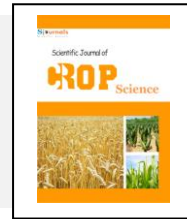


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**CROP** ScienceJournal homepage: [www.Sjournals.com](http://www.Sjournals.com)**Original article****Seroprevalence of infectious bursal disease in backyard chickens of North West Ethiopia****S.A. Kassa<sup>a,\*</sup>, W. Molla<sup>b</sup>**<sup>a</sup>College of Veterinary Medicine, Haramaya University, P.O.Box 138, Dredawa, Ethiopia<sup>b</sup>Faculty of Veterinary Medicine, University of Gondar, P.O. Box 196, Gondar, Ethiopia

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## ARTICLE INFO

## ABSTRACT

*Article history:*

Received 06 June 2012

Accepted 13 July 2012

Available online 02 August 2012

*Keywords:*

Back yard

Indirect ELISA

Infectious bursal disease

North Gondar

Seroprevalence

West Gojjam

A cross sectional study was conducted in North Gondar and West Gojjam Administrative Zones from November 2009 to June 2010 to determine the seroprevalence of infectious bursal disease by using I-ELISA (Indirect enzyme linked immunosorbent assay) test. A total of 400 chickens raised in the back yard production system, 200 from each study area, were randomly selected and examined for the presence of anti-IBD (anti- infectious bursal disease) antibody. Anti-IBD antibody was detected from 294 chickens and this gives an overall seroprevalence of 73.5% (294/400) for the entire study area, where the higher 75% (150/200) and the lower 72% (144/200) was recorded from samples collected in West Gojjam and North Gondar respectively. Even though, place of origin and sex was considered as potential risk factors, the study result shows that variation in place of origin and sex of chickens doesn't have significant influence on the occurrence of IBD (Infectious bursal disease). Generally, the higher prevalence (73.5%) reported in this study indicates that the disease is widely distributed and one of the potential threat for poultry production in the study areas.

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**1. Introduction**

Poultry breeding in Ethiopia has a long traditional practice; women are more involved in keeping back yard chickens for egg collection and selling adult chickens. This extensive breeding practice has significant role in the livelihood of the farmers (Dawit *et al.*, 2008). Mean while, there has been a gradual decline in Ethiopian poultry production, according to Burley (1957) and the Central Stastical Authority (2004-2005), the Ethiopian poultry population was estimated at 85 and 31 million in 1954 and in 2005 respectively.

Many biological and socio-economical factors are incriminated for the decrement of poultry population in Ethiopia, of which disease and poor animal health service are the two most important responsible factors worth to mention here. Among the different diseases causing damage in the poultry production in the country infectious bursal disease is the one (FAO, 2008).

Infectious bursal disease is highly contagious immunosuppressive disease caused by a virus of the genus *Avibirnavirus* of the family *Birnaviridae* (Van Den Berg, 2000; Meihong and Vikram, 2004; Herdt *et al.*, 2005; OIE, 2008). It has been described throughout the world, and its socio-economic significance is recognized worldwide (Muller *et al.*, 2003), occurring in more than 95% of member countries of OIE (Van den Berg, 2000).

The report of introduction and existence of IBD in Ethiopia has come recently with the report of IBD outbreak in Deber zeit large scale poultry farms in the year 2002 where, an over all of 49-89% mortality rate chickens and 90.30% seroprevalence of IBD antibody were reported in different farms (Zelege *et al.*, 2003). Hailu *et al.*, (2009) also documented incidence rate of 38.4 and 17.4% in two localities namely Bahir Dar and Farta, respectively in an outbreak of IBD. However, the status of the disease in free ranging back yard chickens in the country is not well documented. Therefore, the objective of this study was to determine the seroprevalence of the disease in local free ranging back yard chickens.

