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Newcastle Disease in Village Chickens in the Southern and Rift Valley Districts in Ethiopia

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Abstract: A sero-prevalence study of Newcastle disease in village chickens in Ethiopia was conducted on non-vaccinated chickens raised under traditional backyard management system. The study covered dry and wet districts in the Rift Valley and Southern regions, respectively. Higher sero-prevalence rates of Newcastle disease (NCD) virus antibodies were verified in all the dry areas of the Rift Valley and in part of the wet Southern districts. Haemagglutination Inhibition (HAI) Test was used to analyze 283 chicken sera for NCD virus antibodies and the overall sero-positive rate was found to be 19.78%, (n=283). 22.51 % (n=191) sero positive chicken were found in the dry areas while 14.13 % (n=92) were positive in the wet areas. Comparison was made on the sero prevalence of dry and wet areas as well as between sexes. Chickens from all dry areas showed various titter of NCD antibody but sera collected from the high mountain wet areas were negative. The differences in the sero prevalence, however, were not statistically significant between the sexes and the agro climatic areas. In this study NCD virus circulation was evidenced in village chickens reared in various parts of Ethiopia.

Key words: Newcastle disease, sero-prevalence, village chickens, Ethiopia

Introduction

Ethiopia hosts about 56.5 million chickens (ILRI, 1983) of which indigenous birds reared under traditional or "backyard" conditions account for 99%, while only 1% are exotic breeds kept under intensive management system in commercial farms (Alamargot, 1987). As far the Ethiopian poultry farming is concerned, it is apparent that indigenous village chickens are more important than those kept under intensive management system with regard to total numbers, egg and poultry meat production (Alemu, 1987).

Wide arrays of constraints hamper the development of village chicken production in rural Ethiopia, of which rampant diseases, feed problems both in quality and quantitative terms, predation and poor housing are to be mentioned (Alemu, 1995; Dessie and Ogle, 1996). Nevertheless, poultry diseases are the standing constraints incriminated for reduction of total numbers and impairment of productivity (Tadesse, 2000; Ashenafi, 2000).

According to the work done by Ashenafi (2000) and Dessie (1996), some farmers have given up rearing poultry because of disease problems. Newcastle disease, Coccidiosis, Salmonellosis and nutritional deficiencies have been considered to be among the major diseases inflicting heavy losses in Ethiopia.

The first documented evidence of NCD in Ethiopia dates back to 1978 when an outbreak occurred in the then Eritrea, Northern part of the country. Epidemiological and Virological studies made by Nasser (1998) on intensively reared commercial chickens revealed that the Velogenic strains of NCD virus are widely distributed throughout Ethiopia. Quite recent investigations have shown that disease outbreaks with mass death of chickens are alarming and the occurrence of Newcastle disease is increasing (Ashenafi, 2000; Zeleke *et al.* Unpublished data).

Though the epidemiology of NCD is not clearly understood in village chickens of Ethiopia, field reports indicate that NCD seems the most important poultry disease epidemic inflicting heavy losses every year. There has been frequent mass death of chickens in various parts of the country, yet this has not been substantiated with laboratory investigations. The aim of the present study was, therefore, to determine the sero-prevalence of NCD in village chickens and assess its variation in different agro-ecological zones of the Southern and Rift Valley regions of Ethiopia.

Materials and Methods

Study areas: The present study was conducted in four districts of Southern Ethiopia namely Hosanna, Arbegona, Shebedino and Butajira; the three Rift Valley districts were Adami Tullu, Alagae and Awassa. The Southern districts are generally characterized by high altitude; wet climatic conditions while the latter districts are of low altitude and dry climate.

Animals and management: The poultry management pattern in the study areas were entirely free-ranging traditional system where birds scavenge in the backyard, and no investments beyond the cost of the foundation

Table 1: Description of the study chickens by sex and study site

Study Areas	Climatic zone	Number of sera collected		
Rift Valley Region	Arid/dry	Male	Female	Total
Awassa	Arid	8	23	31
Alagae	Arid	9	55	64
Adami Tulu	Arid	24	72	96
Southern Region				
Hossana	Wet	-	21	21
Butajira	Wet	12	6	18
Arbegona	Wet	13	30	43
Shebedino	Wet	3	7	10
Total		69	214	283

stock, a few handfuls of local grain and possibly simple night shades were provided and with no veterinary medical attention at all, no vaccination and drugs use.

Methodology

Questionnaire survey: Questionnaire survey was conducted to have a birds-eye-view of poultry diseases in the afore-mentioned sites. In all study areas veterinary personnel and poultry owners were interviewed with a structured questionnaire. Emphasis was given on the frequent clinical symptoms manifested whenever outbreaks of poultry diseases occurred in the respective study sites. Tentative diagnosis was made based on the classical disease manifestation and the epidemiological information whenever available.

Sera collection and testing: Totally 283 chicken sera were collected from local chickens raised by 56 randomly selected households. 2-3 ml of blood was collected from the humeral region of the wing vein with a syringe and needle of 3ml size. The syringe with blood was then kept horizontally until the blood clotted. After clotting, the syringe was returned to a vertical but inverted position and left on a bench overnight to permit the serum to ooze out. The separated serum was transferred into eppendorf tubes, labeled and stored at -20^{o}C until the Haemagglutination-inhibition (HAI) test was carried out. (HAI) test was performed to detect antibodies against NCD virus.

