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Full Length Research Paper

Seroprevalence of bovine foot and mouth disease (FMD) in Awbere and Babille districts of Jijiga zone, Somalia Regional State, Eastern Ethiopia

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A cross-sectional seroprevalence study of cattle foot and mouth disease (FMD) was conducted in Somalia Regional State (Awbere and Babille Districts) Western, Ethiopia. 384 blood samples were collected in the period of October 2009 to March 2010 from 384 animals and tested for antibodies against non-structural protein of FMD virus by using the 3ABC-ELISA. The overall individual animal antibody seroprevalence was 14.05% (95% CI = 11.2 to 18.13%). Statistically no significant variation (P > 0.05) was observed in the prevalence of FMD in Awbere (14.2%) and Babille (15.1%) Districts. Similarly there was no significant variation (P>0.05) in seroprevalence among male (19.4%) and female (13.6%) animals. Seroposetivity recorded for calves (Zero), young (13.2%) and adult (18.9%) age groups of animals showed a significance variation (χ^2 = 8.45, DF = 2, P = 0.01). The results of this study showed that FMD is an important cattle disease in the study areas. This fact justifies the need of attention and subsequent study for identification of the FMD virus circulating in the area, which helps in the implementation of an effective control measures.

Key words: Cattle, Ethiopia, foot and mouth disease (FMD), Jijiga, Seroprevalence, 3ABC-ELISA.

INTRODUTION

Foot and mouth disease (FMD) is highly contagious and affects over 70 domestic and wild *Artiodactyla* species (Hedger, 1981). Of the domesticated species: cattle, pigs, sheep, goats, and buffalo are susceptible to FMD. It is probably one of the most important livestock diseases in the world in terms of economic impact. The economic importance of the disease is not only due to the ability of the disease to cause losses of production, but to the restrictions on the trade of animals both locally and internationally (James and Rushton, 2002). The direct production effects in extensive production system include loss of milk due to udder involvement, and reduced draught animal power from lesions on the feet (very serious if it occurs in ploughing season).

FMD is endemic in East Africa with six of the seven serotypes namely; O, A, C, SAT types 1, 2, and 3 reported to occur thus complicating the epidemiology and control of the disease in the region. Serotype SAT3 has been recorded only in Uganda (Vosloo et al., 2002). It has been suggested that the pastoralist livestock keeping areas in the East African region form ecosystems in which FMD is maintained (FAO/AU-IBAR/PACE FMD workshop, 2006). These ecosystems also play an important wildlife-livestock interface hosting large populations of FMD susceptible wildlife.

In Ethiopia cattle FMD is reported to be endemic according to the published reports of Gelagay et al. (2009) in centre for disease control and prevention (CDC) and Roeder et al. (1994). In the country FMD was first recorded by Food and Agricultural Organization and World Reference Laboratory (FAO/WRL), which indicated that FMD serotypes O, A and C were responsible for FMD outbreaks during the period of 1957 to 1979 (Martel, 1974). Recent seroprevalence studies of FMD in different districts and localities in the central, south west, northwest and in south pastoral areas of Ethiopia revealed seroprevalence of the FMD in the range of 2.5 to 21% (Bogale, 2005; Gelaye et al., 2005; Rufael et al., 2008; Hailu et al., 2010). At present FMD remains largely uncontrolled in the country. Understanding of the geographic distribution of

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the disease and serotypes of FMD virus involved are among important in puts required to initiate control program, in this regard there is no recent published data on the eastern part of the country particularly in the Somali regional state which shared border with Somalia. Thus, the objective of this paper is to determine the seroprevalence of bovine FMD in two districts namely Awbere and Babille, which are an important risk area for FMD, due to the presence of regular trans-boundary live animal and refugee movement in Awbere District and presence of wild life in Babille District.

MATERIALS AND METHODS

Study areas

The present study was conducted in two districts (Babille and Awbere) of Jijiga zone of Somali regional state, to determine the individual seroprevalence of FMD in cattle. Jijiga zone is situated in eastern part of Ethiopia, about 630 km East of Addis Ababa, and 105 km East of Harrar town. The altitude of the zone ranges from 500 to 1650 m above sea level and found between 9°20'North latitude and 45°56'East longitude. The climate of Jijiga zone is semi-arid type which is characterized by high temperature and the mean annual rainfall in the area ranges from 600 to 700 mm. Agropastoralism is the dominant production system in Jijiga. Cattle, sheep, goats and camels are the main productive livestock reared in the area, and livestock population of Jijiga zone was reported 2,422,400 (CSA, 2008). The zone share border with Shinile administrative zone to the North, the Hararghe highlands of Oromia Region to the West, Dagahabur to the South, and Somalia to the East.

