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Sero-Prevalence of Newcastle Disease in Humans and Apparently Cross-Breed of Chickens in Nigeria

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ABSTRACTS

The prevalence of new castle disease in chicken man in some state of Nigeria was investigated by a haemagglutinating antibody survey. A total of 879 sera (479 chicken and 400 humans) were tested .mean prevalence rate in man was 1.3% (12.6 in females and 14.8 in males) and varied from 8.3% to 60% in different age groups with median antibody titre of 1/64. Occupationally, prevalence rate ranged from 10.5% in civil servant to 28.8% in traders. Among apparently healthy chickens, prevalence rate ranged from 22.3% in Afikpo to 29.4% in Jos. The geometric mean antibody titre were 1.6 and 1.4 for Afikpo and Jos respectively. There is need to combat this disease through vaccination.

Key words: Serum, antigen HI, ND, geometric mean , antibody.

INTRODUCTION

Newcastle disease virus is an avian paramyxovirus that produces pneumoencephalitis in young chickens, turkeys and other domesticated and wild birds characterized by respiratory symptoms, neurological symptoms, enteritis, haemorrhagic lesions and often with high mortality. In human, it may produce inflammation of the conjunctiva. Infection in humans is an occupational disease limited to workers handling infected birds [1] and [2].

The contribution of the chicken industry to the national economy and the per-capita meat and egg consumption is very low [3]. Several factors have been suggested for the low production characteristics of free-range village chickens. The system is characterized by low input and low output, with minimal management interventions, feed supplementation, housing and disease control. This kind of production by itself is a limiting factor to sound economic and sustainable production. The low input is, however, a result of the high risk due to high mortalities experienced in village poultry. Diseases and especially the devastating Newcastle disease (ND) are perceived to be the main constraint [4] which discourages investors in this system. Ananth et al. [5] reported that circulating strains of Newcastle disease virus (NDV) are capable of causing 100% mortality in unprotected birds.

Many reports and studies [6] and [7] suggest a continuous presence of NDV in village poultry populations. Some of the risk factors that have been associated with the maintenance of NDV include: carrier chickens, village poultry

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population dynamics, other poultry species, wild birds and heterogeneity of NDV [8]. Although clinically diseased chickens are the most important hosts for NDV, latently infected birds and survivors of natural infection, which still harbour the agent, may also act as reservoirs. Village chickens may be exposed naturally to virulent virus shed from recovered birds, vaccinated birds having various levels of antibodies in their blood, non – susceptible species carrying virulent virus or susceptible birds yielding virulent virus, which may have evolved from passages in birds of mesogenic viruses [9] and [10]. It was hypothesized that the agro - ecological zone in which village indigenous chickens were farmed influenced the level of diseases occurrence. Over the years the ND is being controlled by vaccination in established poultry farms but the prevalence has not been significantly reduced [11]. Human infection has been reported in other countries [12] following laboratory and accidental transmission but the exact role of man in the epidemiology of this seemingly ubiquitous virus in Nigeria is largely unknown. This study investigated the occurrence of ND in the unvaccinated local breed of birds as well as its distribution in various cadres of Nigeria human population.

MATERIALS AND METHODS

Study Area

The study was carried out in Afikpo, Jos North, Old Aguata and Awka metropolis of Nigeria. These areas are located between Latitude 5° 52'N Longitude 7° 55'E, Latitude 9° 52'N, Longitude 8° 54'E, Latitude 6° 57'N Longitude 7° 59'E and Latitude 6° 12'N Longitude 7° 4'E within the rain forest and Guinea savannah zones of Nigeria, characterized by high rainfall and relative humidity. The annual rainfall is over 1600mm while the mean daily maximum and minimum temperatures are 32^0 and 25^0 respectively [13].

