Austin Journal of Veterinary Science & Animal Husbandry

Open Access

Austin Publishing Group

Research Article

Sero-Prevalence of Contagious Bovine Pleuro Pneumonia (CBPP) and Its Associated Potential Risk Factors in Selected Districts of East Wollega Zone, Oromia Region, Ethiopia

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Received: April 03, 2018; **Accepted:** May 29, 2018; **Published:** June 05, 2018

Abstract

Contagious Bovine Pleuro Pneumonia (CBPP) is a disease of cattle caused by *Mycoplasma mycoides subsp*. *Mycoides* small colonies and it is one of the most important threats to cattle health and production in Ethiopia. Therefore, cross-sectional study was conducted to determine the seroprevalence of contagious bovine pleuro pneumonia and to assess the risk factors associated with the occurrence of the disease in the selected districts of East Wollega zone Western Oromia from January 2017 to April 2017. A total of 447 sera were examined for the presence of specific antibodies of the disease by using competitive enzyme linked immunosorbent assay (cELISA). In this study, districts, peasant associations, age, sex, herd size and market history were considered as risk factors. Thus, the overall seroprevalence of contagious bovine pleuropneumonia in this study was 6.9%. The seroprevalence of contagious bovine pleuropneumonia at districts level were 1% and 5.8% in Limmu and Gida Ayana district, respectively. There was a statistically significant variation ($p<0.05$) in prevalence of the disease among the districts, age, peasant associations and market history. However, herd size and sex were not significant ($p>0.05$) with the serostatus of the animal. In conclusion, even if, the overall prevalence of CBPP in East Wollega Zone was low (6.9%) due to the behavior of the diseases since it is significant at herd level, which warrants the government to follow appropriate preventive and control measures to stop further spread of the disease and appropriate controlling and prevention should be designed in general as a country level.

Keywords: Seroprevalence; CBPP; Risk factors; cELISA; East wollega zone; Oromia regional state; Ethiopia

Introduction

Contagious bovine pleuro pneumonia (CBPP) is an infectious and contagious respiratory disease of *Bovidae* caused by *Mycoplasma mycoides* subsp. *mycoides* "small colony" (*Mmm*SC) with a major impact on livestock production and a potential for rapid spread. CBPP is endemic to parts of Africa, parts of India and China; with minor outbreaks in the Middle East. Countries free of CBPP include the US, UK, and Australia. In almost all African countries CBPP is a fortifiable disease with official controls on the import of cattle. Despite these control, there are nomadic people which move freely across borders of certain countries such as the Fulani in West Africa and the Maasai in east Africa which may have contributed to CBPP spread. Wars, famine and inadequate financing of veterinary departments have resulted in CBPP running riot in east and central Africa [1].

World Animal Health organization reported outbreaks of CBPP in 20 countries, with the highest number of cases in Ethiopia. Ethiopia is one of the African countries were CBPP is causing enormous economic losses through cattle morbidity and mortality. Although there is no systematic epidemiological investigation to show the distribution and impact of CBPP in the country, it is considered as the major disease of cattle in the country especially in pastoral and agro-pastoral areas [2].

Respiratory disease outbreak was occurred in Bako Agricultural Research Center farm at 2011 located in western Oromia, which significant proportion of animals were affected before the disease is diagnosed as CBPP by National Animal Health Diagnostic and Investigation Center (NAHDIC) and in collaboration with Bako Agricultural Research Center (NAHDIC, 2011). As a result, the center was decided not to distribute cross breed heifers or any cattle from the center for farmers until the problem is addressed and further CBPP surveillance is conducted to know the presence and distribution of the disease in the area. So far there was no systematic study conducted to look into the status of this economically important disease in the area. Therefore, the objective of this study was to identify the seroprevalence and associated risk factors of CBPP in the area.

Materials and Methods

Description of the study area

The study was carried out in Limu and Gida Ayana districts of Eastern Wollega zone of Western Oromia region and from each

Citation: Wakgari M, Kitila G, Chali I, Merdasa D, Guta D, Gezahegn E, et al. Sero-Prevalence of Contagious Bovine Pleuro Pneumonia (CBPP) and its Associated Potential Risk Factors in Selected Districts of East Wollega Zone, Oromia Region, Ethiopia. Austin J Vet Sci & Anim Husb. 2018; 5(2): 1043.

Table 1: Association of district and peasant association with finding of the study.

Risk factors		Result		Chi-square (X^2) Value	P-Value
		Negative	Positive		
Districts	Limu	235(49.0%)	5(1.0%)	17.214[a]	0
	G/Ayana	212(44.2%)	28(5.8%)		
Total		447(93.1%)	33(6.9%)		
PA	Malka Lemi	75(15.6%)	5(1.0%)	25.284[a]	0
	Dagem Silassie	80(16.7%)	0(0.0%)		
	Sapera	80(16.7%)	0(0.0%)		
	Lelistu	71(14.8%)	9(1.9%)		
	Doro obora	67(14.0%)	13(2.7%)		
	Sirba wadessa	74(15.4%)	6(1.2%)		
Total		447(93.1%)	33(6.9%)		

district three peasant associations were selected. The altitude of these districts ranges from 650 to 2320 meters above sea level. These districts have 36% is arable or cultivable land (15.2% was under annual crops), 27.4% pasture, 16.4% forest, and the remaining 20.2% is considered swampy, marshy or otherwise unusable. The estimated total population of 125,527; 63,418 and 62,109 are male and female respectively [3].

