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Prevalence of the Major Infectious Animal Diseases Affecting Livestock Trade Industry in Ethiopia

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Abstract
Background: Livestock in Ethiopia provides drought power, incoming to farming communities, means of investment and important source of foreign exchange earning to the nation. Even though the livestock sub sector contributes much to the national economy, its development is hampered by different constraints mainly infectious diseases. The study was aimed to determine the prevalence of the major infectious animal diseases affecting the livestock and to estimate the economic loss due to the diseases.**Methods:** A cross-sectional study was conducted from November 2013 to May 2014 at Adama-Modjo Livestock Export Industry, Eastern Ethiopia. **Result:** Out of 4321 examined bulls, 556 (12.9%), 345 (8.00%) and 321 (7.40%) were found to be positive for Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP) and both using 3ABC Enzyme-Linked Immunosorbent Assay (ELISA) respectively. Similarly, among 23, 479 examined Sheep, 1043 (4.50%) were positive Ovine brucellosis; of 4758 examined camels, 195 (4.10%) were positive for brucellosis through Complement Fixation Test (CFT) and Rose Bengal Plate Test (RBPT) during the study period. The results of the present study was showed significant difference in the prevalence of the diseases among the origin of animals and Livestock Trade Industries ($p<0.05$). The study also revealed direct financial loss due to the diseases was estimated to be 241, 2341.50 US$, 62,580 US$ and 286,767US$ from bulls, sheep and Camels respectively. **Conclusion:** The finding was concluded that FMD, CBPP and Brucellosis are an important diseases problem in Livestock Trade Industry. This may cause international trade restriction of animal and animal products which affecting the export earnings of the country. Thus, attention should be given both at production area as well as to the quarantine stations.
Keywords: Infectious Diseases, Livestock Trade Industry, Adama-Modjo Quarantine Stations

INTRODUCTION

Ethiopia is known for its livestock population which accounts first in Africa and tenth in the world and have the highest draft animal population in the continent. The site and diversity of major agro-ecological zones of the country renders suitable environment for the support of large number and class of livestock (MEDC, 1998; FAO, 1999). Livestock in Ethiopia provides drought power, incoming to farming communities, means of investment and important source of foreign exchange earning to the nation. On the basis of statistics acquired from different sources, livestock provides 16% of the total GDP (equivalent to 30% of agricultural GDP) and generates 14% of the country's foreign exchange earnings (CSA, 2009).

The Ethiopian government has designed an export development strategy mainly focusing on creation of favorable conditions to improve competitiveness of the economy in the world market and generate foreign exchange. This export-led industrialization strategy (2002) gives particular attention to the promotion of labor-intensive agriculture based on production, processing and export sectors. The priority export commodities included in the strategy include livestock, hides and skins, meat and leather products. The government of Ethiopia is therefore, committed to develop the export industry through investment and export incentives and preferential market access, such as the African Growth and Opportunity act (AGOA) and the European Business Assistance Scheme (EBAS) among other measures. Marketing livestock and livestock products is different from other agricultural commodities in such a way that transporting live animals to markets and other final destination is delicate and expensive. Animals could lose weight in transit or suffer injuries due to unstable means of transport. They are also exposed to disease causing pathogens. Livestock products are perishable, demanding for elaborated Packing and high transport and storage costs (ESAP, 2003).

In general, East African livestock trade is characterized by illicit (informal) trade between neighboring countries and inflow stocks are used either for domestic consumption (Kenya and Uganda or for re-export and domestic consumption (Somalia) or re-export alone (Djibouti). Illicit (informal) trade seriously affects Ethiopia. A large number of livestock and livestock products valued at 917 billion birr annually lost via the flow into the neighboring countries. Data from LMA (2001) revealed that an estimated 325,800 cattle, 1,150,000 shoats, 300,000 skins and 150,000 hides outflow every year from Ethiopia through illicit cross border trade (MOI, 2012).

Even though the livestock sub sector contributes much to the national economy, its development is hampered by different constraints. The most important constraints to cattle productions are widespread endemic

diseases including viral, bacterial, and parasitic infestation, poor veterinary service and lack of attention from government (Zewdie, 2004; Kuastros 2007; MOA, 2012). Of the health constraints, tick and tick borne disease, Foot and Mouth Diseases (FMD), Contagious Bovine Pleuloro Pneumonia (CBPP), Brucellosis, Lumpy Skin Diseases (LSD), PPR, Sheep and Goat Pox contribute to the great financial losses and the socio-economic development of poor farmers in the area. These diseases cause a huge mortality and morbidity. Moreover, the diseases make problem on international livestock markets and about 1.5-2.5 billion birr is annually lost from animal diseases (Zewdie, 2004).

