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Sero-prevalence Study on Foot and Mouth Disease in Selected Districts of Western Oromia

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Abstract
A cross sectional study was conducted to demonstrate the sero-prevalence and associated risk factors of Foot and Mouth virus (FMD) of cattle at Gobu-Sayo and Horro districts of western Oromia. A total of 271 blood samples were collected from cattle of above 6 months of age and sera were initially collected and stored at deep fridge(-20C^0) in BARC animal health laboratory and finally transported to National Veterinary Institute (NVI), at Debre-zait for laboratory analysis. Therefore, overall sero-prevalence of FMD virus was 13(4.8%) based ELISA test result. The study showed that there was no statically significant difference ($p>0.05$) in sero-prevalence among the age group, sex, breed and body condition considered. However, there is stastically significant difference among locations ($p< 0.05$); sero-prevalence in Horro (5.2%) district higher than Gobu-Sayo (0.8%) district. Even though, the prevalence of the disease seems low, all community of the study area in general and livestock producers in particular need to be aware the existence and economic importance of FMD virus.
Keywords: Sero-prevalence, FMD, Cattle, Western Oromia, Ethiopia

1. Introduction

Foot and Mouth Disease (FMD) is caused by a virus of the genus Aphthovirus, family Picorna viridae. There are seven serotypes of the virus namely: A, O, C, SAT-1, SAT-2 SAT-3 and Asia 1. Infection with one serotype does not confer immune protection against another. Within serotypes many subtypes can be identified by biochemical and immunological tests (OIE, 2004). The disease is characterized by high fever, loss of appetite, salivation and vesicular eruptions on the feet, mouth and teats (Thomson, 1994). The disease has a high morbidity although mortality is rare in adult animals. However, myocarditis may occur in young animals resulting in death. The recovered animals remain in poor physical condition over long periods of time leading to economic losses for livestock industries (Sangare, 2002).

FMD is endemic to most of sub-Saharan Africa, except in a few countries in southern Africa, where the disease is controlled by the separation of infected wildlife from susceptible livestock as well as by vaccination. Largely due to the endemic character of the disease, and the fact that FMD does not normally cause high rates of mortality in adult animals, FMD outbreaks are not perceived as important and are not reported or investigated further to determine the causative serotypes. However, a number of countries now realize that FMD is one of the trans-boundary diseases that should be controlled to ensure economic stability and access to lucrative international export markets for animal and animal products. FMD is an important constraint to international trade in animals and animal products (Sahle, 2004).

It specially restricts world trade in South-North direction. The endemically or sporadically infected countries, which are mainly in the south, generally face total embargoes on the export of their live animals and fresh meat to many other countries in the world (FAO, 1997). The current situation of FMD in Ethiopia is alarming. There is no national control strategy; no legislation exists for making FMD notifiable to the veterinary authorities or for animal movement restrictions to be imposed. Therefore, livestock are at risk from endemic strains as well as from antigenic variants prevailing in neighbouring countries. The official data may not reflect the reality of the disease along with the unreported cases by farmers and the few samples submitted from diagnosis (Sahle, 2004). There is no clear picture regarding the distribution pattern and prevalence of the disease in Western Oromia. Therefore, the objective of the present study was to determine the sero-prevalence of FMD and to identify some of the risk factors associated with the disease in the study area.

2. MATERIALS AND METHODS

2.1. Study area

The present study was carried out in Gobu-sayo and Horro districts of East and Horro Guduru Wollega Zones respectively. The altitude of the zones varies between 700-2500 meters above sea level, and the mean annual rainfall and temperature varies between 400-2000 mm and 15-27°C respectively. Extensive farming and pastoral systems are practiced in this area with livestock production constituting the major economic activity of the zone.

2.2. Study design

A cross-sectional sero-prevalence survey was conducted and risk factors such as age, sex, peasant association origin, herd type, herd size and cross border migration of livestock were considered. A peasant association is the association of peasants found in a certain locality where they have common grazing and watering resources. A

district can have more than two peasant associations.

