Global Veterinaria 11 (5): 575-578, 2013
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2013.11.5.8113

# Sero-prevalence of Foot and Mouth Disease (FMD) at Dire Dawa and Its Surroundings, Eastern Ethiopia

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**Abstract:** A cross sectional study was conducted to estimate the seroprevalence of Foot and Mouth Disease in cattle using non structural protein 3ABC ELISA kit from November 2010 to March 2011 at Dire Dawa and its surroundings. The overall prevalence of Foot and Mouth Disease was 8.01 % (79/986). There was a statistically significant difference observed in the prevalence of FMD with the origin (p= 0.004) and the age of the animals (p= 0.006). There is a tendency of progressively increased prevalence with increasing age and the odds of animals in age band of 3 to 4 years and above 4 years of age was 3.46 and 2.43 times at more risk of infection than young animals (age group less than 3 years). However, there was no statistically significant difference observed in the case of sex of the study animals (p>0.05). The higher prevalence of FMD at Dire Dawa area warrants further investigation and characterization of the circulating virus serotypes to apply effective control and prevention measures.

**Key words:** Foot and Mouth Disease · Seroprevalence · 3ABC · ELISA

## INTRODUCTION

Foot and mouth Disease, which is also known as Aphtous fever [1]. It is a major global animal health problem [2]. It is the most contagious trans-boundary animal disease (TAD) affecting cloven hoofed animals [3] characterized by the formation of vesicles in the mouth, at coronary band and skin of inter-digital cleft [4]. The loss in animal production and international restrictions imposed following an outbreak make FMD of major concern for livestock owners. Foot and mouth disease has created a restriction of Ethiopian meat export to the Saudi Arabia and pickled skin Indonesia [5].

In Ethiopia Serotypes A, O, C, SAT2, have been identified and characterized by the National Animal health research center at Sebeta and the world reference laboratory for FMD at UK in the years 1969-1994 on samples submitted by Sholla disease investigation laboratory, but from the record of outbreak investigation in cattle by NVI between 1982 -2000, three serotype O, A and SAT2 FMD were identified [6].

Since FMD virus is highly virulent, it can spread fast within a population especially if a new virus type has been brought in to a so far immunological naïve population. In the tropic the most important method of spread is be lived to be by direct contact between animals moving freely across state and national boundaries as trade or nomadic cattle. Disease out breaks occurs mostly with the onset of the hot humid season. The climatic stress suppresses the existing immunity in the cattle population which at first leads to sporadic and subsequently to severe and wide spread disease outbreak [4].

Despite the wide spread and enormous economic importance of FMD in Ethiopia, clinical and serological studies to characterize the disease, under local Ethiopia conditions have never been exhaustive and the endemic level has not been well established. The extent to which a disease is recognized as a problem is of ten dependent on the efficacy of the means for diagnosing it and observing its occurrence [7].

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Therefore, the main objective of this study was to determine the sero-prevalence of FMD in different zones of Eastern Ethiopia (Dire Dawa and its surrounding).

## MATERIALS AND METHODS

**Study Area:** The study was conducted in Dire Dawa and its surroundings Zones. The regions selected purposefully based on the luck of information on disease distribution and serotypes. Dire Dawa city administration is a city located in the eastern part of Ethiopia within the valley surrounding by eastern mountain of eastern Hararghe and at the semi-desert of Somali region. Majority of the livestock population owned by the rural peoples in and around the city are 43124 head of cattle's 185996 head of sheep and goats, 6438 heads of equine, 7260 head of camel and 34199 head of poultry.

**Study Animals and Livestock Population of the Region:** The study was conducted on a total of 986 local (Zebu) cattle blood sample collected from different zones. Approximately about 15 animals from each PAs were selected randomly to be included in the study. Accordingly, PAs and 15 Districts here included in the study.

**Study Design:** A cross sectional study was undertaken on Foot and mouth disease in local cattle from November 2010 to March 2011, during the laboratory work, a total of 986 sera sample tested by using 3 ABC ELISA for the detection of FMD antibodies.

**Sample Collection:** Blood samples of 10 ml were aseptically collected using plain vacutainer tubes from local cattle through jugular venipuncure. Serum samples were separated within 12 hours of collection and stored at -20°C until tested.

**Laboratory Test:** The SVANOVIR® Foot and mouth Disease virus 3ABC-Ab ELISA kit was designed to detect FMDV specific antibodies in bovine serum sample. The kit procedure was based on a solid phase in direct ELISA. In this procedure, samples were exposed to non-infections Foot and mouth disease virus (FMDV) antigen (NSP 3ABC) coated wells on microtiter plates. FMDV antibodies (if present in the test sample) bind to the antigen in the well. HRP conjugate added subsequently forms a complex with the FMDV antibodies. Unbound materials removed by rinsing before the addition of substrate solution. Subsequently a blue- green color develops which is due to the conversion of the substrate by the conjugate of the substrate on the substrate by the conjugate. The reaction stopped by the addition of stop solution. The result can be read by a micro plate photometer, where the optical density (OD) measured at 405nm.

**Data Analysis:** The data were stored into Microsoft- excel and analysis was done using STATA. The total prevalence was calculated by dividing the number of 3ABC ELISA positive animals by the total number of animal tested. Logistics regression was used to analyze risk factors (sex, age and agro ecological zones) have associated with disease occurrence.

## RESULTS

In the present study, a total of 986 cattle from different zones were blood sampled and tested for the presence of antibodies against Foot and Mouth Disease virus using non-structural protein (NSP) 3 ABC ELISA test.

