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Seroprevalence of Foot and Mouth Disease in Bulls of Borana Origin Quarantined in Adama

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Abstract: Across sectional study of FMD was conducted on apparently healthy bulls which were quarantined for export in Adama from December 2011 to May 2012, a total of 1071 blood sample were collected from the jugular vein of individual animals. Serological investigation was performed using 3ABC ELISA kit. As a result the over-all prevalence of FMD infection was 10.8% (116/1071), FMD is the most important livestock disease in terms of economic impact on export earnings; about US$ 71026.8 losses observed in the current study. The result of the current findings indicates that FMD is prevalent in bulls for export from Ethiopia, thus posing major loss in the country's economy. This warrants the necessity of further study of the epidemiology of the disease nation-wide. Investigation of the strains of the virus, climate, and host factors can assist in identifying amenable control options.

Keywords: Bulls, ELISA, Ethiopia, Export, FMD, Seroprevalence

1. Introduction

Ethiopia is one of the richest country in livestock population recently CSA (2011) reports shows that the country has about 41 million heads of cattle. This makes the country the first in Africa. On average in the year 2000-2010; Ethiopia is earned US$ 290 million from the export of live animal of which cattle play an important role. However, due to the high prevalence of some disease like FMD and poor management practices, the country is getting less aesthetic value from the livestock production [1].

FMD is highly contagious viral disease of cloven-hoofed domestic and wild animals. It is widely distributed and occurs most commonly in Asia, Africa and the Middle East and of South America. In terms of livestock export from Africa, FMD is perceived as a major hindrance to international trades, in part, this perception is based on the assumption that disease freedom is required before export is possible and has resulted in costly and elaborate FMD controls measure such as disease free zones in Southern Africa and elsewhere [21]. Commodity based approaches can provide an acceptable level of for exported livestock or livestock production, but in the case of FMD, still require an understanding of FMD status in cattle entering the market chain [6]. Since 2000 the formal export of livestock and livestock products from Ethiopia increased and this trend was associated with more large scale private sector involvement in livestock trade and the establishment of export abattoirs. Although initially focusing on goat meat and mutton, by 2005 beef in the form of chilled meat and live animals were also important. The average monthly export of live animals to Egypt and elsewhere during 2005 was approximately 7000 cattle and 3000 small stock [10].

FMD is caused by virus of genus *Aphtovirus*, family *Picornaviridae*, was the first animal viral infection established [3]. According to the office of international des epizootics, FMD ranks first among the disease of animals. The family *Picornaviridae*is by the viruses consists of naked nucleocapsids approximately 25nm in diameter with icosahedral symmetry composed of four structural polypeptides, within the capsid the virus genome is characterized by a single linear molecule of single stranded RNA, that serve as a messenger for viral protein synthesis [8].

The virus is seven antigenically different serotypes of FMDV described as types A, O, C, SAT1, SAT2, SAT3 and Asia1 that infect cloven hoofed animals [70, 71]. Infection with any one of the serotypes not confer immunity against the other with serotypes, many subtypes can be identified by the biochemical and immunological test [19].

The virus seems to be capable of infinite mutations, so that new antigenically different types are constantly appearing [24]. As there is no cross between serotypes immunity to one type does not confer protection against any of the other six types, therefore the difficulties to vaccination programs are obvious, not only may there be great changes in antigenecity between developing serotypes, but the virulence may also changes dramatically [16].

In Ethiopia there have been few studies conducted in order to assess FMD situation and no work have been done on the prevalence of FMD on bulls to be exported. Serotypes A, O, C, and SAT2 have been identified and characterized by NAHRC at Sebeta and world reference laboratory of FMD at UK in the year 0961-1994 on samples submitted by shoal disease investigation laboratory [20].

FMD is the most contagious disease of mammals. The disease is transmitted by verities of methods between herds, countries and continents, but spread from one animal to another animal is by inhalation or ingestion [2]. In the tropics, the most important method of spread I believed to be by direct contact between animals moving across state and national boundaries as period in temperate and subtropical climates [73].

Thus, the objective of this thesis was to determine the prevalence of FMD and draw baseline information about loosed by FMD in the study unit.

