IJBPAS, October, 2016, 5(10): 2430-2440

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

SEROPREVALENCE OF INFECTIOUS BURSAL DISEASE ANTIBODIES IN GROWN BROILERS REARED IN RURAL AREAS OF SOUTH EASTERN NIGERIA

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Received 14th June 2016; Revised 26th July 2016; Accepted 27th August 2016; Available online 1st Oct. 2016

ABSTRACT

Infectious bursal disease [IBD], an economically important disease of poultry worldwide has been reported to be endemic in Nigeria. High sero-prevalence rates have been reported among indigenous village chickens. This study investigated IBD sero-prevalence in broilers kept for a short average period of 2 months in rural areas. A total of 560 serum samples were collected from predominantly unvaccinated broilers 6 – 9 weeks old that were reared in rural communities located in Nsukka senatorial district of South Eastern Nigeria. The samples were subjected to agar gel immunodiffusion [AGID] test for the detection of antibodies against IBD. Results showed a 6.42% sero-prevalence rate in this age group of broilers reared in rural areas. The short duration of life characteristic of broiler keeping and the intensive system of production which reduces contact of birds with the virus were suggested as the reasons for the low sero-prevalence rate when compared to that already reported for village chickens. Absence or lack of proper vaccination against the disease in the rural communities was also detected as a major problem with broiler production in rural areas as studies in commercial broilers in urban areas in some regions showed high sero-prevalence rates due to vaccinations.

Keywords: Seroprevalence, infectious bursal disease, antibodies, broilers, South Eastern Nigeria

INTRODUCTION

Infectious bursal disease [IBD], or Gumboro disease, is one of the most important poultry diseases worldwide. It causes considerable economic losses to the poultry industry through high rate of morbidity and mortality in an acute form **[1]**. It is a viral disease caused by a non enveloped virus that is classified in the group Avibirnavirus of the family Birnaviridae **[2, 3]**. Members of the family Birnaviridae are non-enveloped, bisegmented double-stranded RNA [dsRNA] viruses infecting insects, avian species and a wide range of aquatic species **[4]**. There are two antigenically distinct serotypes, serotypes I and II. The serotype I strains are pathogenic to chickens and vary in their virulence, whereas serotype II strains are present only in turkeys **[5, 6]**. Young chicks up to 6 weeks old are most susceptible to the virus, depending on their level of maternal immunity against the disease. The clinical disease in severe outbreaks are characterized by sudden onset of depression in susceptible flocks with the bursa of Fabricius, the principal diagnostic organ, being turgid, edematous, and sometimes hemorrhagic and turns atrophic within 7 – 10 days **[2]**. Dehydration and nephrosis with swollen kidneys are common, and hemorrhages in the muscle and mucosa of the proventriculus are observed in the majority of affected birds with the subclinical form of the disease resulting in immunosupression and increased susceptibility of chickens to other infections **[1]**.

Nigeria is a country of marked ecological diversity and climatic contrasts but most part fall within the tropical agro-ecological zone and enjoys the tropical climate which varies from the humid South to the semi arid/arid zones of the North **[7]**. Livestock accounts for about one third of Nigeria's agricultural GDP **[8]**, providing income, employment, food, farm energy, manure, fuel and transport. It is also a major source of government revenue.

Poultry is an import aspect of livestock in Nigeria that is growing in the mist of some challenges **[9, 10]**. Commercial poultry production which was initially practiced by urban dwellers is spreading into the rural areas of South-Eastern Nigeria with an increasing number of the rural dwellers keeping backyard poultry and an increasing number embracing intensive system of production. It has been noted that backyard poultry production [including indigenous village chicken production] and which is part of small scale poultry production represents one of the few opportunities for savings, investments and securities against

risks and accounts for approximately 90% of total poultry production in Nigeria **[11 , 10]**.