Study population

Indigenous non vaccinated Zebu cattle breeds in extensive management system in the area were used as the study population. A total of 384 cattle (67 male and 317 female) were examined in two districts of Jijiga zone, namely Awbere and Babille.

Study design

Across-sectional study was carried out, no indigenous cattle using 3ABC ELISA test (Hamblin et al., 1986) from October 2009 to March 2010 in Awbere and Babille Districts of Jijiga zone. The two districts were selected purposively; Awbere is a District in Jijiga zone where regular trans-boundary animal and refugee movement exists form Somalia whereas Babille is an area which has proximity to one park and sanctuary, where contact with different wild animal exists.

Sampling method and sample size

The simple random sampling technique was followed, to select the animal to be used for the study of prevalence of FMD in the study area. To determine the sample size of a bovine FMD with expected prevalence of 50% in Jijiga zone was taken, since no previous study was done in this area. The desired samples for the study were calculated according to the formula given by Thrustfield (1995), with 95% confidence level and 5% absolute precision.

Therefore, a sample size of 384 was considered for this study. Then proportionate numbers of animals were sampled from the two purposively selected districts based on the cattle population (225 from Awbere and 159 from Babille). During sample collection the age of each of the sampled animal was determine by consulting the owners of the cattle. Accordingly, the sampled animals were categorized as calves (< 2 years), young (2-4 years) and adults (> 4 years).

Sample collection

A total of 384-serum (67 male and 317 female) sample were collected from cattle herds found in two district of Jijiga zone. Blood samples were collected from jagular vein using 10 ml of sterile vacutainer tubes and sterile vacutainer needles. The serum was harvested from the coagulated blood after the whole blood was put at room temperature for 12 h. Then the serum was placed inside a refrigerator (-20°C) for storage at Jijiga regional veterinary laboratory and finally transported to national animal health diagnostic and investigation center (NAHDIC) Sebata, Ethiopia for analysis.

Serological test

The CHEKIT-FMD 3ABC bovine ELISA kit (Switzerland origin) was used and this was indicated to be rapid, simple, sensitive and specific method for detecting antibodies against pathogen of FMDV in serum samples of bovine origin. The test detects antibodies against 3ABC protein independent of the serotype of FMD virus (De Deigo et al., 1997). In the kit, the entire necessary reagents for the standard indirect ELISA technique were included with polystyrene microtiter plate pre-coated recombinant FMD 3ABC protein. Dilution of samples to be tested were incubated in the wells. Any antibody specific for 3ABC protein binds to the antigen in the wells. A proxidase labeled anti-IgG-conjugate was added which binds to antibody of sample complexes with antigen. The TMB-containing substrate was added to the wells. The degree of color development measured by spectrophotometer is directly proportional to the amount of antibody in the sample serum specific to the antigen. In this assay, adequate washing procedure were undertaken in order to remove unbound reagent at each step of the testing procedure.

The result was read by microplate photometer, where the optical density (OD) was measured at 405 nm within 15 min after addition of stop solution. The OD in wells coated with non structural proteins (NSP) 3ABC were corrected by subtraction of the corresponding wells containing the control antigens.

Data analysis

The collected data from the field was stored into a computer on a Microsoft Excel spreadsheet and analyzed using SPSS version 16 software program (2007). Categorical variables (sex, age and sites) were considered. Prevalence was calculated by dividing the number of 3ABC ELISA positive animals by the total number of animals tested. Chi-square test was used for comparison of variables and tests were considered as significant at $P < 0.05$.

RESULTS

Over all prevalence

The overall prevalence of FMD in the study area was

Table 1. Seroprevalence of FMD cattle according to districts.

Districts	No of animals sampled	No of seropositive (%)	95% CI
Awbere	225	32 (14.2)	9.64-18.76
Babille	159	24(15.1)	9.53- 20.67
Total	384	56(14.6)	11.2- 18.6

$\chi^2 = 0.06$. P = 0.81.

Table 2. Seroprevalence of FMD cattle according sex.

Sex	No of animals tested	No of seropositive (%)	95% CI
Female	317	43 (13.6)	9.9- 17.8
Male	67	13 (19.4)	10.7- 31.0
Total	384	56(14.6)	11.2- 18.6

$\chi^2 = 1.51$, P = 0.21.