2. Literature Review

2.1. Definition

FMD is an extremely contagious, acute viral disease of all cloven-hoofed animals, and pigs, characterized by fever, and vesicular eruptions in the mouth and on the feat and teats, and sudden death of young animal [4].

2.2. Etiology

FMD is caused by virus of the genus *Aphtovirus,* family *Picornaviridae.* There are serotypes of FMDV; namely: A, O, C, SAT1, SAT2, SAT3 and Asia1. Infection with one serotypes does not confer immunity against another. Antigenic drift with-out clear-cut demarcation between subtypes and 80 of such subtypes have been identified [37].

There may also be biotypical strains (strains which become adapted to particular animal species) and topotypes (antigenic entity specific to a given topography) [41].

The FMDV is inactivated when exposed to pH below 6.5 or above 9. Heat, UV radiation, and gamma irradiation are used to render animal products free of FMDV. The virus is also easily inactivated by chemicals and disinfectants [45].

2.3. Epidemiology

2.3.1. Distribution

FMD has an essential global distribution, with the exception of North America, Western Europe and Australia. It is endemic in Africa, Asia and South America, the Middle and Far East and parts of Europe [58]. The seven serotypes have heterogeneous distribution [55].

Table 1. *Serotypes of FMD commonly isolated from certain geographical regions.*

Continents	Virus serotypes
Europe (historically)	A, O, C
Asia	A, O, C, Asia1
Africa	A, O, C, SAT1, SAT2, and SAT3
South America	A, O, C

Source: [60]

2.3.2. Host Range

Of the domesticated species, cattle, sheep, goats, pigs and buffalo are susceptible to FMD. In addition many species of cloven-hoofed wild life such as deer, antelope and wild pigs may become infected. Sheep, pigs and cattle are maintenance, amplifier, and indicator hosts of FMD respectively [14].

2.3.3. Carriers

Animals in which the virus persists in oropharynx for more than 28 days after infection are called carriers. The post infection carrier state is significant for FMD evolution, which is up to 5 years for buffaloes, 3 years for cattle, 9 months for sheep and 3-6 months for goats [15].

2.3.4. Sources of Infection and Transmission

In tropics, the most important method of FMD speared is believed to be by direct contact between animals, but under more intensive management systems, it is introduced often, via pigs feeding on contaminated material [35].

Infection can be wind born and possibly across expanses of sea [69]. Herd to herd transmission occurs either by direct movement of infected animals or possibly even infected humans or indirectly by the transportation of the virus on inanimate objects, particularly uncooked and unprocessed products; meat, milk, butter, etc. a person in contact with infected animals can serve as a source of infection for 24 hours post infection, and dogs, cats, horses, and birds can transmit the disease mechanically [5]. Out breaks can occur by viruses escaping from research and vaccine production centers. The semen of infected bull can be a source of infection by Artificial insemination and all secretions and excretions of acutely infected animals are infectious [14].

2.4. Clinical Signs

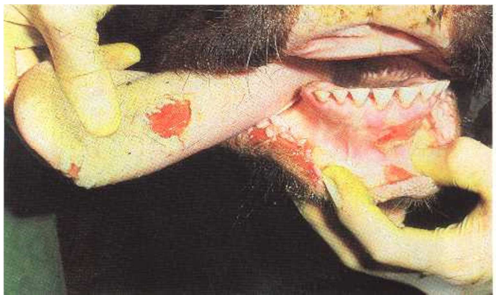
The incubation period of FMD is 2-8 days. The disease is characterized by fever, depression, anorexia, and the appearance of vesicles in the mouth and on the feet and teats. There is abundant salivation, the saliva hanging in long, ropy strings, a characteristic of the lips and drop in milk yield [32].

Lameness, mastitis, abortion, and panting syndrome are common sequels. Prolonged unthrifitiness and failure to gain weight is also common [33].

Morbidity is high (100%), but mortality is very low except in calves, when sudden death may occur in a significant proportion [34].