IBD is one of the major diseases limiting poultry production in Nigeria **[12]**. The disease was first reported in Nigeria by Ojo in 1973 and later confirmed by Onunkwo in 1975 **[13, 14]**. It is now highly endemic in the country **[15 - 18]**. Sero-epidemiological studies on the disease have been carried out in village chickens in Nigeria **[14, 18]**. These chickens were mostly unvaccinated scavengers reared mostly in rural areas and which thrive on a highly contaminated environment. No information is available on the seroprevalence of the disease in broilers which are gradually gaining popularities in rural communities of South-Eastern Nigeria. This paper reports the seroprevalence of IBD antibodies in grown broilers reared in rural communities in Enugu North Senatorial District of South Eastern Nigeria. The clinical significance and implications were discussed.

MATERIALS AND METHODS

Study Area

The study was carried out in Nsukka Senatorial district of Enugu State, Nigeria. This area is located at coordinates 60 51″ 24″ N and 0E latitudes 7o 23″ 45″ an average elevation of approximately 500 metres above sea level **[19]**. The area is about 55 kilometres north of Enugu, the State Capital. The area has an annual rainfall of 119.5 mm which occurs between March and October of every year representing the rainy season. The dry season falls between November and February and this period is characterized with dry harmattan. The mean annual maximum temperature is 29.67^{o}C while the lower ranges fall down to 17^{o}C. The mean relative humidity is 70 %. Most part of district are underdeveloped with poor rural roads linking up the communities. Farmers in the rural areas keep village chickens with a few that keep commercial chickens in wooden cages and very few on shabby concrete homes **[19]**. The flock size ranges from 5 – 50 chickens depending on the purchase capacity of the farmer. The farmers in the area combine this with crop production which is their major occupation.

Questionnaire

Questionnaires were administered to the farmers to have an overview of the production system, number of birds kept, vaccination history of the birds, diseases prevalent among the birds, and source of chickens. As most of the farmers could not read and write, they were interviewed and their responses recorded.

Experimental design

The study involved the collection of serum samples from broilers, 6 – 9 weeks old from farms and markets located in rural

communities in Nsukka senatorial zones. The sampling technique used for the selection of the communities and the farms was the multi- stage sampling technique as described by Araoye, **[20]**. This involved multi-stage cluster random selection where three local government areas in the zone were first identified, followed by random selection of 3 communities within a local government; within each community, 7 – 8 households/markets were randomly selected and 5 – 8 chickens sampled depending on flock size. The serum samples were screened for antibodies against IBD using agar gel immunodiffusion (AGID) test.

Serum sample collection

A total of 560 serum samples as determined above were collected from broilers aged between 6 and 9 weeks. Birds younger than 6 weeks of age were not included. Most of the birds in the area were marketed towards and at about 9 weeks of age. Samples were collected from apparently healthy birds reared intensively. Using a 5ml syringe and 22 gauge, 1.5 inch length needle, 3mls of blood was collected from the jugular veins of each chicken by venepuncture. The blood was transferred into clean bijoux bottle, kept in a slanted position on a surface at approximately 45^{o} for 25 minutes for the blood to clot. The blood samples were then transferred to the laboratory and kept in the refrigerator at +4^{o}C overnight for the clot to retract. The serum was harvested and stored at -20^{o}C until used.

Agar gel immunodiffusion (AGID) test

The test was perfomed following the procedure described in Senne, **[21]**. A 2.8mm thick layer of 0.9% agarose in 8% NaCl was prepared and circular wells 5.3 mm in diameter and 2.4 mm apart were cut out with six wells arranged around a central well. The viral antigen used was very virulent infectious bursal disease virus (IBDV) strain and positive antiserum was obtained from the National Veterinary Research Institute Vom, Plateau State, Nigeria. The antigen was placed in the central well. Three positive and three test sera were placed in alternate wells surrounding antigen in the central well and the plates were incubated at 20 – 25°C in a humid environment for 24 - 72 hours. The plates were read under good illumination and the formation of precipitin lines indicated positive reactions.

