples reacted with 31.5% middle OD values followed by turkeys with 9.4% middle OD values and all the remaining samples reacted with lower OD values (Figure 1).

Table 1: Distribution of IBDV antibodies among some species of poultry in Maiduguri, Nigeria

Poultry Type	Total number tested	Number (%) Positive
Local chicken	401	134 (33.4)
Layers	52	35 (67.3)
Broilers	313	159 (50.8)
Turkeys	127	77 (60.6)
Ducks	29	19 (65.5)
Geese	22	16 (72.7)
Total	944	440 (46.6)

Table 2: Distribution of IBDV antibodies based on sex among some species of poultry in Maiduguri, Nigeria

Poultry Species	Males		Females	
	No. tested	No.(%) positive	No. tested	No.(%) positive
Local chicken	251	81 (32.3)	150	53 (35.3)
Layers	NA *	NA	52	35 (67.3)
Broilers	313	159 (50.7)	0	0 (0)
Turkeys	57	51 (89.4)	70	26 (37.1)
Ducks	15	12 (80)	14	7 (50)
Geese	7	5 (71.4)	15	11 (73.3)
Total 643	308 (47.9)	301	132 (43.8)	

Key: NA*= Not Applicable

Discussion

IBDV infection has been reported to be widespread in major poultry producing countries (Cardona *et al.,* 2000), and this study also confirmed the presence of antibodies to IBDV in the study area. The specie/type specific prevalence rate shows that geese recorded the highest prevalence of 72.7%; this is followed by layers and ducks with 67.3% and 65.5% respectively. This higher prevalence might have resulted from natural infection or from close contacts with commercial chickens, since geese are not routinely vaccinated against IBDV. Similarly, the prevalence of 65.5% in ducks in this study is higher than the 19.1% reported by Oluwayelu *et al*. (2007) and 0.0% reported by Mai *et al.* (2004). The higher prevalence recorded here may be attributed to the highly sensitive and specific nature of the diagnostic tool employed (ELISA test) when compared to the less sensitive AGID used by the authors (Oladele *et al*., 2001). The high prevalence observed among layers (67.3%) in this study may be attributed to vaccination.

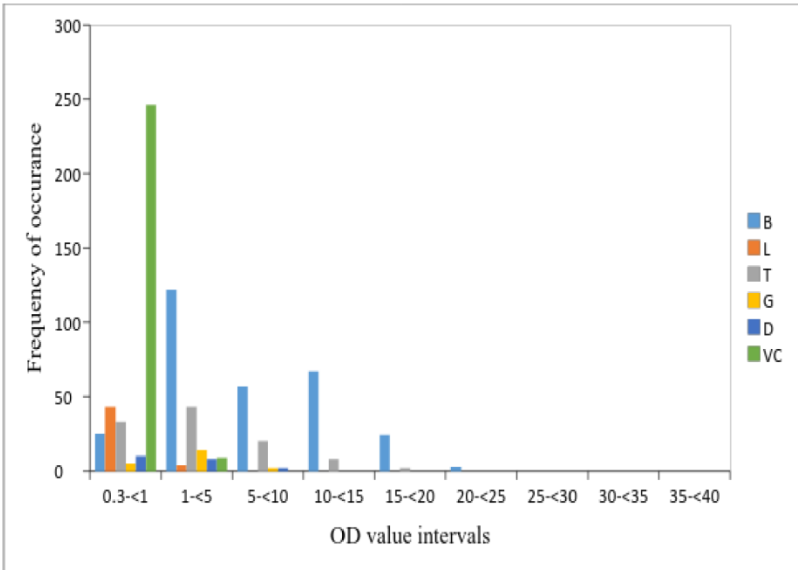

Figure 1: Bar chart showing the optical density (OD) values of IBDV antibody positive samples

Key: B= broilers; L= layers; T= turkeys; G= geese; D= ducks; VC= village chickens

In this study, local chickens showed a seroprevalence rate of 33.4%. This is lower than 63.5% reported by Lawal *et al.* (2014). The lower prevalence can be attributed to small sample size (944) in comparison to that analyzed by Lawal *et al.* (2014) (1500). It is however higher than 7.7% prevalence reported by Mbuko *et al*. (2010).

Khan *et al*. (2009) reported a prevalence rate of 7.75% in broiler in the district of Peshawar, Pakistan. This is lower than 50.8% reported in this study. This variation may be because Khan *et al*. (2009) reported their prevalence on the basis of history and detailed post-mortem examination.

The sex distribution of the IBDV antibodies observed in this study showed that males had higher seroprevalence rate (70%) than femaes (30%) (Table 2). The higher prevalence in males in this study could be due to the fact that male birds, which are mostly broilers were sampled more than the female birds in this study.

The detection of IBDV antibodies in the sera of apparently healthy, free-roaming turkeys, geese, local chickens and ducks in this study indicates natural exposure to the virus and implicates them as a potential source of infection to commercial chickens since neither vaccination nor other preventive measures are practiced in local chickens, turkeys, ducks and geese in Nigeria.

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