Nigerian Veterinary Journal
Vol 34 (2) 775-780

A Serological Survey for Newcastle Disease Virus Antibodies in Village Poultry in Yobe State, Nigeria

SULE, A.G.[1*], ABDU, P.A.[2], AJOGI, J.[2] and UMOH, J.U.[2]

[1]Department of Veterinary Health and Preventive Medicine, University of Maiduguri, Nigeria,
[2]Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.
*Correspondence: suleadamu@yahoo.com, Tel: 08029805011

SUMMARY

A serological survey to detect the presence of antibodies to Newcastle disease virus (NDV) in village poultry was conducted in 17 villages of Yobe State, Nigeria. The aim of the study was to investigate the prevalence of NDV using haemaggluttination inhibition test. Ten households were sampled from each village. Five chickens were randomly selected from each household in the night for convenience of handling (6-9 pm GMT+1) and bled from their wing vein. Serum was extracted from clotted blood and screened for antibodies to Newcastle disease virus. The results showed an evidence for NDV antibodies. The prevalence of antibodies to Newcastle disease virus was 34.5% in chickens. The prevalence was 4.0% in ducks, 3.5% in guinea fowls, 23.0% in turkeys and 0.0% in pigeons. The detection of detection of NDV antibodies in village chickens and other birds reared together in Yobe State, Nigeria could serve as a base line data for future studies.

Key words: Nigeria, prevalence, village poultry, viral diseases

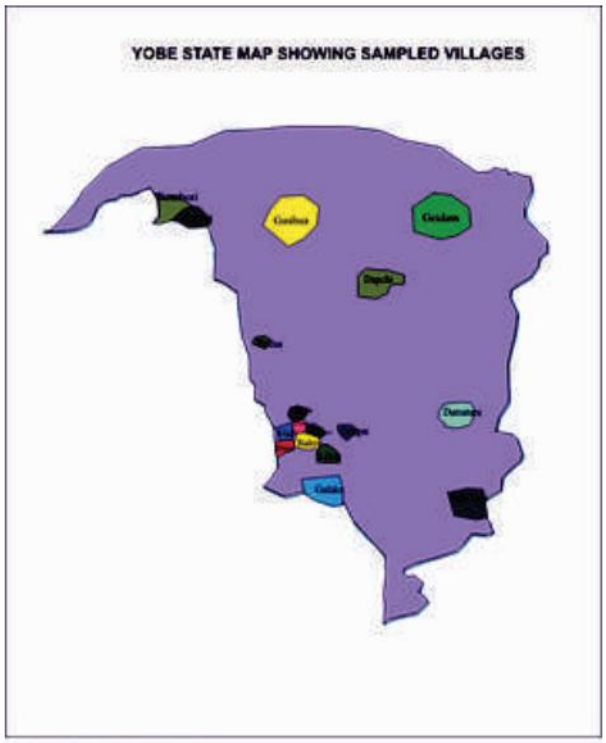
INTRODUCTION

Although, Newcastle disease (ND) have been recognized as the most important disease of village chickens in Zaria, Nigeria (Abdu *et al.,* 1992) and as the principle factor limiting village chicken production in Africa (Spradbrow, 1988; Alexander, 1991; Awan *et al.,*1994), the prevalence of the disease in village chickens have not been documented in Yobe State, Nigeria, despite the fact that chicken mortality occurs annually within a village chicken population of over 3 million FEDERAL DEPARTMENT OF LIVESTOCK AND PEST CONTROL SERVICES, (FDLPCS), 2006). The mortality of these chickens affects the economy of the poor, especially, women who largely own these birds (Gu'eye, 2000). It is for this reason that this study was designed to detect and determine the prevalence of antibodies to NDV in village chickens using haemagglutination inhibition (HI) test. The study also examined the presence and distribution of antibody to NDV in few birds that are reared together with chickens.

MATERIALS and METHODS

Study area

This study was conducted in 17 villages in Yobe, Nigeria. The people in these villages are of different ethnic groups whose occupation includes crop and livestock production, trading and fishing. The state has an estimated chicken population of 3.4 million of which 3.0 million are village poultry (FDLPCS, 2006).



Source: GIS Analysis 2012.

Sample size and distribution

The sample size was calculated using the formula outlined by Joachin (1998). The sample size of 273 was calculated using 77% expected prevalence, obtained from previous study on ND (Ezeokoli *et al.,* 1984), 5% desired precision and 95% confidence level. The sample size of 273 was increased fourfold to 1100 to obtain a result similar to that of random sampling (Martins *et al*., 1987).