However, various alternative options are initiated by different actors (private sector, governments and international organization). These initiatives are often regional encompassing more than one country in east Africa and attempt to find sound solutions to overcome barriers to trade so that Ethiopia and other countries could effectively use their rich livestock resources for the improvement of the live hood of their populations (MOI, 2005). Currently, Ethiopia is exporting livestock (bulls, sheep and Camels) to Middle East countries mainly Yemen, Egypt and Jordan (ADOA, 2001). Even though the complete data are found the Adama-Modjo quarantine stations, there is no well documented on the prevalence of the diseases at country level especially in academic area. Thus, the present study was designed to determine the prevalence of the major infectious animal diseases hinder the Livestock Export Enterprises and estimate the financial losses at Adama-Modjo Quarantine Stations.

MATERIALS AND METHODS

Study Area

The study was conducted at five Private beef animals' Exporter Enterprises located in and around Adama City. The city is found at 99 km East of Addis Ababa, capital city of Ethiopia. The City is located at $08^0$33N $39^0$16E on the main roads of Addis Ababa to Dire Dewa road. In addition, the Ethio-Djbouti Rail way that crosses and the number of population the City are 300,000 (CSA, 2009). Moreover about 25,000 estimated people visit every day. The populations of the city are increasing from time to time so that the demand of meat consumption is rising every time.

Study population

Study population for this study was apparently healthy bulls, Sheep and Camels that were kept for fattening purpose after all quarantine protocols have been done. The animals brought to the feedlots from different regions of the country. The bulls were come from Borena, Arsi and Bale areas; Camels were brought from Borena, Somale, Kereyu and Arsi bale areas whereas the sheep were brought from Borena, Somale and Afar regions. Accordingly, those animals were subjected as a study population for active screening of the diseases.

Sampling and Sample size determination

A convent sampling methods were conducted to sample study animals so that all animals prepared for the export during the study period were included. About 4321 bulls, 23,479 sheep and 4758 camels were screened for the diseases.

Study Design

A cross-sectional study was conducted from November 2013 to May 2014 to determine the prevalence rate of the major infectious animal diseases affecting the livestock export industry and estimate the financial losses.

Sampling Procedures

The collection of field specimens was conducted from Adama-Modjo Quarantine Stations while Laboratory analysis of specimens was made in National Animal Health Diagnostic and Investigation Center (NAHDIC). Essential materials that were used for sample collection and transportation were offered by the exporters, importer companies and research institute. The blood samples were collected from the jugular vein of the animals aseptically. About 5-7 ml of blood was collected from bulls and camels whereas 2-3ml of blood was collected from sheep through sterile plane Vacutainer tube and Venoject needle. Immediately, each animal was tagged and the respective blood samples were labeled accordingly. This blood was let down to clot for about 2-3 hours in room temperature then the clotted blood samples were stored at 4^0C till serum extraction usually within 24 hours. Then serum was extracted and dispensed into cryovials in NAHDIC Serum storage was made at -20^0c. Then each serum samples were subjected to the laboratory test through the OIE recommended diagnostic tool.

Serological Test Procedures

Enzyme-Linked Immunosorbent Assay (ELISA) Test: For specific antibodies against nonstructural proteins of FMD was conducted in NAHDCI virus using commercially available enzyme-linked immunosorbent assay (ELISA) test (Chekit-FMD-3ABC, Intervet). The 3ABC ELISA can be used as a screening test for detecting exposure to FMD virus and carrier bulls on farm basis. About 100µl of pre diluted samples (1: 16 in diluents 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. Test procedures were conducted as the procedures indicated in the leaflet with the kit and OIE standards (Andrews *et al*., 2004).

Rose Bengal Plate Test (RBPT): RBPT was performed in NAHDCI on all sera samples collected as per the

procedure described by Alton et al (1975) and OIE Manual (2004).

Complement Fixation Test (CFT): Sera samples found positive by RBPT were further tested by CFT at NAHDCI, Sebeta, Ethiopia, according to the protocol described in OIE Manual, (2004). The CFT is the test approved by the Office International des Epizooties (OIE) as the definitive test for the confirmation of CBPP (CIRAD, 2002).

Data Management and Analysis

All the data that was collected are entered to MS excel spread sheet program to create data base and it was filtered before analyzed by using SPSS version 20. Descriptive statistics was used to determine the prevalence of the diseases. In all the analyses, confidence level was held at 95% and $P<0.05$ was set for significance.