Serology

Haemagglutination-Inhibition (HAI) test: HAI test was done according to the procedures of Beard (1989) and OIE, (2000). The test was carried out by running two fold dilutions of equal volumes (0.025 ml) of Phosphate Buffered Saline (PBS) and test serum (0.025 ml) in a V-bottomed micro titer plates. 4 haemagglutinating units (HAU) of virus/antigen were added to each well and the plate were left at room temperature for a minimum of 30 minutes. Finally 0.025 ml of 1% (v/v) chicken RBCs was added to each well and, after gentle mixing, the RBCs were allowed to settle for about 40 minutes at room temperature. The HI titer was read from the highest dilution of serum causing complete inhibition of 4 HAU of antigen. The agglutination was assessed by tilting the plates. Only those wells in which the RBCs stream at the same rate as the control wells (containing 0.025 ml RBCs and 0.05 ml PBS only) were considered to show inhibition. A titter greater than or equal to 3 (log to base 2) was taken as positive.

Data analysis: Chi-square test was used to compute the association between explanatory variables (sex and climatic zones) and sero prevalence. 5% level of significance ($p < 0.05$) was used to determine significant differences.

Results

Sero-prevalence: The over all sero-prevalence of NCD revealed in this study was 19.78%. In the low altitude dry areas of the Rift Valley a mean sero prevalence of 22.51% was found. The highest prevalence was recorded at Alagae district (35.93%) followed by Adami Tullu (16. 66%). In the wet high land districts the mean sero prevalence was 14.13%. The highest prevalence in the wet highlands was recorded from Hossana (47.61%) followed by Butajira (16.66%). No positive sera were recorded in the remaining two districts found in higher altitude (Table 2).

29%, 95% C. I. [15.36, 43.16] of the male birds tested and 20.66 %, 95% C.I. [14.16, 27.16] of the female chicken examined were found positive for NCD virus antibodies in the drier areas. Similarly, 10.71 %, 95% C.I. [0.69, 22.11] of male birds and 15.63%, 95 % C.I. [6.73, 24.53] of the females were found positive in the wet villages. However there was no statistical significant difference among the agro ecological zones and sexes (Table 3).

Questionnaire survey: The questionnaire survey indicated that the most common disease symptoms described by the poultry farmers and the veterinary personnel's in both the dry and wet areas were sudden onset of mass death, respiratory symptoms manifested

Table 2: Sero-prevalence of NCD in different study sites

Study Areas	Agro-Climatic zone	Number of sera collected			Sero-prevalence rate of >1:40		
Rift Valley districts	Low altitude and Arid regions	Male	Female	Total	Male	Female	Total
Awassa		8	23	31	3 37.5	1 4.34	4 12.9
Alagae		9	55	64	4 44.4	19 34.54	23 35.93
Adami Tulu		24	72	96	5 20.83	11 15.27	16 16.66
Sub-total		41	150	191	12 29.26	31 20.66	43 22.51
Southern Region	High altitudes and wet regions						
Hossana	Wet	-	21	21	-	10 47.61	10 47.61
Butajira		12	6	18	3	- 16.66	3 16.66
Arbegona	Wet	13	30	43	-	-	0
Shebedino	Wet	3	7	10	-	-	0
Sub total		28	64	92	3 10.71	10 15.63	13 14.13
Total		69	214	283			56 19.78

Table 3: Sero prevalence of NCD by sex and agro-climatic zones

Prevalence	Sex		Agro-climatic zone	
	Male (n=69)	Female (n=214)	Dry (n=191)	Wet (n=92)
Positive	15(21.74%)	41(19.16%)	43(22.51%)	13(14.13%)
Negative	54(78.26%)	173(80.84%)	148(77.49%)	79(85.87%)

There was no significant difference in prevalence of NCD antibodies between the different agro ecological zones ($p > 0.05$). Similarly the difference in prevalence between sexes was insignificant.

by sneezing, abnormal respiratory sounds, nasal discharges, gastrointestinal disorders like diarrhea with green, yellowish and blood stained excreta; nervous signs including twisted necks, inability to drink and eat properly.

Scabby lesions around the eyes, swollen comb and wattle, black heads were also described by veterinary professionals in Hossana and Adami Tullu districts of the Rift Valley region.

Discussion

The present study indicated that NCD is endemic in the studied Southern and Rift Valley districts in Ethiopia. All except two sites in the wet districts showed evidence of Newcastle disease antibodies in the laboratory tested sera. The prevalence varied in different agro ecological zones. The difference, however, was not statistically significant.

The variable sero prevalence rates ranging from 12.9 to 47.6 % in this study agrees with the findings of various workers in Africa. In a similar study Yongolo (1996) reported a variable sero prevalence of 25-81.5% in Tanzania and he noted the variation in sero prevalence in different months and localities. Similarly, Eskoli (1984) has reported a 72% sero-prevalence of antibodies to NCD virus in traditionally managed, non-vaccinated village chickens in Nigeria. Japiot *et al.* (1990) reported 14 % sero prevalence in non-vaccinated village chickens in Niger. In Ethiopia 43.68 % sero positive rate of Newcastle disease was reported in the cool central highlands (Ashenafi, 2000).

The significant sero positive rate of NCD in village chickens in the present investigation is indicative of the continuous infection pressure. This might be because of the free ranging management system that allows the uninterrupted cycle of infection as the virus passes from one to the other. The chickens are also prone to acquire infection from wild birds. The local open markets where huge numbers of chickens are gathered might also serve as continuous foci of infection.

The finding in this study that NCD occurs regardless of sex and all agro climatic zones is in line with the works of Nasser (1998) who reported that NCD virus is distributed all over the country. The absence of positive sera from the wet mountainous areas in the present study needs further investigation as this disagrees with previous workers of Nasser (1998) and Ashenafi (2000). Based on the laboratory investigations, discussions with professionals working in different districts and also from the questionnaire results of the poultry farmers, the authors are convinced that the recurring wide spread mass death of chicken in Ethiopia could be attributed to Newcastle disease.

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