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Sero Prevalence, Associated Risk Factors and Molecular Detection Contagious Bovine Pleuropneumonia from Seropositive Cattle and Assessment of Knowledge, Attitude and Practice of Farmers about the Disease in Dawo District South West Shewa Zone, Ethiopia

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Abstract

Contagious bovine pleuro pneumonia is prevalent in almost all areas of Ethiopia and cause reduction to the livestock production and affect livelihood of small scale farmer which caused by *MmmSc*. Even though Contagious bovine pleuro pneumonia is prevalent in Ethiopia and large numbers of cattle are present in Dawo district there was no information about prevalence and risk factors of disease, there was no research conducted to detected molecules of disease from positive cattle and knowledge, attitude and practice of farmer in Dawo district of south west shewa zone, Oromia, Ethiopia. A cross-sectional study was conducted to determine prevalence and associated risk factor of CBPP, molecular detection of *MmmSc* from positive cattle and to evaluate knowledge, attitude and practice of farmer on occurrence of disease. Four hundred cattle were randomly selected from five purposively selected peasant associations and serum sample were transported to National animal health diagnostic center for diagnosis the presence of antibody against *MmmSc* antigen. The collected data were analyzed using SPSS version 20 software. From 400 cattle 72(18%) individual animals and from 144 herds examined 54(37.5%) herds were positive against *MmmSc*. In present study a statistically significant association were observed in risk factors like adult cattle (OR=2.42, P=0.015), large herd size (OR=2.52, P=0.015), animals with respiratory problems (OR=1.84, P=0.027), cattle with poor body condition (OR=3.1, P=0.005) at an individual animal-level and midland agro ecology (OR=2.45, P=0.014) at herd-level. From 19 seropositive animals' lung tissue and nasal swabs were tested with PCR and *MmmSC* was detected in 17(89.5%) samples. Knowledge, attitude and practice gap were observed from study farmers with only 32.6% of respondents aware about the respiratory diseases. Contagious bovine pleuro pneumonia is the important disease of cattle in Dawo district.

Keywords: CBPP • c-ELISA • Dawo • Ethiopia • Polymerase chain reaction

Introduction

Background

Contagious bovine pleuro pneumonia (CBPP) is a bacterial disease which causes major constraint to the livestock and affects livelihood by its impact on animal health and effect on the livestock production, availability and quality of animal food [1-4]. It is contagious, acute, sub-acute or chronic disease of cattle caused by mycoplasma mycoides subspecies small colony (*MmSc*) [5-8]. CBPP is characterized by loss of appetite, increased body temperature and respiratory problem such as difficulty in breathing, cough, nasal discharge, and arthritis [9]. Contagious bovine pleuro pneumonia is endemic in many sub-sahara regions of African countries and threats the country due to the carrier status of its host. The disease spread alarmingly in late 19th century and infecting several countries previously free from the disease causing greater losses in cattle [7]. Due to high economic losses caused by CBPP, OIE declared it as trans boundary animal disease [10].

In Africa control of CBPP is difficult due to economic weakness, political disturbances and governmental inability or lack of will to enforce movement controls. These difficulties are aggravated by the lack of diagnostic tools and an efficient epidemiological surveillance network. The true situation regarding this disease is therefore often not appreciated, making it very difficult to take decisions on control measures [11]. From 20 countries outbreak of CBPP reported previously; highest number of cases were reported in Ethiopia according to World organization for animal health (OIE) [12]. The disease is known by its ability to transmit by direct contact, long incubation time; early excretion of mycoplasma before the showing clinical signs, during disease time and after clinical sign disappear in "lung sequestra" up to two years [13-18].

In Ethiopia different researcher provided that CBPP is most important livestock diseases which effect livestock production system. For example the prevalence of 39% in Somali Regional State [19-23], 66% in North Gondar [24] and 55.7% in Bako Tibe and Ilu Galan districts [16] was reported. This indicates that the disease is serious disease of cattle in Ethiopia. The presence of large numbers of cattle population, appropriate environmental condition for disease, cattle movements, extensive grazing system used and increased production systems in the country create ideal conditions for the spreading the disease. Although, the impact of CBPP on cattle producer was known, prevalence, risk factors associated with disease, molecular detection of CBPP from sero positive cattle and knowledge, attitude and practice of the farmer regarding to disease was not known in Dawo district of south west shewa zone. An assessment of the current situation of contagious bovine pleuropneumonia

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in the study area was provide baseline information about the diseases and plays a significant role in designing strategic control toward the disease. Therefore, the objectives of this study were to estimate the seroprevalence, associated risk factors, and molecular detection of CBPP and to determine knowledge, attitude and practice of farmers in Dawo district of Southwest Shewa zone, Ethiopia.