Blood samples were collected from the jugular vein of randomly selected animals using vacuutainer tubes and an identification code was given to the sample. The blood samples were allowed to stand overnight at room temperature to allow serum separation. The serum samples were collected and then kept at -20°C until analysis. Finally, the sera were transported from the collection site to the National Veterinary Institute by using an icebox. The serum samples were tested using the FMD non-structural protein ELISA as described below to determine if animals in the herd had been recently infected with FMD virus thereby estimating the sero-prevalence in the herd, district or zones.

2.3. Sample size Determination

A two-stage cluster sampling technique was used to determine the sample size. The sampling frame of peasant associations was prepared with the assistance of a zonal agricultural office and was picked randomly but giving specific attention to agro ecology (low land, mid altitude and highland). To this effect the actual sample size was calculated with the following pre-determined parameters.

Confidence interval= 95%, Expected prevalence = 12.5% (NVI record), Desired level of precision= 5%
In between cluster variance= 0.0002441, the in between cluster variance was determined by estimating the standard deviation (that is, the average difference expected between individual cluster prevalence and the overall mean cluster prevalence) and then squaring the standard deviation to give the variance components between clusters (Thrusfield, 1995). The average individual owned herd size was determined to be 30 cattle in the study area.

$$g = \frac{1.962(nvc + Pexp(1-Pexp))}{nd2}$$

$$Ts = \frac{1.962 * g * Pexp(1-Pexp)}{gd2 - 1.962vc}$$

Where; n= herd size; vc= in between cluster variance; d= desired level of precision; Pexp= expected prevalence; g= number of clusters needed; Ts =Total sample size. Thus, a total of 271 animals were sampled from the selected areas.

2.4. Data Management and Analysis

The data was stored in Microsoft Excel Spreadsheet. Descriptive and analytical statistics was computed using SPSS (2007) Statistic Package for Social Sciences Version 16.SPSSInc Software. Chi-square test analysis was employed to test for association of risk factors with that of Foot and Mouth Disease infection.

3. RESULT

A total of 271 blood samples were collected from cattle above 6 months old. Thus, Out of 271 samples tested 13(4.8%) were positive with different strains of FMD-virus. The rest 258(95.2%) samples were free from FMD virus as well as Comparison was made among prevalence of FMD with its existing risk factors (location, age, sex, breed, body condition).

3.1. Location

The prevalence of FMD virus in different location is summarized in (table1). According to the result of the study indicated 8.2% and 0.8% prevalence was observed in Gobu-Sayo and Horro districts respectively and the observed difference was statically significant ($p<0.05$).

District	No. Examined	No. Positives (%)	χ^2 (p-value)
Horroo	147	12(8.2)	
Gobu-Sayo	124	1(0.8)	7.97(0.004)
Total	**271**	**13(4.8)**	

3.2. Sex

There was prevalence difference among the sex. Prevalence of FMD-virus was 3% and 6.6% in male and female respectively. However, there was no statically significant sex related difference ($p>0.05$) (Table 2).

Sex	No. Examined	No. Positives (%)	χ^2 (p-value)
Male	135	4(3)	
Female	136	9(6.6)	1.98(0.13)
Total	**271**	**13(4.8)**	

3.3. Age

Comparison was also made on the prevalence of FMD-virus with the age groups in order to investigate the presence of any association. Thus, sampled cattle were grouped into two age categories: cattle ≤ 2 years old were

grouped as young and those greater than two years (>2) were categorized as adult. According to the result of the present study described that there was statically significant age related difference ($p<0.05$) (Table 3).

Age	No. Examined	No. Positives (%)	χ^2 (p-value)
Young (≤ 2)	108	2(1.9)	
Adult(>2)	163	11(6.7)	3.41(0.05)
Total	**271**	**13(4.8)**	

3.4. Breed

The present study also tried to identify the presence of any association between prevalence of cattle FMD virus among the breeds. However, there was no statically significant breed related difference ($p>0.05$) (Table 4).