## 2. Materials and methods

**Study area description:** The study was conducted in North Gondar and West Gojjam Administrative Zones of Amhara National Regional State in the North Western part of Ethiopia from November 2009 to June 2010. West Gojjam Administrative Zone is situated in western part of Amhara National Regional State at an altitude range of 1500-2300 meters above sea level with mean annual rain fall of 1200-1600 mm and mean temperature of 10-20°C. North Gondar Administrative Zone is located in North west part of the same region and has an altitude that ranges from 4620 meters in the Semen Mountain in the North to 550 meters in the west. The rainfall varies from 880 mm to 1772 mm with a monomodal distribution, while the minimum and maximum temperatures are in the order of -10°C in the highland and 44.5°C in the West. The farming system in these study areas is characterized by a mixed crop-livestock production system (Bureau of Agriculture, 2006).

### 2.1. Study design and sampling procedures

A cross sectional study was conducted to determine the seroprevalence of infectious bursal disease in unvaccinated backyard chickens in 40 villages of the 6 districts found in West Gojjam and North Gondar Administrative Zones. These two zones were selected purposively because they represented the different agro-ecological zones of the region along with the dominant backyard production system and great potential for commercial poultry production. Multistage sampling technique was implemented to select districts and villages (Kebele: small administrative units in Ethiopia) from each zone.

Three districts and twenty villages (ten villages in the rural district and ten villages in town district) were selected from each zone and 10 chickens were selected from each village. A total of 400 unvaccinated back yard chickens with age greater than 3 week were randomly selected and blood sample was taken from each bird.

Sterile 3 ml/cc disposable syringe with needle size 22 (gauge) x 1 ¼" were used to collect blood sample from wing (brachial) vein of chickens. The sera poured off from the syringes in to sterile eppendorf tubes were subjected to centrifugation at 1000 rpm for clarification. Each sample was labeled accordingly and the code was directly translated to eppendorf tubes holding the clarified sera. Then the clarified sera were stored at -20°C until tested at the national veterinary institute, Deber Zeit Ethiopia.

### 2.2. Test procedure and interpretation

In this study, indirect Enzyme-Linked Immunosorbant Assay (ELISA) commercially available Proflock plus infectious bursal disease virus antibody test kit was employed and the kit manufacturer procedure was followed.

Valid IBD ELISA results are obtained when the average optical density (OD) value of the normal control serum is less than 0.250 and the corrected positive control value range is between 0.250 and 0.900. If either of these values is out of range, the IBD test result should be considered invalid and the samples should be retested. OD value range of normal control serum was between 0.07-0.2 and for positive control serum 0.45-0.82.

The IBD ELISA titer values obtained represents a comparison of the IBD antibody level within each filed chicken serum tested and the IBD ELISA kit positive and non reactive sera. Therefore, it is important first to determine that the IBD ELISA positive and normal positive control sera values obtained are valid as detailed above in the "Assay Control Values" section. For interpretation of the test results, a Sp (sample to positive ratio) of each test serum was required. Then the sample to positive ratio calculated by the following formula directed by the manufacturer:

$$SP = \frac{\text{sample absorbance} - \text{average normal control absorbance}}{\text{Corrected positive control absorbance}}$$

An IBD ELISA titer calculated by the following suggested equation by the manufacturer

$$\text{LOG}_{10} \text{ TITER} = (1.172 \times \text{LOG}_{10} \text{ Sp}) + 3.614 \text{ then,}$$

$$\text{TITER} = \text{ANTILOG OF LOG}_{10} \text{ TITER}$$

If Sp (sample to positive control) value was  $\geq 0.5$  the IBD antibody status was considered to be positive but  $< 0.5$  was taken as negative.

### 2.3. Statistical analysis

The data collected were entered and managed in Microsoft excel. An intercooled Stata 7 software (Stata Corporation, 2001) statistical program was employed for the data analysis. The prevalence of IBD was determined by dividing the number of positive serum samples by the total number of chicken serum samples tested for IBD, and was expressed as percentage. Chi-square test was used to assess if there was a statistically significant difference in IBD infection between sex groups and among different locations. For this analysis P-value less than 0.05 was considered significant whereas P value greater than 0.05 considered non significant.

## 3. Results

Of the total 400 serum samples collected 294 samples were found positive for IBD yielding an overall prevalence of 73.5% for the study area. The prevalence in West Gojjam and North Gondar was 75% (150/200) and 72% (144/200) respectively (Table 1). Though there is difference in seroprevalence of IBD between these two study areas, the difference was not statistically significant ( $P > 0.05$ ).