Materials and Methods

Description of the study area

The study was conducted in the Dawo district of the South west Shewa zone of Oromia regional State, Ethiopia. Dawo district is located at 96 Km from Addis Ababa in the South west direction with elevation ranging from 2050-3100 meter above sea level. The district is lies between 8.44'29" – 8.58'35"N and 38.16'10" E. The area receives mean annual rainfall of 1150 mm with minimum and maximum temperatures of 14oc and 25oc, respectively (Figure 1) [19]. The livestock populations of the district were: Cattle 82,691, Sheep 31, 217, Goat 11,121, Poultry 70,944, Horse 9,297, Donkey 10,342, and Mules 231 [20].

Study population

In this study target populations were all local and exotic breed cattle greater than six months of age of both sexes with no history of vaccination against CBPP and the study populations were all cattle selected for purpose of this study in selected peasant association of Dawo district. The age of the individual animal was categorised as young (6 months –3 years), and adult (> 3 years). Body condition score was made and recorded as poor, medium and good according to Mtui-Malamsha NJ [21].

Study design

Cross-sectional study was used to determine prevalence and associated risk factors of contagious bovine pleuropneumonia and to detect molecular characterization of disease from sero positive animals.

Sample size determination

Sampling methods: Five peasant associations and one town were selected purposively from Dawo district of south west shewa. Cattle owner (herds) and individual animals were selected using systematic random sampling technique.

Sample size determination: The total number of cattle required for this study was calculated according to the formula of Thrusfield [22]. Accordingly there was no previous study conducted regarding to contagious bovine pleuropneumonia in the study area, so 50% expected prevalence, 5% desired level of precision and 95% of confidence interval were used.

$N= 1.96^2 \times P (1-P)/d^2$

Where N= required sample size, P= the expected prevalence of the disease (50%) and d= the precision level (5%). Therefore 384 sample sizes were calculated. However to increase the precision of the study total sample size was increased to 400.

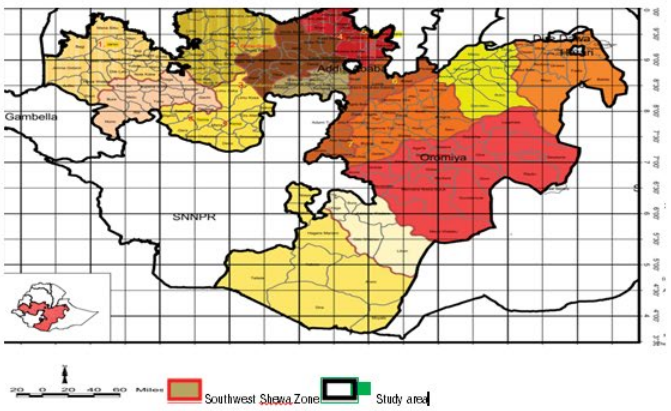

Figure 1. Map of the study area (Source: Disaster prevention and preparedness agency information center, 2006).

Data collection

Questionnaire survey: A questionnaire survey was prepared to determine Knowledge, attitude and practice of farmer about the general livestock health problems and targeted disease particularly. Data on general information of farmers; cattle respiratory disorders, general knowledge of farmers on the factors that contribute the disorders, common signs of CBPP that understand by farmers, possible transmissions methods of CBPP and management practices that associated with prevention and control of disease were included in the questionnaire.

Data quality control and quality assurance: Data quality was qualified through careful organization of the sample collection format. The questionnaire survey was prepared first in English then translated into Afaan Oromo language and re-translated into English to check its consistency. The questionnaire format was validated using a pre-test on 5% of the sample size that was randomly selected.