Breeds	No. Examined	No. Positives (%)	χ^2 (p-value)
Local	250	13(5.2)	
Cross-bred	21	0	1.15(0.34)
Total	**271**	**13(4.8)**	

3.5. Body condition

In this study comparison also has been done on the prevalence of FMD-virus with body condition scores. There was no statistically significant variation ($p> 0.05$) was observed among the different body condition categories (table 5).

Body condition	No. Examined	No. Positives (%)	χ^2 (p-value)
Poor	210	12(5.7)	
Good	61	1(1.6)	1.7(0.67)
Total	**271**	**13(4.8)**	

4. Discussion

The overall sero-prevalence 13(4.8%) recorded for FMD in this study is indicative of its importance in the study area. The individual animal sero-prevalence documented in this sero-survey showed low value when compared to the previous reports of 8.18%, (Molla et al., 2010) and 9.5%, (Megersa et al., 2009) in South Ethiopia (South Omo, Sidama and Gamo gofa zones). As well as extremely lower sero-positivity was recorded in this study when compared to the finding of the overall sero-prevalences of 21 and 26.5% reported by (Shale et al.2004 and Rufael et al.,2008), respectively.

In this study result, significant variation was found in prevalence of FMD between districts. The animal level sero-prevalence recorded in the two agro ecology of the districts western oromia regional sate, namely Horro 12(8.2%) and Gobu-sayo (0.8%) can be considered as low prevalence. These results are lower to the work of (Rufael et al. 2008) in Borana pastoral production system and the reports of (Megersa et al. 2009 and Gelaye et al. 2009) in which a higher sero-prevalence result were registered. Lower prevalence of the disease in these two locations namely, Horro and Gobu-sayo in case of this study could be due to different reasons like restricted herd mobility, absence communal grazing areas and agro ecology of the area. For instance (Ekboir, 1999) suggested that movements of infected animals are by far the most important dissemination and transmission means for FMD. Again (Paul et al. 1996) in northern Thiland and (Bronsvoort et al. 2004) in Cameroon observed the influence of the movement and keeping animals at homestead in the incidence of FMD.

The study result revealed there is a significant variation on sero-positivity of foot and mouth disease among the two age groups. Generally, as the study result revealed, there is higher sero-prevalence of FMD in adult animals than in young animals which was in lined with the previous reports of (Rufael et al. 2008) in Borena pastoral area, (Molla et al. 2010) in south Omo zone and (Megersa et al. 2009) in Gamo gofa and Sidama zones. On the other hand Esayas *et al*. (2009) who has done their research in Bench Maji zone of southern Ethiopia documented no significant association between sero-positivity of FMD and age of cattle.

No significant difference ($P>0.05$) was observed in the prevalence of FMD between female and male cattle in this study. This finding was consistent with the previous findings reported from different parts of Ethiopia (Esayas et al., 2009; Megersa et al., 2009), where sex appeared not to have a significant effect on sero-positivity for FMD. On the contrary, (Hailu et al. 2010) in their report on the incidence of FMD among dairy cattle in northwest part of Ethiopia documented a higher rate of incidence in female (16.63%) cattle than that of male (1.37%) cattle.

5. Conclusion and Recommendation

In conclusion, the sero-prevalence of FMD was found to be low 4.8% in the two districts of Oromia regional state of western Ethiopia. However if there is no controlling intervention, FMD cannot be ignored as nonexistence disease in the study area it can be hazard to livestock industry even with lower prevalence. Its

prevalence seems to be low, but the impact is great in international livestock trade. FMD should not be existed in a given area and should be tackled since it is a devastating and economically important animal disease. Therefore;

- Further identification and characterization of the serotypes of FMD virus in the study area is very important in order to deliver effective vaccination service for each serotypes.
- So that an efficient prevention and controlling measures like movement control, quarantine, regular vaccination, etc. has to be implemented to avoid the economic impact and dissemination of the disease called FMD in the study area.

6. Referances

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