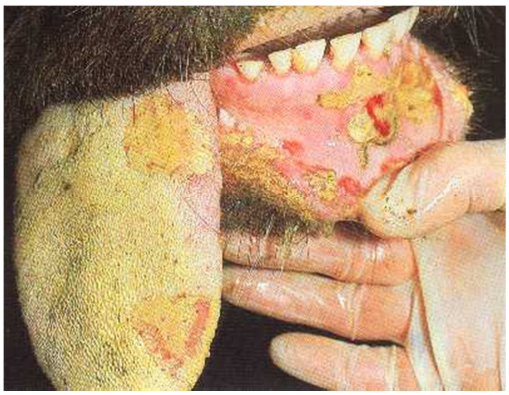
2.5. Pathogenesis and Pathology of FMD

Susceptible livestock may be infected by FMDV as a result of direct or indirect contact with infected animal or with an infected environment [67]. Following incubation period, usually between 2 and 8 days, clinical signs become evident. FMDV may be detected in esophageal/pharyngeal fluids and lymph nodes which constitute the site of primary replication after infection by the respiratory tract through inhalation [12]. The lesions on the dental pad and tongue appear as reddened areas and progress within a few hours into vesicles [64, 65]. The vesicles are easily ruptured within 24 hours leaving a raw surface and healing occurs within on to two weeks of rupture. Lesions at interdigital areas occur and animals can lose their hooves in severe cases [36]. There has also been supportive evidence that FMD virus replicates in the bovine mammary gland and mastitis may occur due to secondary bacterial infection. Moreover, histological studies have revealed the presence of clumps of necrotic secretory epithelial cells in the mammary gland alveolar tissue [44]. A week after the onset of the disease in cattle, an increase in the number of alveoli containing necrotic cells, and luminal exocytosis of all alveoli occurs with concomitant increase in non-secretory areas [63]. On the feet, lesions are most prominent at the bulbs of the heel, along the interdigital cleft and to a lesser extent, along the coronary bands. Lesions may be also present at the nares and on the muzzle. Rumen and heart lesions are frequently found at necropsy especially on young animals before weaning [52].



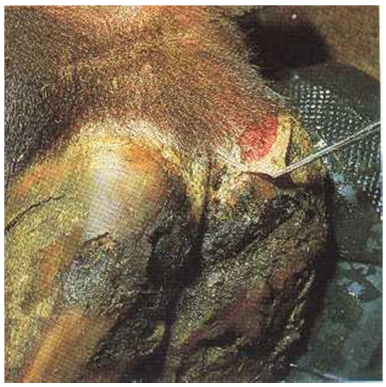
Source: [8]

Figure 1. *Two day old ruptured vesicle (blister) on tongue, lower gum and lower lip of a steer.*



Source: [8]

Figure 2. *Same animal as above with four day old lesions.*



Source: [4]

Figure 3. *Steers foot.*

2.6. Diagnosis

Rapid diagnosis of FMD is paramount importance, especially in countries that are usually free of infection, so that quarantine and eradication programs can be implemented as quickly as possible [7].

A vesicular condition appearing in cattle and involving other species of cloven-hoofed animals like sheep and pigs might be tentatively diagnosed as FMD. Similarly, in cattle FMD should be considered whenever salivation and lameness occur simultaneously and vesicular lesion is seen or suspected [27].

Due to highly contagious nature and economic importance of FMD, the laboratory diagnosis and serotype identification of the virus should be done in a virus secure laboratory [26].

Diagnostic samples includes; vesicular fluid, epithelium, blood in anticoagulant, serum and esophageal fluids collected with a cup-probang. In advanced or convalescent cases samples of oropharyngeal fluid are appropriate. Additional tissue samples include lymph nodes, thyroid, heart, adrenal gland and kidneys [51].

For viral isolation specimens suspected to contain FMDV are inoculated into cell culture (primarily pig, calf, lamb, and kidney). BHK-21 and IB-RS-2 cells, incubated at 37°C and examined for cytopathic effect after 48 hours [53].

For the detection of viral antigens and identification of viral serotypes; ELISA and CFT are used. The PCR can be used to amplify the genome fragments of FMDV in diagnostic material [12].