Collection of samples

Random sampling of different sexes, age and occupation was employed in case of human and in sampling of apparently healthy cross breed of chickens. Exactly 400 humans' serums of both sexes were collected from different laboratories and hospitals with Awka metropolis and of local chickens within Afikpo and Jos. The sera collected were stored at freezing temperature and later analyzed using haemaglutination inhibition (HI) test.

Haemagglutination Inhibition (HI) Test:

The serum samples were tested for NDV-H1 and NDV-C antibodies using standard H1 method as described by Allan and Gough [14] and modified by OIE [15]. The antigen used was reconstituted with allantonic fluid of 9-11 day old reared embryonated chicken eggs inoculated with ND (Komarov) vaccine obtained from the National Vertinary Research Institute, Vom, Jos, Nigeria.

RESULTS

Age Range	No. Tested	No. Positive	% +ve	Complement from Antibody Titre							
				1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256
1-10	8	5	62.50				1			2	2
11-20	18	10	55.56			1		4	2	3	
21-30	41	0	00.00								
31-40	61	2	3.28							1	1
41-50	46	1	2.17								1
51-69	21	2	9.52				1				
61& above	5	1	20								1
Total	200	21				1	2	4	2	6	5

Table 1: Prevalence of ab to NDV in man with reference to age

Sex	No. tested	No. Positive	% +ve	Complement from Antibody Titre							
				1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256
Male	76	7	9.21					1	1	2	3
Female	124	14	11.29			1	2	3	2	4	2
Total	200	21	20.5			1	2	4	3	6	5

Table 2: Prevalence of ND in man with reference to sex

Table 3: Prevalence of ND in man with reference to LGA

LGA	No. Tested	No. Positive	%+ve
Orumba North	49	6	12.24
Orumba South	57	4	7.02
Agauata North	43	4	9.80
Aguata South	40	5	12.50
Nnewi North	11	2	18.18
Total	200	21	59.74

Table 4: Prevalence of ND in man with reference to age distribution

Age Range	No. Positive/No Tested	% Positive	Com	Complement from Antibody Titre						
			1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256
1-10	2/16	12.5%				2	1	2		
11-20	8/48	16.6%						2	2	1
21-30	6/54	11.0%	1				1	2	1	2
31-40	4/46	8.7%		1	1				1	
41-50	3/19	15.7%				1		2		
51-69	1/12	8.3%					1			
61& above	3/5	60.0%		1			2			
Total	27/200	13.5%	1	2	1	3	5	8	4	3

Table 5: Prevalence of ND in humans with reference to sex

Sex	No. Positive/No. tested	% positive	Com	pleme	nt froi	n Antib	ody Tit	re		
			1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256
Male	12/81	14.8%		1	1	1	3	2	2	2
Female	15/119	12.6%	1			2	2	6	2	1
Total	200	20.5%	1	1	1	3	5	8	4	3

Table 6: Prevalence of ND in humans with reference to occupation at Awka metropolis

Sex	No. Positive/No. tested	% positive	Complement from Antibody Titre							
			1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256
Traders	15/104	28.8%		2	1	2	3	3	1	1
Drivers	2/16	13.0%						1	1	
Students	6/42	14.3%				1		2	3	
Civil servants	4/38	10.5%	1			1	1	1		
Total	27/200	13.5%	1	2	1	4	4	7	5	1

Table 7: Distribution and geometric mean antibody titre among healthy cross breed of chickens in Afikpo and Jos

X (Log ₂)	Frequency (F)	% Frequency	Frequency (F)	% Frequency	Afikpo	Jos	Afikpo	Jos
0	161		195	77.67	0	0	1.6	1.4
1	28	70.61	33	13.15	28	33		
2	18	12.28	12	4.78	36	24		
3	13	0.89	2	0.80	39	6		
4	3	5.70	1	0.40	12	4		
5	1	1.32	1	0.40	5	5		
6	1	0.44	1	0.40	6	6		
7	1	0.44	1	0.40	7	7		
8	1	0.44	2	0.80	8	16		

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9 10	1 0	0.44 0.00	5 0	1.20 0.00	9 0	27 0	
Total	228	100.00	251	100	150	128	

The result obtained in this work showed that in old Aguata, humans with the age bracket of 1-10 years had the highest prevalence rate of 62.5% while age range 21-30 had zero prevalence rate (Table 1). Conversely, in Awka metropolis, 51-60 had the highest antibody titre of 60% (Table 4). However, the highest antibody titre obtained in old Aguata was at 1:128 (Table 1). The lowest antibody titre for old Aguata and Awka were observed at 21-30 years and 51-60 years respectively.