RESULTS/DISCUSSIONS

The chickens were mostly unvaccinated against IBD as most of the farmers (96%) do not vaccinate their chickens after the initial vaccination against Newcastle disease usually done using Newcastle disease vaccine Hitchner B1 (NDV, intraocular vaccine) and given intraocularly

on the day of procurement at day old in the hatchery or by the distributor. The few that vaccinated again after this could not identify the type of vaccine administered.

Out of the 560 serum samples collected from the communities, 36 were positive for antibodies against IBD while the remaining 524 were negative. This gave a 6.42% seroprevalence rate among this age group of birds (Table 1).

Most of the sero-prevalent studies in chickens in Nigeria have been in village chickens which are mostly unvaccinated. Anosa et al. **[14]** reported a sero-prevalent rate of 41% among scavenging village chicken in Nsukka area of South Eastern Nigeria. A similar study carried out in the same area by Okwor et al. **[17]** and using the same diagnostic tools showed a prevalence rate of 52.1%. A serological survey conducted to determine the prevalence of the disease in flocks of apparently healthy unvaccinated adult indigenous Nigerian ducks in Oyo and Osun States of South Western Nigeria showed a prevalence of 19.1% **[16]**. Another serological survey to detect the presence and prevalence of antibodies against infectious bursal disease virus among village chickens which was conducted in 17 villages of Yobe State in Northern Nigeria showed a prevalence rate of 63% **[22]**. The above therefore point to the endemic nature of the disease among poultry flocks especially chickens in Nigeria. The case is not different in other African countries. In Tanzania, Swai et al. **[23]** reported a prevalence rate of 58.8% in free-range village chickens. Studies in backyard village chickens in Ethiopia showed a sero-prevalent rate of 76.64 – 82.2% **[24, 25]**. Studies in the same local chickens in Niger, a border country with Nigeria showed a prevalence rate of 47.0% **[26]** and with a rapid increase to 73.9% **[27]**.

The implication of the above seroprevalence reports in village chickens is the high prevalence of the disease in our environment. The village chickens contribute a lot in the dissemination of the virus as they are mostly free range scavengers. Broiler keeping which was formerly popular among urban dwellers is increasingly becoming important in rural communities. This brings them in closer contact with the village chickens. However, it is also becoming a common practice to rear these broilers intensively in these communities as they are not as hardy as the village chickens and are also highly susceptible to most of the diseases common in the environment. This system of production guarantees profit in broiler enterprise. Unlike what is obtainable with village chickens, broilers are vaccinated

routinely against IBD but this is however obtainable in urban areas where veterinary services, electricity and good roads are available and not in rural areas where these are not available.

Since breeder flocks are vaccinated and they transfer maternal antibodies to the chicks this type of study in broilers will include maternally derived antibodies. To exclude maternally derived antibodies, younger birds below the age of 6 weeks were not screened in this survey. Maternal antibodies to IBD in unvaccinated chickens have been reported to persist in chicks up to 21 days with complete decay by days 28 and 35 post hatch **[28]**. Birds between the ages of 6 – 9 weeks were screened in the survey and this will detect antibodies developed due to contact with the field virus and those developed as a result of possible vaccination. Hussain et al **[29]** in an attempt to establish the prevalence of antibodies against IBD in different age groups of broiler birds found a prevalent rate of 78.57% in 6 – 8 weeks old broilers. The authors remarked that the reason for this high level of sero-prevalence might be due to the presence of infectious agent in the environment and the result of vaccination. Their work however did not discriminate between urban and rural areas but most of the birds sampled were reared in commercial farms where vaccination against the disease was practiced and sampling was done in and around an urban city. This was why the authors suggested vaccination as the reason for the high sero-prevalence in these broilers. To support this argument in intensively reared birds, Uddin et al., **[30]** in their investigation on the prevalence of the virus in intensively managed broiler farms recorded an infection rate of 8.42% showing contact with the infectious agent in intensively managed birds.