The serological test, virus neutralization and liquid phase blocking ELISA, are prescribed for trade [56]. The antibody detection by 3ABC ELISA can be used on herd basis to detect FMDV infection in vaccinated and unvaccinated (infected) population [57]. This test was useful for the surveillance following an outbreak to identify silent infection. The non-structural proteins (NSPs) mainly proteases and RNA polymerases, expressed during viral replicative cycle elicit an antibody response in infected animals which theoretically is not present in animals vaccinated with purified viral particles [54]. The antibody response in cattle to the structural antigens of FMDV can be detected as early as 3-4 days post- infection. However, the

antibody response to NSPs is variable; the response to 3A, 3B, 3D and 3ABC could be detected in cattle as early as 7-10 days post-infection and subsequently decrease gradually. In general, antibodies to NSPs decline below detectable level before antibodies to the structural proteins of FMDV. Anti-3ABC antibodies have been detected in experimentally infected animals up to 560 and 742 days post-infection. However, other authors have reported that antibodies to 3ABC polyprotein decline within 6 months, but still may be detectable for one year after infection [13].

The detection of antibody to the polyprotein 3ABC is a useful indicator of FMD virus infection regardless of the serotype involved. Antibody to the 3ABC is only found in virus-infected animals, but not in vaccinated animals. It was also reported that the presence of antibody to one or more pf the other NS proteins (2C, 2A, 3D) is an indication of previous infection [22].

Compared to the blocking ELISA, the advantage of the 3ABC ELISA is the differentiation between infected and vaccinated animals in the diagnosis of FMD exposure. The 3ABC ELISA is also a rapid test for screening of large number of sera. In areas where more than one serotype exists, the test is also cheap compared to the conventional liquid phase blocking ELISA, which has the advantage than each serum sample must be tested against all existing serotypes [19].

Generally, NSPs 2C, 3AB, and 3ABC have the potential to discriminate infected from vaccinated or naïve animals. Out of them, 3ABC is the most immunogenic and has been extensively studied [7]. The Chekit FMD-3ABCbo-ov enzyme immunoassay (EIA) kit provide a rapid, sensitive and specific method for detecting antibodies against the pathogen responsible for FMDV in serum or plasma samples of bovine and ovine origin. This test allows discriminating between samples from infected (3ABC positive) and vaccinated (3ABC negative) animals. In addition, irrespective of which FMDV serotype is circulating, it allows the detection of serogically positive animals [49]. This is an indirect-trapping ELISA for the detection of antibodies against 3ABC. The sensitivity and specificity of the assay on experimental sera post-infection was reported to be 100% and 99%, respectively [25].

Differential diagnosis of FMD should include: vesicular stomatitis, vesicular exanthema of swine, vesicular disease, blue tongue, render pest, pox, and foot rot [61].

Table 2. *Function(s) of FMDV non-structural proteins.*

Protein	Functions
L	Host protein synthesis shutoff and protease cleavage
2A	Protein cleavage (polypeptide)
2B	Alteration of membrane permeability, inhibition of cellular exocytosis, dissociation/rearrangement of endoplasmic reticulum and Golgi and RNA amplification.
2C	Formation of vesicles, NTPase, virus encapsidation, direct replication complexes to cell membrane, RNA binding in RNA replication (as 2BC) and increase membrane permeability (as 2BC)
3A	Inhibition of MHC class I expression, association with intracellular membranes, inhibition of intracellular membrane transport, inhibition of protein secretion and virus interaction with host cells and host range.
3B	Primer for RNA synthesis, covalent linkage to 5' end of positive and negative strands, membrane association of replication complexes (as 3AB), stimulation of 3Dpol (as3AB) and stimulation of 3CD autocleavage (as 3AB).
3C	Viral protein processing, host protein cleavage, host protein synthesis shutoff, transcription inhibition, RNA binding in RNA replication and stimulation of VPguridylylation.
3D	VPguridylyation, RNA-dependent RNA polymerase, stimulation of RNA synthesis and RNA binding.

Source: [42]

2.7. Economic Importance

In economic terms FMD is probably the most important livestock disease threatening the livelihoods of simple farmers, large sophisticated farming practices and the national and international economies of countries [28].

In many instances FMD is the only constraint to opening up incrative markets of live animals and animal's products in Europe, North America and Japan, and Middle East and Africa countries including Ethiopia [46].

The main effect of the disease is due to its high infectiousness. Economic losses result from the loss of milk production, retarded growth and loss of draught power, abortion in pregnant animals and deaths in calves, kids and lambs [38].