Financial Loss Estimation: The direct financial losses of the feedlots were estimated and calculated (USAID 2008).

RESULTS

Sero-prevalence of FMD and CBPP in Bulls

A total of 4321 Bulls were examined for the prevalence of Anti body against FMD and CBPP using 3ABC ELISA during the study period. About 556 (12.9%), 345 (8.00%), 321 (7.40%) of the animals were positive for FMD, CBPP and both diseases respectively. About 241, 2341.50 US$ finance was lost due to the diseases in this study (Table1, 2 and 3).

Screening of Sheep and Camels for Brucellosis

A total of 23, 479 Sheep's prepared for exports were examined for the prevalence of Ovine brucellosis through RBPT and CFT were 1043 (4.50%) during the study period. About 62,580 US$ economy was lost due to the diseases in the study (Table 5 and 6). Similarly, 4758 Camels were examined for the prevalence of brucellosis through RBPT and CFT were 195 (4.10%) during the study period. About 62,580 US$ and 286,767US$ hard currency was lost due to the diseases in sheep and Camel respectively in the study (Table 5-8).

In the present study, five (5) exporter enterprises were included during the study period. Of 4321 Bulls, 902 were examined for the prevalence of Anti body against FMD and CBPP using3ABC ELISA during the study period. Higher prevalence, (20.6 % and 22.7%) was found at Mogas and Jordan Agro Industry respectively whereas, the least prevalence of the diseases was found in Seyoum Feedlot (1.40%) (Table9).

DISCUSSION

The overall Sero-prevalence of Foot and Mouth Disease (FMD) and Contagious Bovine Pleuropneumonia (CBPP) in bulls kept at Eastern Ethiopia Livestock Export Enterprises was 556 (12.9%) and 345 (8.00%) respectively. The present finding was higher than the findings of (Bedru, 2006) who reported, 5.53 % on exported bulls of Borana and Jimma origin. Similar study which was done by Jembere (2008) indicated that an overall prevalence of 5.6% in Afar Regional State while Musema (2008) reported a prevalence of 2.3% in Mizan area. However, the finding of this study was very low when compared to the reported overall prevalence of 26.5% (Sahle, 2004) and 21% (Rufael, 2008) for Borana pastoral production system, 14% (Abdulahi 2010) in Jijiga zone of Somali regional state and 12 % (Gelaye *et al*., 2009) for Bench Maji zone of Southern Ethiopia, 28.9% (Mensur, 2008) , South Omo zone, 27.7% (Lemma, 2009) feedlots of Adama area and 21.49% (Misgana, 2008) report of Bale cattle zone. This might be due to the difference in type of animals selected, management system, spatial and temporal variation of the disease.

In the present study, all animals are apparently healthy bulls purchased after physical examination and brought to the farms and vaccinated for endemic diseases including FMD. The majority of the animals were from Arsi and Bale origin while minor percent from Borana lowlands origin. The difference might be due to 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 system and composition animal species of have got their own role in the epidemiology of foot and mouth disease (Aftosa, 2007; Megersa *et al*., 2008).

In present study, the overall sero-prevalence of Camel brucellosis was 195 (4.10%) during the study period. This finding was agrees with the previous reports from different areas (Megersa *et al*., 2008). However, it was lower than other reports; 9.3% in slaughtered camels in Egypt (Ismail *et al*., 1992), Sudan (Muasa *et al.,* 2008), 8.4% in Saudi Arabia Kaufmann (2005). On other hand, Musa et al (2009) reported higher prevalence of Brucellosis (23.8%) from camels kept mixed with ruminant species in Sudan. The result further suggested that cattle were the possible source of infection for the camels as small ruminants were sero negative. The findings reported that the status of Camel brucellosis depends on the *Brucella* species prevalent in other animals sharing their habitat and on the husbandry methods of camels.

In present study, the overall sero-prevalence of Ovine brucellosis was 1043 (4.50%) during the study period. The result was in line with the finding of Hosie et al (1985) who reported (4.4%) in the Yemen Arab Republic. However, the finding was higher than of Bekele et al (2011) who reported (1.60%) in Jijiga District,

Somali Regional State of Ethiopia; Yesuf *et al*. (2011) who reported (1.58%) in south Wollo, Amhara Regional State of Ethiopia. On other hand it was lower the findings of Boukary *et al*. (2013) who reported (14.2%) in Niamey, Niger. The significant variation in Ovine brucellosis in the present study might be attributed to differences in management systems, lack of supplementary feeding that result in low immunity and long distance transportation from different areas to feedlot that induce stress to the animals.