Study animals

The study animals include all cattle populations which were kept under extensive husbandry systems. Cattle above one year old age of local cattle and those with no history of vaccination before one year back were used.

Study design

A cross-sectional survey was carried out in two districts. Limmu and G/Ayana districts were selected purposively based on history of previous suspected out breaks reports. Peasant associations (PA's) were purposively selected based on the district livestock population and outbreak report. Peasant association selected from G/Ayana district was Lalistu Gudina, Doro Obora and Sirba Wadessa and from Limmu district was Melka Lemi, Dagem Silasse and Sapera.

Sampling and sample size determination

A total of 447 samples were selected based on district livestock populations and PAs size of the district Gida Ayana (212) and Limmu (235). The sampling methods were purposive sampling based on CBPP status as outbreak area, suspected area and free area. Since the approximate prevalence of the disease in the region was not known, 50% expected prevalence and a 5% absolute level of precision was considered to calculate the number of animals to be sampled [4]. However, a totally of 447 sero-samples were collected from the two districts of six peasant association.

Sample collection

Animals were restrained by owners and 10ml of blood sample were collected from the jugular vein using vacutainer tubes. The samples were kept under the shade in a slant position for twenty four hours. The sera sample were transferred to serum tubes, labeled with a code and kept at -20^{0}C until they were tested. Corresponding to each sample code, the age, breed, body condition, PA and sex of every animal's information were collected and registered on a separate case book. Therefore, in this study, districts, PAs, age, sex, breed, body condition were considered as risk factors.

Laboratory test

A total of 447 serum samples were collected from the study areas and were submitted to Bedelle Regional Veterinary Laboratory Center. Sera were examined for the presence of specific antibodies against *Mycoplasma mycoides* sub species *mycoides* small colony type by using competitive enzyme linked immunosorbent asssay (cELISA).

Data analysis

The collected data were stored in Microsoft office excel 2007 spreadsheet. Statistical analyses were performed using SPSS version 20 software. The overall sero-prevalence of CBPP was determined using descriptive statistics. Sero-prevalence was calculated by dividing the number of positive test results by the total number of animals tested. Chi-square test was used to determine association between explanatory variables and the serostatus of the animals. In all analyses confidence level of 95% and p–value of 0.05 was used for statistical test of significance.

Results

Prevalence of contagious bovine pleuro pneumonia (CBPP) using c-ELISA

The overall seroprevalence of CBPP in the study area was 6.9%. The highest CBPP seroprevalence (5.8%) was observed in Gida Ayana district while the lowest seroprevalence (1.0%) was recorded in Limu district. There was a statistically significant variation (X^2=17.214[a], P-value=0.000) in CBPP seroprevalence among the two districts (Table 1).

Herd size of 6-10 and market history of born harbored more CBPP infection of their prevalence 4.8% and 3.8% respectively. Herd size is insignificantly associated with prevalence of CBPP, but market history significantly associated with prevalence of the CBPP in the study area (Table 2).

Female cattle harbor more prevalence of CBPP than male. Cattle aged 6-10 were suffered with high prevalence of CBPP. Sex and age insignificantly associated with prevalence of CBPP (Table 3).

Discussion

The current study indicated that CBPP was found to be one of the major cattle health problems in western Oromia Region. In this investigation a total of 447 serum samples were tested from the two districts of East Wollega zone of western Oromia Regional state and

Table 2: Association of the herd size and market history with result of the study.

Risk factors		Result		Chi-square (X^2) Value	P-Value
		Negative	Positive		
Herd Size	5-Jan	104(21.7%)	5(1.0%)	5.435[a]	0. 066
	10-Jun	218(45.4%)	23(4.8%)		
	>10	125(26.0%)	5(1.0%)		
Total		447(93.1%)	33(6.9%)		
Market History	Born	332(69.2%)	18(3.8%)	6.056[a]	0.014
	Bought	115(24.0%)	15(3.1%)		
Total		447(93.1%)	33(6.9%)		

Table 3: Association of sex and age with the outcome of the study.