14.6% (95% CI = 11.2%- 18.6%).

Districts prevalence

The prevalence of FMD among Awbere District animal was determined as 14.2% (n=225) while in Babille was 15.1% (n=159) with no significant variation (P < 0.05) in seroprevalence of FMD between two districts (Table 1).

Sex

Statically there was no significance variation in the prevalence of FMD between female and male animals (Table 2).

Age

Sampled cattle were grouped in to three age categories: calves (< 2 years), young (2 to 4 years) and adults (> 4 years). There was significant variation in prevalence between these age categories (P< 0.05). The prevalence of FMD was highest in adult cattle and lowest calves (Table 3).

DISCUSSION

The overall seroprevalence (14.05%) recorded for FMD in this study is indicative of its importance in the study area. The individual animal seroprevalence documented in this survey showed high value when compared to the previous reports of 8.18% (Molla et al., 2010) and 9.5% and (Megersa et al., 2009) in South Ethiopia (South Omo, Sidama and Gamogofa zones). On the other hand, the seropositivity finding of this study lower than the overall seroprevalences of 21 and 26.5% reported by Shale et al. (2004) and Rufael et al. (2008) respectively. The prevalence reported in this study is comparable to the prevalence (12.05%) found for cattle in the Bench Maji zone, Southern Ethiopia (Gelaye et al., 2009).

In this study no significant variation was found in prevalence of FMD between districts. The animal level seroprevalence recorded in the two agro pastoral districts of Somalia regional sate, namely Awbere (14.2%) and Babille (15.1%) can be considered high. These results are comparable to the work of Rufael et al. (2008) in Borana pastoral production system, again our study is supported by the reports of Megersa et al. (2009) and Gelaye et al. (2009) in which a higher seroprevalence in animals from pastoral system than sedentary. Bogale (2005) also documented a high number of cattle FMD outbreak reports from pastoral areas of Ethiopia. Higher prevalence of the disease in pastoral areas such as Babille and Awbere in case of this study could be attributable to possible reasons like unrestricted high herd mobility, continuous contact and intermingling of different herds at water points and communal grazing areas. Ekboir (1999) also 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. In addition the present study areas specifically Awbere are bordering with Somalia and prone to border uncontrolled livestock movement with subsequent increased risk of FMD transmission.

The study revealed a significant variation on sero-posetivity of foot and mouth disease among the three age groups (Table 3). The significantly higher seroprevalence of FMD in young and adult animals than in claves

Table 3. The seroprevalence of foot and mouth by age group.

Age group	No of animals tested	No of sero positive (%)	95% CI
Calves	38	0 (0)	-
Young	182	24(13.2)	8.6-19.0
Adult	169	32 (18.9)	13.2-25.7
Total	384	56(14.6)	11.2-18.6

χ^2 = 8.45, DF = 2. P = 0.014.

observed in the current study is in agreement 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 document no significant association between seropositivity of FMD and age of cattle. The zero seroprevalence of FMD recorded in claves could be associated with the low frequency of exposure; in addition farmers in the study area keep their calves around the homestead, where there is less contact with other herds.

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 else where in Ethiopia (Esayas et al., 2009; Megersa et al., 2009), where sex appeared not to have a significant effect on seroposetivity 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.

In conclusion the seroprevalences of FMD were found to be high in the two districts of Somalia regional state, eastern Ethiopia. Besides this, identification and characterization of the serotypes of FMD virus in the study area is very important in the understanding of the disease and also for the implementation of efficient prevention and control measure to avoid the economic impact of FMD.

REFERENCES

Bogale A (2005): Review of foot and mouth disease: An in-depth discourse of global, sub-saharan and Ethiopia status, Addis Ababa University Ethiopia, pp. 1 - 46

Bronsvoort BM, Nfon C. Hamman, SM, Tanya VN, Kitching RP, Morgan KL. (2004). Risk factors for herdsman-reported foot and mouth disease in the Adamawa province of Cameroon. Prev. Vet. Med., 66: 127-39

Central Statistical Agency (CSA)(2008). Federal Democratic Republic of Ethiopia. Central Statistical Agency, Agricultural Sample Survey Report on Livestock and Livestock Characteristics. Volume II, 2007/2008. Central Statistical Agency, Addis Ababa, Ethiopia.

De Diego M, Brochi E, Mackey D, De Simone F (1997). The use of nonstructural polyprotien 3ABC of FMD virus as a diagnostic antigen in ELISA to differentiate infected from vaccinated cattle. Arch. Virol. 142: 2021-2023.