**Table 1**  
Seroprevalence of IBD in the two study areas.

Study area	No. Samples examined	No. Positive	Prevalence (%)
West Gojjam	200	150	75
North Gondar	200	144	72
Total	400	294	73.5

The seroprevalence of IBD in districts found in West Gojjam ranges from 72-78%. The lowest and the highest seroprevalence were recorded from Meshenti and Andassa respectively. The proportion of seropositive chickens, however, doesn't vary significantly among the three districts ( $P > 0.05$ ) (Table 2).

**Table 2**  
Seroprevalence of IBD in West Gojjam

Districts	No. Samples examined	No. Positive	Prevalence (%)
Bahir Dar town	100	75	75
Bahir Dar Zuria	50	39	78
Mecha	50	36	72
Total	200	150	75

The seroprevalence of IBD, in the three districts in North Gondar ranges from 70-73%. The lowest and the highest seroprevalence were detected from Dembya and Gondar town respectively. The difference in the frequency of detection of IBD antibody, however, doesn't vary significantly among the three districts ( $P>0.05$ ) (Table 3).

**Table 3**  
Seroprevalence of IBD in North Gondar

Districts	No. Samples examined	No. Positive	Prevalence (%)
Gondar town	100	73	73
Dembya	50	35	70
Gondar Zuria	50	36	72
Total	200	144	72

In our study, assessment was made to see the effect of sex on the disease prevalence. Relatively higher seroprevalence was recorded among female chickens (75.5%) than that of male ones (72.5%), but the difference between sex groups was not statically significant ( $P>0.05$ ) (Table 4).

**Table 4**  
Seroprevalence of IBD between sex groups

Sex	No. Samples examined	No. Positive	Prevalence (%)
Male	236	171	72.5%
Female	164	123	75.5%
Total	400	294	73.5

#### 4. Discussion

The result of the current study demonstrates higher prevalence (73.5%) of IBD in unvaccinated local breed back yard chickens, indicating IBD is wide spread in the study areas. The presence of anti-IBDV (anti-infectious bursal disease virus) antibodies in the sera of unvaccinated chickens was an evidence for the circulation of the virus and subsequent exposure of chickens at the field. Even though it is documented that IBD is primarily a potential threat for the commercial farms, different authors report an evidence of the importance of the disease in the loose management system where chickens are usually kept without confinement. The finding of higher seroprevalence in this production system is therefore not unexpected and our finding was in agreement with the finding of Abrar (2007), who reported a Prevalence of 76.3% in selected areas of East Showa Zone and Nigussie (2007), who reported a Prevalence of 65.9% in non-vaccinated back yard chickens in Addis Ababa and Adam Tulu areas using ELISA test. This finding was also comparable to the finding of Ibrahim and Tanya (2001), who reported 60.6% prevalence in Nigeria from village chickens and karuankaran *et al.* (1993), who reported a prevalence of 73.8% in India by using ELISA test. The finding of this study (73.5%) was higher than the finding of Reta (2008), who reported a prevalence of 39.2% in unvaccinated backyard chickens in East Shoa Zone using AGID (Agar gel immuno-diffusion) test. Studies from abroad by different authors also indicate relatively lower prevalence like 49.3% by Ndanyi *et al.* (2004) in Kenya, 34% Anjum *et al.* (1993) in Pakistan and 45% by Tsai and Lu (1993) in Taiwan. The difference in our result may be attributed to the difference in the test employed, serological survey results can vary depending on sensitivity and specificity of the diagnostic tool applied (De Wit *et al.*, 2007) and ELISA test is known to be highly sensitive than that of AGID (OIE, 2008). The prevalence between the two study areas was found to be 75% and 72%, where the higher prevalence was observed in West Gojjam and the lower prevalence was noticed in North Gondar. Though there is variation in prevalence between the study areas, the difference was not statically significant ( $P>0.05$ ). This finding was online with the finding by Nigussie (2007), who reported that the absence of variation in prevalence of infectious bursal disease in different areas. This is also in agreement with the nature of the disease, as there is no specific environmental situation that can prevent or modify the occurrence of the disease. The disease occurs worldwide in all major poultry production areas and it can be serologically evident in all age groups (Van Den Berg, 2000) and infectious bursal disease virus is very resistant to different environmental condition and it is capable of surviving in the environment for long period (Dawit *et al.*, 2007). Another author, Reta (2008) reported the effect of place of origin on the prevalence of the