Out of the total 986 serum samples examined, 8.01% (79 of 986) found to be positive for FMD. Regional level prevalence showed; Dire Dawa 8.91% and E/ Harerge (Oromia) 5.13 %. Table 1 displays the distribution of FMD sero-prevalence in the study area.

Table 1: Prevalence and distributions of FMD in studied Region and respective Zone

| Region | Zone | No | Positive | Prevalence (%) |
|---|---|---|---|---|
| Dire Dawa | Eastern Zone | 362 | 28 | 7.73 |
| | Kola Zone | 131 | 14 | 10.69 |
| | Western Zone | 259 | 25 | 9.65 |
| | *Subtotal* | *752* | *67* | *8.91* |
| Oromia | E/Harerghe Zone | 234 | 12 | 5.13 |
| | *Subtotal* | *234* | *12* | 5.13 |
| Overall | 986 | 79 | 8.01 | |

Table 2: Univariate analysis of risk factors associated with foot and mouth disease prevalence

| Variables | No | Positive (%) | OR (95% CI) | P- value |
|---|---|---|---|---|
| Region | | | | |
| Dire Dawa | 752 | 67 (8.91) | 3.49(0.12, 0.67) | 0.004 |
| E/Harerghe(Oromia) | 234 | 12 (5.13) | 1 | |
| Sex | | | | |
| Male | 284 | 16 (5.63) | 1.0 | |
| Female | 702 | 63 (8.94) | 1.65(0.94, 2.91) | 0.083 |
| Age group | | | | |
| <3 years | 330 | 16 (4.85) | 1.0 | |
| 3-4 years | 411 | 36 (8.76) | 3.46 (1.02, 3.46) | 0.041 |
| > 4 years | 245 | 27 (11.02) | 2.43(1.28, 4.62) | 0.007 |

Associations of presumptive risk factors such as animal factors (age and sex) and agro ecological factors were evaluated using univariate logistic regressions. Table 2 shows association of some factors with FMD seropositivity. Of these factors origin of the animals was significantly associated with FMD sero-prevalence. In this study, the prevalence of FMD was seen higher at Dire Dawa than East Harerghe of Oromia regional state. Even though, age was not statistically significant, there is a tendency of progressively increased prevalence with increasing age and animals in age band of 3 to 4 years and above 4 years of age be 3.46 and 2.43 times at more risk of infection than young animals (age group less than 3 years). Prevalence was similar between male and female animals.

## DISCUSSIONS

Foot and Mouth Disease was reported to cause impediment for about 6% of export animal product [8]. It is an economically important disease in Ethiopia with incidence increasing between 1.3 to 1.5 times since 1990 [9].

The overall prevalence (8.01%) reported in this study was in agreement with the previous report by Megersa *et al*. [10] (9.5%). The prevalence also supported by the report of Bedru [8] in which lower prevalence was recorded in cattle kept under mixed farm than pastoral system due to limited movement of animals for the search of watering point and grazing area and relative small herd holding capacity. The prevalence of FMD was found to be higher at Dire Dawa than East Harerghe Zone of Oromia regional state. The possible reason for this might be due to the fact that Dire Dawa is the exit route for the export of the Livestock to the Middle East countries. Therefore, there could be a possibility of dissemination of this virus on the way to this town and the surrounding areas. The town and its surrounding are the sites where slaughter animals are coming from different areas and become source of infection for outbreaks. In most parts of the country, animals to local market destinations are often transported on foot and subsequently result in dissemination of infection. Kelin *et al*. [11] observed higher prevalence of FMD during Islamic Edi festival attributed to increased animal movement for slaughter. However, outbreak of FMD frequently occurs in the marginal lowland areas of Ethiopia [12]. This is mainly due to unrestricted high herd mobility, continuous contact and intermingling of different herds at watering and grazing areas. Rufael *et al*. [13] also observed peaked outbreaks during the dry seasons, which attributed to herd movement to dry season grazing areas.

The reason for the rapidity of spread to fully susceptible population is due to the highly infectious nature of the virus, the production of high titer in respiratory secretions and the large volumes of droplets and aerosol of virus shed by infected animals, the stability of virus in such droplet, the rapid replication cycle with very high yields and the short incubation period [14].

Animal factors play significant role in the occurrence of a disease. Significant difference was observed in different age groups ($p<0.05$). The relatively low prevalence in young animal may be indicative of low frequency of exposure to risk factors. The low exposure in immature age groups was as a result of keeping young animals around homestead and around camps separately from the adult animals. In line with this, Rufael *et al*. [13] has also reported lower prevalence of FMD in young animals from Borena area. Generally, mortality is higher in young animals: over 20% compared to about 2% in adults. During an outbreak, the morbidity rate in cattle rich 100% while mortality can be up to 40% in younger animals [15].

In conclusion, FMD is highly contagious pandemic disease causing huge economic loss to the country due to the lack of effective vaccine, absence of livestock movement control and absence of systematic disease surveillance and reliable epidemiological data. It is however likely that the disease is underreported due to comparatively high tolerance of local breeds to the clinical episodes of the disease [12]. FMD is more prevalent and has been one of the major causes for considerable economic loss of the rural communities in Ethiopia. Thus, the present study has demonstrated prevalence of the disease in the study area, where livestock plays a crucial role in the livelihood of the farmer's households and potential sources of animals and animal products for both national and international.

Therefore, the current finding has provided insight information on the epidemiology of FMD and its potential impacts on households and national economy, signifying the need for development control measures. So the following recommendations are made:

## ACKNOWLEDGEMENTS

The study was supported by the National Animal Health Diagnostic and Investigation Centre (NAHDIC), which deserved enormous appreciation from the authors.

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