2.8. Zoonotic Importance

Since 1921, FMDV (A, O, C) have been isolated from people in Europe, Africa and South America [62]. Because infection is uncommon, however FMD is not considered to be a public health threat. Humans can be infected with foot-and-mouth disease through contact with infected animals, but this is extremely rare. Some cases were caused by laboratory accidents. Because the virus that causes FMD is sensitive to stomach acid, it cannot spread to humans via consumption of infected meat, except in the mouth before the meat is swallowed [11]. In the UK, the last confirmed human case occurred in 1966, and only a few other cases have been recorded in countries of continental Europe, Africa and South America [31]. Symptoms of FMD in humans include malaise, fever, vomiting, red ulcerative lesions (surface-eroding damaged spots) of the oral tissues, and sometimes vesicular lesions (small blisters) of the skin. According to a newspaper report, FMD killed two children in England in 1884, supposedly due to infected milk [59].

Another viral disease with similar symptoms, hand, foot

and mouth disease, occurs more frequently in humans, especially in young children; the cause, Coxsackie A virus, is different from FMDV. Coxsackie viruses belong to the *Enteroviruses* within the *Picornaviridae* [43].

Because FMD rarely infects humans, but spreads rapidly among animals, it is a much greater threat to the agriculture industry than to human health [40]. Farmers around the world can lose huge amounts of money during a foot-and-mouth epizootic, when large amounts of animal capital is destroyed, and revenues from milk and meat production go down [18]. In general, people are quite resistant, but can be carriers after contact exposure [47].

2.9. Prevention and Control

The official attitudes of a country regarding control of a disease depends on how seriously the disease affects the country, the financial and technical ability of the country and what its neighboring are doing [17]. The procedures commonly used are control by eradication and vaccination or a combination of the two [21].

In FMD endemic countries regular vaccination is a-way of life for most of the world and vaccine production is a major industry [50]. Vaccination is achieved with inactivated vaccine, which should induce protective immunity against each type of antigen incorporated [23]. Therefore, intratypic variation of field strains of FMDV must be considered to contain the same subtypes as in the area, which may be monovalent, bivalent, trivalent or polyvalent [72].

The first vaccination leads to immunity in ruminants for about 3-6 months, subsequent vaccination may give protection for about 1 year in cattle, but only about 6 months in sheep. Herd immunity is achieved at about 80-85% vaccination [39].

In FMD free areas, rapid diagnosis is essential, followed by slaughter and disposal of the carcass by burning or burial, and decontamination of the premises [30]. This measures, also called ”stamping out” (depopulation), consists of slaughter of in contact and other herds in which there is no clinical evidence of disease [38].

When there is failure of slaughter to halt out-break or due to difficulties involved in killing large numbers of animals and subsequent carcass disposal emergency vaccination may be initiated [29]. The objective of emergency FMDV vaccination is to provide protective immunity, as rapidly as possible to susceptible stock and to reduce the amount of virus released, and there by limit the spreads of the disease [21].

3. Material and Methods

3.1. Study Area

The research was conducted from December 2011 to May 2012 in livestock facility where bulls are quarantined and prepared for export purpose; the bulls are purchased from borana pastoral systems and brought into the feedlot farms located in adama. The borana area located 30°36’-6°38’ N latitude and 36°41’-40°41’ E longitude and it has international boundary of 521km with Kenya in the South. The borana plateau generally slopes from an altitude of about 2000 masl in the foot hills of bale-sidama massifs (jemjem plateaus) in the North to 1000 masl near the Kenya boundary in the South with an abrupt mountain areas reaching out 2000 masl or more (EDDPO,1998). The region is predominated by a semiarid climate, annual mean temperature vary from 19°C-24°C and has annual rain fall about 700mm (Coppock, 1994).

3.2. Study Population

The study was conducted on apparently healthy bulls with average age of 3-5 years that were kept for fattening purpose after all vaccination protocols have been done. The animals were brought from borana regions and were fed high energy diet and vaccinated against FMD, LSD, CBPP, Anthrax, pasteurollosis and Black leg in the feedlot farms and observed for any disease during their stay. A total of 1071 samples were collected from the bulls kept in the feedlot farms during the study period.

3.3. Study Design

It was across sectional study designed to assess the seroprevalence of FMD on export bulls. Conventional veterinary investigation methods were applied to generate information of FMD on exported bulls.