disease. In his study he states higher prevalence of the disease in an area named Akaki, which is found in Addis Ababa. Our difference may attributed to the relatively high risk for chickens to get infection in Akaki, as described by Zelek *et al.* (2005) that the disease has been speculated to be introduced concurrent with increased number of commercial state and private poultry farms flourishing in the country especially in and around urban areas. So Addis Ababa is the major and the principal site where a number of commercial farms are present, hence chickens brought to this area will have higher risk of getting infection from sundry sources. From the samples collected in West Gojjam and North Gondar the prevalence ranges from 70 to 78%, where the lower and higher prevalence was observed from samples collected in Dembya and Mecha respectively. However, the difference in Prevalence among the six districts were not stastically significant ( $P>0.05$ ). The relatively higher Prevalence in Mecha may be associated with the introduction of the disease in Mecha poultry breeding and multiplication center exhibited by an outbreak and later by case report studies by Woldemariam and Wossene (2007), where 100% seroprevalence in unvaccinated chickens reported. IBD is highly contagious disease and it is described as if one chicken found positive in a certain flock the whole flock considered as infected (OIE, 2008). In this study relatively higher prevalence was recorded in female chickens (75.5%) than male ones (72.5%), however the difference was not statistically significant ( $P>0.05$ ). This finding was similar with that of Reta (2008), who reported the absence of influence of sex on the prevalence of the disease. Although infectious bursal disease is considered a problem of commercial poultry production system the current study revealed the wide spread nature of the virus in the backyard production system. In commercial production system, where a lot of chickens existing, high morbidity with a spiking death curve may attract the attention of the professionals. Nevertheless, death of two or three chickens per household in the backyard production will leave behind the importance slight. Moreover, the immune suppressive form of the disease keeps chickens susceptible to different diseases so many chickens will die now and again and the virus continues to circulate in the environment. Hence, the disease will seriously affect the livelihood of the farmers in particular and the national economy in general, as the majority of the Ethiopian poultry population is found in the extensive scavenging production system (CSA, 2008). Ahead of this, in view of the fact that circulation of the virus in the environment where there is no notice about health and related issues will expose chickens to acquire infection in their early life. Therefore, the immunosuppressive form may dominate and keeps the disease unrecognized. This masks the magnitude of the dilemma, keeping it chief only in the commercial production system. The disease could also be introduced to the different poultry farms by workers, since most of employees of farms will have poultry in their house so they will serve as a between bridge. Though, it is described that IBD introduced recently in to the country by Zeleke *et al.*, (2005) the higher prevalence of the disease in the backyard production system will be an indicative how fast the disease is spreading. Governmental farms that distribute chickens to the farmers through the extension service may contribute for the introduction and spread of the disease in the backyard production system. Therefore, a great emphasis has to be accorded particularly to the farms that distribute chickens and effective biosecurity, vaccination, follow up studies and frequent diagnosis has to be made to diagnose the disease as soon as possible before disseminating it to the farmers.

## 5. Conclusion

We conclude that though IBD was well thought-out less important in the backyard production system the existing study bare higher seroprevalence of the disease, 73.5% in the study areas signifying the disease was wide spread in backyard chickens. Variation in place of origin and sex of chickens does not have significant association with the occurrence of IBD. Therefore this study necessitates further studies on the identification of serotype(s) to design and execute appropriate control measures.

## Acknowledgements

We appreciate the support we have received from the National Veterinary Institute and Bahir Dar Regional Veterinary Laboratory, Ethiopia. To all of our family, friends, co-workers and especially to Dr. Tamiru N. we couldn't do all that we do without you ..... thanks always.

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