Ekboir JM (1999). Potential impact of foot and mouth disease in California. The contribution of animal health surveillance and monitoring, California. Agric. Res. Manage., pp. 7-13.

Esayas G, Gelagay A. Tsegalem A, Kassahun A (2009). Seroprevalence of foot and mouth disease in Bench Maji zone, southwestern Ethiopia. J. Vet. Med. Anim. Health, 1: 5-10.

FAO/AU-IBAR/PACE (2006). Joint Meeting on Foot-and-Mouth Disease; Regional Co-ordination and emergency control in the African Great lakes countries of Rwanda, Burundi, Democratic Republic of Congo, Tanzania and Uganda. Nairobi, Kenya 3-4th August 2006.

Gelaye E, Beyene B, Ayelet G (2005). Foot and Mouth Disease virus serotypes identified in Ethiopia. Ethiop. Vet. J., 9: 75-80.

Gelagay A, Mana M, Esayas G, Berhe G, Tesfaye R, Mesfin S, Nigel PF, Jemma, W, Geoffrey HH, Nick JK (2009). Genetic Characterization of foot and mouth disease viruses, Ethiopia, 1981-2007, CDC. Emerg. Infect. Dis., 15: 1409-1417.

Gelaye E, Ayelet G, Abera T, Asmare K (2009). Seroprevalence of foot and mouth disease in Bench Maji zone, Southwestern Ethiopia. J. Vet. Med. Anim. Health, (1): 005–010.

Hailu M, Mengistie T, Negussie H, Alemu S, Asaminew T (2010). Incidence of foot and mouth disease and its effect on milk yield in dairy cattle at andassa dairy farm, Northwest Ethiopia. Agri. Biol. J., 1: 969-973.

Hamblin C, Barnett I, Crowther JR (1986a). A new enzyme linked immunosorbent assay (ELISA) for the detection of antibodies against foot and mouth disease virus, Application. J. Immunol. Meths., 93: 123-129.

Hedger RS (1981). Foot and mouth disease, in: infections disease of wild animals, 2nd edition, edited by JW Davis, LH Karstad, DO traineder, 2nd edition.Ames, Iowa State university press, pp. 87-96.

James AD, Rushton J (2002). The economics of foot and Mouth Disease. Rev. Sci. Tech. off. int. Epiz., 3: 637-644.

Martel JL (1974). Foot and mouth disease in Ethiopia. Distribution of viral serotypes. Rev. Elev. Med. Vet. Pays Trop., 27: 169–175.

Megersa B, Beyene B, Abunna, F, Regassa A, Amenu K, Rufael T (2009). Risk factors for foot and mouth disease seroprevalence in indigenous cattle in Southern Ethiopia: the effect of production system. Trop. Anim. Health Prod., 41: 891-898.

Molla B, Ayelet G, Asfaw Y, Jibril Y, Ganga G, Gelaye E (2010). Epidemiological Study on Foot-and-Mouth Disease in Cattle: Seroprevalence and Risk Factor Assessment in South Omo Zone, South-western Ethiopia. Trans. Emerg. Infect. Dis., 57: 340-347.

Paul C, Cleanda F, Chris B, Pornchai C, Laurence JG (1996). Village level Risk factors for foot and mouth disease in Northern Thiland. Prev. Vet. Med., 26: 253- 261.

Roeder PL, Abraham G, Mebratu GY, Kitching RP (1994): Foot and mouth disease in Ethiopia from 1988 to 1991. Trop. Anim. Health Prod. 26: 163-167.

Rufael T, Catley A, Bogale A, Sahle M, Shiferaw Y (2008). Foot and Mouth Disease in the Borana pastoral system, southern Ethiopia and implications for livelihoods and international trade. Trop. Anim. Health Prod., 40: 29–38.

Shale M, Dwarka RM, Venter EH, Vosloo W (2004). Molecular epidemiology of serotype O foot-and-mouth disease viruses isolated from cattle in Ethiopia between 1979-2001. *Onders.*t J. Vet. Res., 71: 129- 138.

SPSS (2007). Statsitic Package for Social Sciences. Version 16.

SPSSInc., 1989-2007, USA.
Thrusfield M (1995). Veterinary Epidemiology, 2 nd ed, Black well science.
Vosloo W, Bastos,ADS, SangareO, Hargreaves SK, Thomson GR (2002). Review of the status and control of foot and mouth disease in sub-Saharan Africa. OIE Sci. Technol. Rev., 21(3): 437-447.