The aim was to obtain serum samples from 50 village chickens. Sampling was conducted between 7.00 and 9.00 pm the time when chickens were at home and could easily be handled; and when most chicken owners were at home and have not gone to bed. The division of the sample size of 1100 by the maximum of 50 chickens to be sampled per village resulted in a total of 22 villages to be sampled for this study. The selection of the 22 villages to be sampled was undertaken using a simple random sampling (sampling without replacement) from a shuffled list of 68 villages. The list of the 68 villages was drawn from four villages for each of the 17 sampled LGAs of Yobe State. Because information from pre-tested questionnaire showed that farmers kept an average of 5-15 chickens per flock, a maximum of five adults chickens per household were bled in this study. The division of a maximum of the 50 chickens to be sampled by the maximum of five chickens to be sampled per household resulted in a total number of 10 households to be sampled from each village. The sampling of the 10 households utilized a chosen transect, the major road dividing the village into two. Five households were sampled on either side but opposite ends of a chosen transect. Beginning from the first household on either side but opposite ends of the chosen transect, every fifth household was the systematic order used in sampling the 10 households selected- with the next fifth house considered when the previous house has no chickens or has less than five chickens.

Only 17 out of the 22 selected villages were sampled. A total of 815 serum samples of village chickens were obtained from 17 villages. In addition, 45, 56, 26 and 22 serum samples were obtained from ducks, guinea fowls, pigeons and turkeys respectively, within the same period. All the serum samples were screened for antibodies to NDV by haemaggluttination inhibition (HI) test (Office des Internationale Epizooties (OIE), (2000). Excluded from the study were chicks that have recently been weaned because the farmers considered them too young for bleeding.

Collection of blood

Between 1.5-2 ml of blood were obtained from the brachial vein of adult chickens using a 2 ml syringe and a 23-gauge needle. The blood was transferred into 5 ml plastic test tube and left overnight in a cool box. Serum was extracted using a plastic micropipette and transferred into sample bottles and was frozen until tested.

Detection of antibodies to NDV

Antigen

Newcastle disease virus LaSota strain obtained from the National Veterinary Research Institute (NVRI), Vom, was used as antigen for HI-test.

The antigen titer was determined using haemagglutination (HA) test as described by OIE (2000). The titer was taken as the reciprocal of the highest dilution giving a 100% agglutination of 1% chicken RBC. This amount represents 1 haemagglutination unit (HAU). Four HAU of the virus antigen titer was calculated and diluted accordingly for use in HI test.

Test procedure

HI test was performed using the beta technique against 4HAU of the virus antigen following the procedure described by OIE (2000). The titers were expressed as $\log_2$ of the reciprocal of the highest dilution of serum giving 100% inhibition of the 4 HAU. Titers equal or higher than 4 $\log_2$ were considered positive.

Data analysis

The prevalence of antibody to NDV was calculated using the formula outlined by Bennette et al. (1991).

RESULTS

We tested 851 samples of which 281 (34.5%) were positive. All the 17 villages sampled had chickens that were positive for antibodies to NDV by HI test (TABLE I). The prevalence of antibodies to NDV was 34.5 in all the villages sampled across the state. The villages of Kukargadu and Badejo recorded the highest prevalence of 57.5% and 52.0% while the lowest prevalence of 22.5% was obtained in the villages of Budua.

Of the other village poultry sampled only pigeons did not show positive antibodies to NDV (TABLE II). The prevalence of antibodies to NDV was 4.4% in ducks, 3.6% in Guinea fowl, and 22.7 in turkeys.

TABLE I. Distribution of NDV antibodies in village chickens sampled within Yobe state

Villages Sampled	Total serum Samples	Positive serum Samples	% prevalence
Badejo	50	26	52.0
Bombori	46	19	41.3
Budua	48	11	22.9
Buniyadi	48	21	43.7
Damagum	49	17	34.6
Damaturu	48	15	31.2
Daya	50	13	26.0
Dapchi	50	15	33.3
Degubi	44	16	34.7
Gadaka	50	13	26.0
Garin-Maje	48	17	35.4
Gashua	44	15	34.0
Geidam	50	17	34.0
Jangadole	50	14	28.0
Kukargadu	47	27	57.4
Potiskum	43	11	25.5
Nguru	50	14	28.0
Total	815	281	34.5

TABLE II. Distribution of ND antibodies among other village poultry sampled within Yobe State

Species	Total serum samples	Positive serum samples	% prevalence
Ducks	**45**	2	4.4
Guinea fowls	**56**	2	3.6
Pigeons	**26**	0	0.0
Turkeys	**22**	5	22.7

DISCUSSION

The spread of NDV antibody across the state seem to suggest that the disease may be endemic.