Risk factors		Result		Chi-square (X^2) Value	P-Value
		Negative	Positive		
Sex	Male	161(33.5%)	16(3.3%)	2.052[a]	0.152
	Female	286(59.6%)	17(3.5%)		
Total		447(93.1%)	33(6.9%)		
Age	5-Feb	268(55.8%)	13(2.7%)	5.997[a]	0.05
	10-Jun	175(36.5%)	20(4.2%)		
	>10	4(0.8%)	0(0.0%)		
Total		447(93.1%)	33(6.9%)		

the overall seroprevalence of CBPP in the study areas was 6.9%. The finding was agree with the work of [5-7] reported seroprevalence of 9.4% in Borena, 9.7% in south western Kenya and 9.1% in Northwest Ethiopia, respectively. The overall seroprevalence of CBPP in the present study was lower than the findings of [8-12] reported seroprevalence 16% in Kajiado District Kenya, 39% in Somali Regional state, 32.5% in Iluabora and Wollega, 56% in North Omo and 28% in Bodji district of Western Wollega. However, the overall sero-prevalence of CBPP in the current study was higher than that of [13] who reported seroprevalence of 4% in and around Adama. Extremely the highest herd sero-prevalence was observed in Mieso district (100%) followed by Qabribeyah (75%) and in Afdem (71.4%) according to study in Somali region by [9]. In Western Gojam and Awi zone the highest sero-prevalence was also observed in Banja district (66.3%) followed by Dangila (41.7%) and Denbecha (33.3%) [7]. The variation in the prevalence of CBPP reported from different part of Ethiopia in particular and other countries in general could be due to difference in agro-ecological system, animal management, production system, population density, livestock movement and the types of tests used to evaluate the seroprevalence.

In the current study seroprevalence recorded among the districts were highly different from each other such as (1%) in Limmu district and (5.8%) Gida Ayana. The result of this study revealed that there is higher statistically significant difference of prevalence was recorded in both district ($P<0.05$) (Table 1). This could be related due to different reasons such as the presence of large number of livestock population within the district, the presence of communal grazing and watering areas.

In the present study seroprevalence recorded among the peasant association were highly different from each other such as Malka Lemi (1%), Dagem Silasse (0.00%), Sapera (0.00%), Lalistu (1.9%), Doro Obora (2.7%) and Sirba Wadessa (1.2%). The result of this study revealed that there is higher statistically significant difference of prevalence was recorded in all peasant association ($P<0.05$, $X^2=25.284^a$) (Table 1). This could be related due to different reasons such as the presence of large number of livestock population within the district, the presence of communal grazing and watering areas.

In the recent study there was a slightly prevalence difference among the sex 3.3% and 3.5% male and female respectively. However, there was no statically significant difference with sex ($p>0.05$, 0.152, $X^2=2.052^a$). This result was contrary to [6] who reported statically significant difference among sex. The prevalence of 2.7%, 4.2% and 0.0% were recorded in animals age category of 2-5 years, 6-10 years, and >10 years respectively. This result is in agreement with the previous report by [8,14] in which sero-positive in adults would be higher as compared to the young. So that low prevalence of infection in young was due to the decreased contact between the other animal because young animal don't move long distance as well as it may be due to c-ELISA test because the present study used only c-ELISA test to categorize the cattle as CBPP seropositive and negative. It is well understood that c-ELISA is more sensitive in detecting cattle with chronic stage than any other test and it is more prone to miss individual animals at the early stage of infection or young animals [15,16]. However, this results contrary to the report of [17] who reported that young animals were susceptible to articular forms of CBPP than adult cattle.

In this study there was no significance difference among herd size ($p>0.05$, 0.066, $X^2=5.435^a$) in the sero-status of the animals which may due to animals in one or more villages stay in the same communal grazing land. This result in lines with the report of [18] in Bishoftu abattoir and export oriented feedlots around Adama town.

In the study there was slightly prevalence difference among the market history of born (3.8%) and bought (3.1%) which was statistically significant with market history ($p<0.05$, 0.014, $X^2=6.056^a$). The small sero-prevalence in born animals than bought was due the high contact time among diseased herd than those bought due to the diseases behavior.

Conclusion and Recommendation

In general, the present study indicated that the overall prevalence of CBPP 6.9% in East Wollega zone of Western Oromia Regional State. It was confirmed that CBPP is one of the major threats to cattle production in western part of the Oromia in particular and the whole country in general. Therefore, the Regional State follows appropriate prevention and control measures of the disease like short term intervention such as isolation of infected animals and strict vaccination culling sick animals which is preferred and impossible in our country due to large animal bovine population and prevention of this economically devastating disease and further continuous study should be done in the future in order to identify the temporal pattern of the disease in the country, absence of livestock movement policy and needs compensation to farmers. Even if treatment not recommended since animals remain carriers after treatment, of symptomatic valuable animals ought to treated with Tylosin and must be started to stop further spread of the disease in the area. Both the federal and regional government of the country has to be emphasized in controlling.

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Austin J Vet Sci & Anim Husb - Volume 5 Issue 2 - 2018
ISSN: 2472-3371 | www.austinpublishinggroup.com

Citation: Wakgari M, Kitila G, Chali I, Merdasa D, Guta D, Gezahegn E, et al. Sero-Prevalence of Contagious Bovine Pleuro Pneumonia (CBPP) and its Associated Potential Risk Factors in Selected Districts of East Wollega Zone, Oromia Region, Ethiopia. Austin J Vet Sci & Anim Husb. 2018; 5(2): 1043.