Sample collection

Blood sample collection: After cattle was restrained by the owner following standard procedure 10 milliliters of serum samples were collected from the jugular vein of each animal using sterile vacutainer tubes and needles then each sample was labeled properly. Then, the samples were protect from sun light by kept in a slanting position for 24 hours at normal temperature to allow clotting of serum samples to separate. After clotting the serum sample was transferred gently to sterile vials and immediately submitted to national animal health diagnostic center (NAHDC) with an icebox and stored at -20oc until the laboratory analysis. The serum samples were tested using competitive Enzyme-linked Immunosorbent Assay (c-ELISA) to detect *MmSC* antibodies based on the manufacturer's instruction. The test was an OIE prescribed test and can be used for official CBPP testing. The specificity of the c-ELISA has been reported to be at least 99.9% and as compared to complement fixation test which can detect nearly all sick animals with acute lesions, but c-ELISA can detect chronic stage of disease. This test was based on a monoclonal anti *MmmSC* antibody, named Mab117/5and sample with percentage of inhibition greater than or equal to 50% are considered as positive for *MmmSC* antibodies and sample with percentage of inhibition less than 50% are considered as negative for *MmmSC* antibodies.

Lung tissue sampling: Seven lung tissue samples were collected from died animals during and after blood sample collection for the serological study and immediately stored at -20 OC and submitted to NAHDIC, and analyzed by PCR. It allows detection of *MmmSC* directly in samples of lungs, bronchial lymph nodes, nasal swabs, pleural fluid and blood. PCR amplify the genes from all members of the Mycoplasma mycoides cluster. Outbreaks of CBPP often require analysis of large numbers of specimens to detect the occurrence of *MmmSC*. The traditional method for the analysis of PCR products was agarose gel electrophoresis which was useful if a small numbers of samples are involved.

Nasal swab sampling: Out of the total 72 seropositive animals, twelve strong c-ELISA seropositive results were traced back and the nasal swab was collected and transported to the NAHDIC in transport media and stored at -20oc until the PCR analysis.

Laboratory test

C-ELISA, genome extraction and PCR: Competitive Enzyme-linked Immunosorbent Assay (c-ELISA), genome extraction and PCR techniques were used based on a monoclonal anti-*MmmSC* antibody named Mab 177/5, simplified universal genomic DNA extraction protocol suitable for PCR were done based on protocol respectively.

Data analysis

After collection data were stored in a Microsoft office excel spread sheet and analyzed using SPSS version 20. Associated risk factors like

peasant association, age, sex, body condition score, and herd size, history of respiratory problem, breed of animal, agro-ecology and parity were analyzed. Co-linearity of variables was checked through Pearson correlation coefficient and exposure variables were forwarded for further analyses by using univariable logistic regression. Factors with P≤ 0.25were selected for multivariable logistic regression analysis. Finally the presence of the strength of association between the risk factors and disease was assessed and non-significant variables were removed sequentially using backward elimination at P< 0.05.

Results

Prevalence of contagious bovine

Out of 400 individual cattle examined 72 cattle were positive for contagious bovine pleuro pneumonia (CBPP) antibody. Total sero prevalence of CBPP at individual animal level was 18% (n=72/400). From the 144 herds examined 54 of herds were found positive against CBPP antibody with an estimated herd sero prevalence of 37.5% (n=54/144). Regarding to study area prevalence of CBPP was in Busa 01 peasant association 25% (25/100), Ulma Busa 22%(13/60), Sedare Arbu 20%(12/60), Dawo Seden 15%(9/60), Tute Kunche 12%(7/60) and Bashi Kiltu 10%(6/60) (Table 1).

Individual animal-level risk factors

Animals with poor body condition has higher sero prevalence 23.10% (143/400) than in medium 19.4% (155/400) and good body condition 8.8% (55/400) and there was a statistical significant association between animals with poor body condition and CBPP antibody circulation, higher seropositivity was recorded in adult cattle 20.8% (102/400) than in young cattle 9.8% (198/400)and there was a statistical significant association between adult animals and CBPP antibody circulation, highest sero prevalence 21.8% (225/400) was recorded in cattle with a previous respiratory disease problem than cattle free from respiratory problem 13.10% (175/400) and there was a statistical significant association between animal with history of disease and CBPP antibody circulation, higher sero prevalence was occurred in large herd size than medium and small herd size (Table 2).