The prevalence of antibodies to NDV of 34.5% obtained in chickens sampled in the 17 villages indicates the endemicity of NDV in Yobe state. The variation in prevalence across the villages reflects the variations in activity of the virus with high prevalence of 57.5%, 52.0% and 48% obtained from the villages of Kukar-Gadu, Badejo and Buni-Yadi respectively. The high prevalence obtained in these villages may not be unrelated to thecomplaints farmers from the sampled villages made of a disease that is associated with high chicken mortality that occurred in these villages some few weeks prior to this study. Since, a cutoff point of $4\log_2$ in HI test is an indication of a protective titer (OIE, 2000), the low prevalence obtained in Potiskum (25.6%) and Budua (22.9%) seems to suggest the building up of a susceptible population that should be the target of intervention by vaccination to boost their immunity. The prevalence of 34.5% obtained in this study was higher than the 26.0% reported in neighboring Borno state (Baba *et al.,* 1998) and lower than 53.6% in Bauchi state (Nwankiti, *et al*., 2010), 77.0% in Zaria (Ezeokoli *et al.,*1984), 41.0% across some States in Nigeria (34.0% in Kano, 54.4% in Kaduna, 40.0% in Jos) (Adu *et al.,* 1986), 38% in Ibadan (Oyewola *et al.,* 1996) and 63.0% in South-Eastern Nigeria (Orajaka *et al.,* 1999) probably because this study used a cutoff point of 4 $\log_2$ which will show a lower prevalence when compared to the study by Baba et al.(1998) who used a cutoff point of $3\log_2$ and others who determined the presence or absence of NDV using the same test.

The results obtained from the screening of the few samples obtained from other species of birds reared together with chickens were all positive with the exception of samples from pigeons. A prevalence of 0.0% was obtained in pigeon, while, a prevalence of 3.6%, 22.7% and 4.4% were obtained respectively from Guinea fowl, turkey and ducks. The result obtained from this species may be of Significance in the epidemiology and control of the disease in village chickens with implications that the virus can be transmitted across these birds and that interventions ND control should target all the birds. No infection was detected in pigeons perhaps because the sample size is small.

Prevalence of antibodies to NDV of 4.4% obtained in this study from ducks was lower than the 6.0% reported in Northern Nigeria (Ibu *et al.,* 1990) 6.7% reported in Jos (Mai *et al.,* 2004) and 16.7% reported in Zaria (Oladele *et al*., 1996). The prevalence of 3.6% in guinea fowl was lower than 13.6% obtained in Jos (Mai *et al.,* 2004). No antibodies to NDV were detected in pigeons in this study probably because the sample size is too small. Oladele et al. (1996) was also unable to detect any NDV antibody to pigeon. The prevalence of 22.7% obtained in turkeys was the highest among all the species of birds commonly reared together with village chickens indicating the possibility of high susceptibility to Newcastle disease in this species. The high prevalence obtained in turkeys may possibly be associated with vaccination from 6 of the birds purchased by a farmer who didn't know the vaccination status of the turkeys he purchased from the market for rearing about 4weeks before this study was undertaken.

The prevalence of antibodies to NDV obtained in this study shows the presence and spread of ND among village poultry sampled in Yobe State. The existence of antibodies to NDV in guinea fowls, ducks and turkeys may constitute a risk factor associated with the spread and transmission of NDV to village chickens.
Undertaken the study in the night allows for easy handling of the birds and can be adopted for conducting research on village chickens.

The authors recommend regular surveillance for antibodies to NDV as well as examination of the risk factors for Newcastle disease in village chickens to enable the institution of a suitable control program. Also recommended is vaccination of village chickens to confer protection to susceptible birds. Vaccination of other birds could also be attempted in water bowls especially when administering feed supplements.

REFERENCES

ABDU, P.A., MERA, U.M. and SAIDU, L. (1992): A study on chicken mortality in Zaria, Nigeria. Research National Workshop on Livestock and Veterinary Institute, Vom, Nigeria. August, 11-14th.

ADU, F.D., EDO, U. and SOKALE, B. (1986). Newcastle disease: the immunological status of Nigerian local chickens. *Trop. Vet.* **4**: 149-152.