In terms of sex, males had prevalence of 9.21% between the titre ranges of 1:32 to 1:256 in old Aguata whereas females had 11.29% with titre ranges between 1:8 to 1:256 (Table 2). Nevertheless, the prevalence to ND varied in respect to sex with males having a higher prevalence of 14.3% than females (12.6%).

More so, the prevalence of ND in man among different localities in both cities was concentrated in few places. Occupationally, traders had the highest rate (28.8%) followed by students (14.3%), while drivers and civil servants had antibody titre of 13% and 10.5% respectively (Table 6).

The results of this work also revealed the highest sero prevalence antibodies to NDV in chickens at Afikpo and Jos was obtained at Log_{20} . Within antibody titre of Log_{24} and Log_{27} , Jos had a constant frequency of 1 while in Afikpo the constant prevalence of 1 started from Log_{25} to Log_{29} . The geometric mean titres for Afikpo and Jos were 1.6 and 1.4 respectively (Table 7).

DISCUSSION

Serodiagnostic tests become a useful tool of analysis for better test performance, for reliable sensitivity and specificity [16]. The haemaglutination inhibition (HI) test is still the most widely used assay that requires cheap reagents, easy interpretation and it is a conventional serological method for measuring anti-NDV antibody levels in poultry sera and considered the standard laboratory method for diagnosis of NDV [17].

Sero prevalence of ND in humans and apparently cross breed of chickens in Nigeria was studied. Newcastle disease (ND) is a contagious disease of man and birds [18]. This ailment is assayed serologically using haemaglutination inhibition test [11]. In this study, it was observed in humans, 1-20 years recorded the highest antibody titre of 62.5% whereas the least antibody titre was recorded with 41-50 years. The high antibody titre in man could be due to the presence of mumps virus which this age is vulnerable. Moreover, at 1-20 years, the people are usually involved in sweeping poultry houses which may be infected with NDV, and through aerosol from contaminated faeces, such people may be infected with NDV [19], [20] and [21].

The study also revealed that Awka metropolis had higher antibody titre than Old Aguata. This may be attributed to the fact that Awka embark more on poultry farms contaminated with NDV than old Aguata. Old Aguata is better informed on the epidemiology of ND than ancient city of Awka. Contrarily, Tariq and Taib [16] reported that the difference in geographical and climatic situation may have little to do with the epidemiology of ND in domestic village chickens.

There is a relationship between age and Newcastle disease (P<0.05) (Table 3).

The prevalence of ND in birds from Afikpo and Jos were 29.40% and 22.30%, respectively. The result obtained from majority of the sera tested in both cities could be as a result of the absence of NDV. This agrees with the work done by Olabode et al. [11].

The geometric mean titre (GMT) were 1.6 and 1.4 for Afikpo and Jos, respectively. The prevalence of ND antibody in Afikpo was slightly higher than Jos. This was probably due to high population density of birds in Afikpo than in Jos. Similarly, these findings were also recorded by Khalafalla and Awad [22]. However our findings revealed that birds from Afikpo and Jos did not have protective ND antibody (Table 7). Furthermore, our work revealed that the presence of ND antibodies in both Afikpo and Jos were higher than 10% as reported from Malaysia by Aini [23] but lower than the sero prevalence of 60.90% recorded at Nsukka by Amadi and Iroegbu [19].

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