Risk factor of disease at herd-level

Higher prevalence of CBPP antibody was observed in midland (45.9%) than in the highland agro ecology (25.4%) and there was statistically significant association of midland agro ecology with CBPP antibody circulation (OR=2.45; 95% CI: 1.205-5.134; P = 0.014). Large herd size (52.6%) show higher prevalence than small herd size (27.1%). Herds with respiratory problem show higher prevalence (39.8%) than healthy one (26.9%).

Laboratory results

The PCR amplification of the CBPP indicated that from 19 samples tested *MmSC* antigen was detected in 17 samples. From twelve (12) nasal swap 11(91.7%) and from 7 lung tissue 6 (85.7%) were detected against *MmSC* antigen. The result of PCR looks like the following figure (Figure 2).

Knowledge, attitude and practice of farmer toward the disease

Socio-demographic Information of the respondents: From 144 respondents 58.3% (84/144) were illiterate 29.9%(43/144) primary 5.6% (8/144) secondary school and 6.3% (9/144) were from higher institute and the age of respondents range from 15-72 years. From sex of respondents 82.6% (119/144) were males and 17.4% (25/144) were females. Regarding to married status of respondents 81.9% (118/144) were married and 18.1% (26/144) unmarried and 70.8% (102/144) of the respondents from rural and 29.2% (42/144) from urban area. In Dawo district the predominant cattle diseases were Blackleg (68.1%), Lumpy skin disease (38.9%), Foot and mouth disease (36.1%), Anthrax (29.2%), and Pasteurellosis (25%); whereas Contagious bovine pleuro pneumonia were not known according to the respondents (Table 3).

Farmers' knowledge assessment regarding major symptoms of CBPP: Swelling of the throat and dewlap 77.1% (111/144), coughing with extended head 70.1%(101/144), dilation of the nostril and mucoid discharge 47.9%(69/1444), frothy saliva at the mouth 45.1%(65/144), chest pain 20.1%(29/144), standing with back arched 18.8% (27/144) grunting during exhaling or coughing 18.1% (26/144), polyarthritis particularly on young 16.7%

Table 1. Prevalence of CBPP in the study area.

Study area	No of examined	No of positive cattle	Seroprevalence (%)	95%CL Lower	Upper
				Lower	Upper
Beshikiltu	60	6	10.00	2	18
Tutekunche	60	7	12.00	4	20
Dawo Seden	60	9	15.00	6	24
Sedare Arbu	60	12	20.00	10	30
Ulma Busa	60	13	22.00	11	32
Busa 01	100	25	25.00	17	33
Total	400	72	18.00	14	22

Table 2. Prevalence of CBPP antibody with risk factors at individual animal-level.

Risk factors	Category	No of tested	Prevalence (%)	Adj. OR (95% CI)	P-values
Age	Young	102	26(21-30)	1	
	Adult	298	74(70-79)	2.42(1.18-4.92)	0.015*
Sex	Female	154	38(34-43)	1	
	Male	246	62(57-66)	0.91(.54-1.54)	0.732
Breed	Cross	65	16(13- 20)	1	
	Local	335	84(80-87)	2.41(1.99-5.83)	0.050
History of RD	No	175	44(39-49)	1	
	Yes	225	56(51-61)	1.84(1.07-3.16)	027*
Herd size	Small	104	26(22-30)	1	
	Medium	120	30(26-34)	2.35(1.07-5.18)	034*
	Large	176	44(39-49)	2.52(1.19-5.31)	015*
BSC	Good	102	26(21-30)	1	
	Medium	155	39(34-44)	2.5(1.12-5.47)	0.025*
	Poor	143	36(31-40)	3.1(1.41-6.81)	0.005*

Figure 2. Gel electrophoresis result of PCR products using primer-CBPP MSC.

(24/144)and stand with the elbows abducted 14.6% (21/144) are responded of the farmer (Table 4).

Question related to way of respiratory disease transmission: The majority farmer has not aware about way of respiratory disease transmission. But 84% (121/144) of the farmers are understood the respiratory diseases transmitted through direct contact with carrier cattle and 75.7% (109/144) farmer understood disease transmitted by coughing of carrier cattle (Table 5).