ALEXANDER, D.J. (1991): Newcastle Disease. In: Rweyemamu, M.M., Palya, V., Win,T., and Sylla, D. (Eds.), Newcastle Disease Vaccine for Rural Africa. Debre Zeit, Ethiopia, Pan Africa Veterinary Vaccine Centre: 7-45.

AWAN, M.A., OTTE, M.J. and JAMES, A.D. (1994). The epidemiology of Newcastle disease in rural poultry: a review. *Avian Pathol.* **23**:405-423.

BABA, S.S., El-YUGUDA, A.D. and BABA, M.M. (1998). Serological evidence of mixed infections with Newcastle disease and egg drop syndrome 1976 viruses in village chickens in Borno State, Nigeria. *Trop. Vet.* **16**:137-141.

BENNETE, S., WOODS, T., LIYANAGE, W.M. and SMITH, D.L. (1991): A simplified general method for cluster sampling surveys of health in developing countries. *World Health Stat. Q.* **44**: 98-106.

EZEOKOLI, C.D., UMOH, J.U., ADESIYUN, A.A. and ABDU, P.A. (1984). Prevalence of Newcastle disease antibodies in local and exotic chickens under different management systems in Nigeria. *Bul.l Anim. Hlth. Prod. Afr.* **32**: 253-257.

FEDERAL DEPARTMENT OF LIVESTOCK AND PEST CONTROL SERVICES. (2006). Highly Pathogenic Avian Influenza Standard Operating Procedures.

GU`EYE, E.F. (2000). The role of family poultry in poverty alleviation, food security and the promotion of gender equality in Rural Africa. *Outlook Agr.* **29**: 129-136.

IBU, O.J., NWOSUH, C., ADULUGBA, E.P. and MAKINDE, A.O. (1990): Re-appraisal of immune status of local chickens to Newcastle and Infectious bursal disease viruses in Northern Nigeria. 27th Annual Conference of the Nigerian Vet. Medical Asso. October 29th –2nd November 1990 Maiduguri, Nigeria: 42.

JOACHIN, O. (1998): Sample size considerations. In: G. Uilenberg (ed) A Field Guide for the Diagnosis, Treatment and Prevention of African Animal Trypanosomosis. Food and Agriculture Organization of the United Nations: 151-156.

MAI, H.M., OGUNSOLA, O.D. and OBASI, O.L. (2004). Serologic survey of Newcastle disease and infectious bursal disease in local duck and local guinea fowl in Jos Plateau state, Nigeria. *Revue Elev. Med. Pays trop.* **52(1-2)**: 41-42.

MARTIN, S.W., MEEK, A.H. and UILENBERG, P. (1987): Veterinary Epidemiology: Principles and Methods. Iowa University Press, Ames 1A: 22-47.

NWANKITI, O.O., EJEKWOLU, A.J., IBRAHIM, I., NDAKA, J.A., ECHEONWU, G.O.N. (2010). Detection of serum antibody level against Newcastle disease in local chickens in Bauchi metropolis, Bauchi state, Nigeria. *Afr. J. Clin. Exp. Microbiol.* **11(2)**: 95-

101
OFFICE INTERNATIONAL DES EPIZOOTIES (2000): Newcastle Disease. In: Manual of Standards for Diagnostic Test and Vaccines: 1-15.
OLADELE, S.B., KAZEEM, H.M. and RAJI, M.A. (1996). Survey for antibodies to infectious bursal disease, Newcastle disease and fowl pox in ducks, pigeons and guinea fowls in Zaria. *Nigerian Veterinary Journal Special Edition*. **1**: 85-87.
ORAJAKA, L.J.E., ADENE, D.F., ANENE B.M.A and ONUOHA, E.A. (1999). Sero-prevalence of Newcastle disease in local chicken from South east derived savannah zone of Nigeria. *Revue d` Elevage et de Medecine Veterinaire des Pays Tropicaux*. **52**: 185-188.
OYEWOLA, K.A., OGUNDIPE, G.A.T. and DUROJAIYE, D.A. (1996). Sero-prevalence of Gumboro and Newcastle disease in local chickens in Ibadan, Nigeria. *Bul.l Anim. Hlth. prod. Afr.* **34**: 57-59.
SPRADBROW, P.B. (1988): Geographical distribution of Newcastle Disease. In: D.J. Alexander (ed.), Newcastle Disease. Kluwer Academic Publishers, Boston, MA: 247-255.