The results of the present study also showed that there was significant difference in the prevalence of the diseases between the origin and Export Enterprises (feedlot) ($p<0.05$).This finding was in line with the findings of Berhe (2006). The reason might be due to the difference in management system and agro ecology (Pegram *et al.*, 1981). The study revealed direct financial loss/hard currency due to the diseases was estimated to be 241, 2341.50 US$, 62,580 US$ and 286,767US$ from bulls, sheep and Camels respectively in the study during the study period. The result was in line with other findings (Halderman, 2004; USAID, 2008).

CONCLUSION

The seroprevalence finding of the present study revealed that FMD, CBPP and Brucellosis are an important diseases problem in Livestock Trade Industry. The occurrence of the may cause restriction on the trade of animals and animal products internationally, affecting the export earnings of the country, thereby threatening the livelihood of pastoralists and national agricultural economy. Thus, attention should be given both at production area and the quarantine stations. Moreover, vaccination program need to be consider the regional situations of the problem.

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Table1. Prevalence of FMD in Bulls (Borana, Bale and Arsi origin) at Eastern Shewa Livestock Export Enterprises, Ethiopia

Origin	No of bulls examined	+Ve Result	Prevalence (%)	P-value
Borana	587	89	15.2	**0.00**
Bale	1432	276	19.3	
Arsi	2019	191	9.50	
Total	**4321**	**556**	**12.9**	

Table2. Prevalence of CBPP in Bulls (Borana, Bale and Arsi origin) in the study area.

Origin	No of bulls examined	+Ve Result	Prevalence (%	P-value
Borana	857	61	10.4	**0.03**
Bale	1432	128	8.90	
Arsi	2019	156	7.70	
Total	**4321**	**345**	**8.0**	

Table3. Prevalence of FMD and CBPP in Bulls (Borana, Bale and Arsi origin) at Eastern Ethiopia livestock Export Industry.

Origin	No of bulls examined	+Ve Result	Prevalence (%)
Borana, Bale and Arsi	**4321**	**321**	**7.40**

Table4. Summary of Financial losses due to FMD and CBPP on Export Bulls in the study area.

Average Live Weight (A)	No Bulls Examined (B)	FMD and CBPP +Ve (C)	Unit Price/kg US$ (D)	Total Loss (US$)(A*C*D)
450 kg	**4321**	**321**	**1.67**	**241,231.50**

Table5. Prevalence of Brucellosis of Sheep (Borana, Somale and Afar origin) at Eastern Shewa Livestock Export Enterprises, Ethiopia

Origin	No of Sheep examined	+Ve Result	Prevalence (%)	P-value
Borana	2845	329	11.6	
Somale	8511	173	2.03	**0.04**
Afar	12, 123	541	4.50	
Total	**23, 479**	**1043**	**4.50**	

Table6. Summary of Financial Losses due to Brucellosis on Export Sheep

Total Animals Examined (A)	Brucellosis +ve (B)	Unit Price/head US$ (C)	Total Loss (US$)(B*C)
23,479	**1043**	**60**	**62, 580**

Table7. Prevalence of Brucellosis of Camel (Arsi- Bale, Borana, Somale and Afar origin) at Eastern Shewa Livestock Export Enterprises, Ethiopia

Origin	No of Camel examined	+Ve Result	Prevalence (%)	P-value
Borana	1862	29	1.56	
Somale	1415	73	5.16	**0.02**
Kereyu	567	41	7.23	
Arsi-Bale	914	52	5.69	
Total	**4758**	**195**	**4.10**	

Table8. Summary of Financial Losses due to Brucellosis on Export Camels

Total Camels Examined (B)	Seroreactives for Brucellosis	Unit price/head US$ (C)	Total Loss (B*C)
4758	**195**	**1470.60**	**286,767US$**

Table9. Prevalence of FMD and CBPP on Bulls at Eastern Shewa Livestock Export Enterprises, Ethiopia

Exporter Enterprise	No of Bulls Tested	+Ve Result	Prevalence (%)	P-Value
Jordan Feedlot	379	86	22.7	
Moges Feedlot	945	195	20.6	
Seyoum Feedlot	587	8	1.40	**0.01**
Jacranda Feedlot	820	91	11.1.	
Israel Feedlot	590	102	17.3	
Total	**4321**	**482**	**11.2**	

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