FMD serology

To determine FMD seroprevalence, serum samples were examined at NVI for specific antibodies against non-structural proteins of FMD virus using commercially available ELISA test (Chekit-FMD-3ABC, intervet). The 3ABC ELISA can be used as a screening test for detecting exposure of FMD virus and carriers bulls on farm basis. About 100ul of prediluted samples (1:16 in diluent buffer A) and controls (1:100 in Chekit-FMD-3ABC sample diluents) were dispensed into the appropriate wells of the microtiter plate pre-coated with recombinant FMDV 3ABC viral antigen (Annex 1).

3.4. Samples Size and Sampling Method

The sample size for the sero-prevalence study was determined by assuming a prevalence of 4.74% based on previous study in the bulls of borana (Abdulaziz, 2011). The sample size was determined using the prevalence through a simple random sampling method of thrusfield (2005) with 95% confidence interval and desired precision of 0.05. The calculated sample size was 70. However, a total of 1071cattle were sampled in this study to improve precision.

Serum samples were collected from the jugular vein to plain vaccutainer tubes of 10ml and sterile vaccutainer needle. After taking blood sample the ear tag of individual animals were labeled on the corresponding adhesive paper on the vaccutainer tube and transported to the NVI laboratory under cold chain by ice box. The serum was collected from the clotted blood and serological test were conducted for the seroprevalence of FMDV, the 3ABC-ELISA provide rapid,

simple, sensitive and specific, method for detecting antibodies against the pathogen responsible for FMD in serum sample of bovine origin.

3.5. Statistical Analysis

Data were entered in Microsoft excel sheet, coded and analyzed using statistical package for social sciences (SPSS version 20). Descriptive statistical such as proportional (percentage) was used to summarize the data and calculated seroprevalence of FMD. The prevalence (infection or presence of antibodies) was defined as the proportion of the number of bulls positive for antibodies against FMD disease by 3ABC ELISA test to the total number of bulls tested, which was expressed in percentage.

4. Result

During the study period 2011/2012 1071 bulls were examined for prevalence of antibody against FMD using 3ABC ELISA, the prevalence of FMD in bulls prepared for export purpose in the above mentioned place was 10.83% (116/1071).

Table 3. *Prevalence of FMD in bulls from borana and bale lowlands origin that kept in feedlot farms of Adama.*

Origin	Number of bulls examined	Serological status		Prevalence (%)
		Positive	negative	
Borana	1071	116	955	10.83

Epidemiological risk factors associated with the disease such as sex, age, breed and others were not considered as these borana breed bulls were from the same ecology, originated from pastoral livestock production systems, the same age group and sex (breed).

FMD is the major problems of exporting animals, the current study 10.83% prevalence should not over looked as low prevalence It is great loss for the country and as well as for the owner. During this study the live weight of 1kg bull exported to Lebanos was 1.57 US $ and a bull weigh 390kg would be US $ 612.3. Though the loss of the country from the mentioned prevalence 10.83% 116/1071) study due to FMD alone account US $ 71026.8. According to the current study the economic loss is estimated under (table 4).

Table 4. *Summary of economic losses due to FMD in exported bulls.*

Average weight of the animal	Total animal examined (B)	FMD positive (C)	Unit price /kg US $(D)	Total lossA*C*D
390kg	1071	10.83%(116/1071)	1.57	71026.8

5. Discussion

The over-all seroprevalence of 10.83% (116/1071) recorded for FMD in study animals in the bulls kept in the adama feedlot is indicative of its importance in animal origin (boraan).

The over-all prevalence obtained in this study is consistent with the findings of 12% (Gelaye *et al*, 2009) for bench maji zone of southern Ethiopia. In another study (Jembere, 2008) has got an over-all prevalence of 5.6% reported in afar regional state and 2.3% (Musema, 2008) Mizan area.