Table 1: Sero-prevalence of IBD antibodies in 6 – 9 weeks old broilers

Age of chickens	Total sample	No negative	No positive	% positive
6 – 9 weeks	560	524	36	6.42

Table 2: Interview results for 78 respondents in the rural areas surveyed

Vaccination after procurement of chickens	Frequency	Valid Percentage
Yes	3	4
No	75	96
Flock size		
5 – 15	32	41
16 – 30	28	36
31 – 50	18	23
Housing		
Wooden cage	41	53
Small house with concrete floor either attached or not attached to kitchen	37	47
Do you have problems with diseases		
Yes	74	95
No	=	0
Not certain	4	5

Our study showed a comparatively low seroprevalence of 6.42% in 6 - 9 weeks old commercial broilers reared in rural areas. As noted earlier, studies in local chicken have shown high prevalence of the disease in the environments under study. Though biosecurity measures which are not popular among the rural farmers allows contacts between the broilers and village chicken resulting in the spread of the virus, the intensive management system which we noted reduces contact of the birds with the infectious agent. Again the short period of keeping broilers may not have allowed enough time for the contact that will result in high seroprevalence rate. It is important to note that if the chickens were vaccinated according to the local vaccination schedule (first vaccination at 2 weeks and booster vaccination at 4 weeks), birds of this age group were expected to carry high antibodies in their serum leading to high seroprevalence. Reports show that approximately 10 – 12 days are required after proper vaccination for the development of minimal protective antibody levels and the protective level lasts for more than 4 – 6 weeks **[5, 31]**. We therefore suggest strongly that the reason for the low sero-prevalence among this age group of bird was due to the intensive system of production coupled with the short period of rearing broilers. This study also exposed the lack of vaccination against IBD in broilers reared in rural communities in South Eastern Nigeria. The lack of vaccination among most exotic chickens reared in rural areas and the possible improper administration of the vaccine where it may be practiced will be responsible for the wide differences between our observations in this study and that observed by researchers on intensively managed broilers in and around urban areas.

This lack of vaccination may to a larger extent be attributed to inadequate access to and high cost of veterinary services as veterinary outfits are not cited in these rural areas. Another reason is also due to lack of awareness by a reasonable number of the famers as most of them are not educated. Adeyemo and Onikoyi, **[8]** noted that a large number of backyard and small scale poultry farmers especially those in the rural or remote areas do not have easy access to veterinary clinical services. Bamaiyi, **[12]** remarked that the little that strain to access it find the high cost of veterinary services prohibitive and hence resort to the available quacks that wreck havoc on their chickens. This may not be peculiar to IBD alone as no adequate prophylactic measures are taken against other common diseases in the villages like Newcastle disease and fowl pox.

Problems associated with rural agricultural development in Nigeria have made it impossible for farmers to access modern agricultural techniques. Rural infrastructural and agricultural developments in Nigeria have long been neglected **[32]**. The rural areas of Nigeria are inhabited by the bulk of the nation's population and the vast majority of farmers who dwell in the rural areas have limited access to modern inputs, other productive resources and the basic infrastructures like electricity, portable water and good roads **[33]**. Nigeria's rural road network is one of the least developed in sub- Saharan Africa and the villages become virtually inaccessible during the rainy season **[32]**. These and other factors militating against agricultural development have made it impossible for farmers to take adequate control measures against diseases. It is therefore important that government pays more attentions to infrastructural developments in rural areas as this will boost agriculture especially poultry production.

CONCLUSIONS/ RECOMMENDATIONS

This paper therefore reports a low sero-prevalence rate of 6.42% in 6 – 9 weeks old broilers reared in rural communities within the study area. With the intensive system and the short period of keeping broilers, contact of the chickens with the infectious agent may not be enough to give high sero-prevalence rates as seen with local chicken. It also exposes the absence of vaccinations against the disease. Lack of infrastructural facilities in rural areas of Nigeria leading to no access to veterinary clinical services in these communities is responsible. Government should improve on the provision of infrastructures in the communities and provide extension workers to educate the farmers on the modern methods of poultry production.

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