On other hand, the findings of this study was low when compared to the over-all prevalence reports of 26.5% (Shale, 2004) and 21% (Rufael, 2008) for borana pastoral production system, 14% (Abdulahi, 2010) in jijiga zone of Somali regional state and 28.9% (Mensur, 2008) Addis Ababa dairy cattle, 27.7% (Lemma, 2009) feedlots of adama area and 21.49% (Misgana, 2008) reports of bale cattle zone. This may be due to type of animals selected for the study or age of the animal. In this study all animals are healthy bulls purchased after physical examination and brought to the farms and vaccinated for endemic disease including FMD. This variation in results among researchers might be attributed to season of the year, type of animals selected for the study or age of the animal, ecological and management factors. Furthermore animal in field conditions do have a chance of movement, contact with wild animals, production systems and composition of animal species have got their own role in the epidemiology of FMD (Megersa *et al*., 2008 and Aftosa, 2007).

The low prevalence of current study bulls of borana originwas10.83% should not taken as short coming of the prevalence of the disease due to the fact that these are apparently healthy bulls with average of 3-5 years old passed general physical examination during purchasing and quarantined in the feedlot farms vaccinated and ready for export. As aforementioned the borana area is not free from FMD. Even bulls were purchased from market where continuous commingling of animals from different localities zone. This shows that the bulls for export are not from the FMD due to the origin of the animals and the animals once infected by the virus will remain carrier for long period of time and transmit to other animals.

Foot and mouth disease is probably the most important livestock disease in terms of economic impact. The disease causes the greatest losses in Ethiopia, particularly, in livestock trade. FMD status is an important determinant of international trade in livestock products and the existence of FMD is an effective barrier from the markets with the highest prices for these products. These efforts have been successful in that many areas of the world are now either free from FMD or have the disease under control. The incentives of these control activities are dependent on the export potential of countries and the types of livestock systems that

are found within the countries.

FMD is the major problem of exporting animals, the current study 10.83% prevalence should not over looked as low prevalence, it is great lo for the country and as well as for the exporter. During this study the live weight of 1kg bull exported to Lebanos was 1.57 US $ and a bull weigh 390kg would be 612.3 US $. Though the average loss of the country from the above mentioned prevalence 10.83% (116/1071) study due to FMD alone account US $ 71026.8. The country loosing; the currency exchange where as the owner loss willing to participate in livestock trade due to small cost in the domestic market and also cause drastic loss of image on international export market of our livestock.

According to the ministry of Agriculture and rural development of Ethiopia (2000), the incidence of FMD has increased between 1.3 to 1.5 times since 1990. This indicates that the disease is becoming more important not only adversely affecting the productivity of livestock, but also causing ban of external market of livestock and livestock products. A small-scale vaccination practice against FMD is realized in occasion like FMD outbreak in different parts of the country. FMD occurs frequently in pastoral herds in the low land areas of Ethiopia, but in recent years the incidence of the disease has increased and become in the high land areas where more than 60% of the total livestock population exists.

However, FMD control by vaccination does not to be successful as vaccination coverage itself limited some cases, animals vaccinated using bivalent “A” and “O” vaccine were found affected by severe outbreak (Aragaw, 2004). By this virtue of these facts and given mode of livestock movement without restriction, the FMD virus contamination is maintained in the population making the disease endemic in nature.

6. Conclusion and Recommendations

The seroprevalence findings of the present revealed that FMD is an important disease problem in export bulls; even the prevalence seems to be low. The occurrence of FMD may cause restriction on the trade of animals and animal’s products internationally, affecting the export earning of the country, there by threatening the livelihood of pastoralists particularly and national agricultural economy in general. Moreover, the epidemiology of the disease in Ethiopia is complicated because the existence of the 3 serotypes in neighboring countries. Due to such heterotypic existence in different parts of the country, vaccination program need to be consider the regional situation of the problem.

In view of the above conclusion, the following recommendations are forwarded:

- Presence of FMD in the livestock populations affects the country’s economy at large by limiting and /or hindering international trade of live animal or animal products. This underlines the need to give attention towards the control of this wide spread and important disease using principle of zonation.
- The movement of livestock from the neighboring countries and between regions with in the country should be controlled with appropriate quarantine and check up procedures. So that the government should have its own quarantine area for better accomplishment.
- An extensive regular serological survey, virus isolation and characterization of FMDV need to be conducted for a possible development of polyvalent vaccine.
- Exporters should be aware of the disease and test the animals at their arrival to the quarantine station before mixing with other groups collected from different collecting center.

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Author Contribution

AW: Conception of the research idea, designing Data collection, interpretation of the results and drafting the manuscript with. The author read and approved the final manuscript.

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