Economy importance of CBPP disease: Farmers are responded as disease cause loss of body weight 88.9% (128/144), reduced working ability of cattle 72.9% (105/144), loss of production 66.7% (96/144) and reduces fertility of cattle 52.1% (75/144) (Table 6).

Control and prevention of respiratory diseases: From 144 respondents 91% (131/144) respondents responded that the respiratory disease can be controlled by treatment, 61% (88/144) they responded that disease can be prevented by vaccination, 46.5%, (67/144) isolation of newly purchased animals from herd and 8.3% (12/144) responded that respiratory disease were prevented by killing of affected animals (Table 7).

Discussion

From the total 400 animals tested 72 animals were seropositive and the individual animal and herd-level prevalence were 18% and 37.5% respectively. Seroprevalence of CBPP at herd level finding were closely agrees with the finding of Gizew [10] who reported 39% in Somali region; however lower than findings of Teklue T, et al. [24], Molla W, et al. [15], Mtui-Malamsha NJ, et al. [21] Gezahegn A, et al. [25] who reported 66% in North Gondar zone, 55.7% at Bako Tibe and Ilu Galan districts of west Shoa Zone and 45.7% in the south west of Kenya respectively. The variation in the report of seroprevalence of CBPP at herd level might be due to the fact that differences in agro-ecology, management and production system, the population density, grazing and watering system and number study cattle [26-28].

Individual animal-level sero prevalence of CBPP 18%(400/72) which closely related with the finding of other researcher like Daniel W, et al. [6, 26] who reported 19% in Molla W, et al. [15,16] reported 17.5% in the North Gondar zone, Cherinnat TM [9] reported 20.1% in Ilu Gelan district and Tola E, et al. [23] reported 16.4% in Abe Dongoro district. However the present research was relatively greater than reports from different scholars like 10.3% in Somali region by Gedlu Mekonnen G, et al. [10], 11.9% in Teklu T et al. [24], 1.4% in Bale zone by Lemu and Worku. Dawit K, et al. [29] and 0.4% reported by Gezahegn A, et al. [25] from cattle feedlot at East Shewa zone [30]. However the present results were lower than 42.5% reported by Woldemichael. Juhar TB [31] in Bambasi district, Negash W, et al. [16] reported 53.9% in Asaita district, Daniel W, et al. [6] reported 40.3% in western Oromia zone and Billy [32] reported 46% at Kaura Local Government area of Nigeria.

The variation in the report of seroprevalence of CBPP at individual might be due to differences in the management and production system, the population density, disease controlling and prevention strategy, number study cattle, and tests and methodology used to determine the seroprevalence. Statistical significant association between age group with the disease occurrence (P<0.05) were observed. Similar result were reported by Neggasa T, et al. [33] in Western South Sudan, Kassaye and Molla W [29,15] at export quarantine in and around Adama, Cherinnat TM [9] in the selected district of east Wollega and west Shewa zones, Fulasa A, et al. [20] at Bako Tibe and Ilu Galan Districts of West Shewa zone and Anjum [34]. Wang T, et al. [35] in Punjab, Pakistan. This might be due to the fact that as age increased repeated exposure to the disease also increased and persistent of CBPP in lung for a long time. There was statistical significant association between poor body condition animals (P<0.05) and CBPP antibody and this finding was similar with the finding of Bekele T, et al. [31] and Fulasa A, et al. [20] who reported poor body condition was statistically associated with CBPP antibody. This might be due to side effects of the disease.

Animals with previous respiratory disease and CBPP antibody circulation show statistical association which was in line with the report of Neggasa T,

Table 3. Common cattle diseases in the study area.

A question raised to the respondent	The local name	Scientific name	Freq. (%)
List any infectious diseases found in your area	*Gororsisa*	Pasteurellosis	36(25.0)
	Aba-Gorba	Blackleg	98(68.1)
	Desta	Rinderpest	12(8.3)
	Aba Sanga	Anthrax	42(29.2)
	DhibeSimbira	Could be CBPP	29(20.1)
	Kebenessa	FMD	52(36.1)
	Bokoksa	Bloat	14(9.7)
	Chitesa	LSD	56(38.9)
	Samba	TB	6(4.2)
	Dhibe harma	Mastitis	29(20.1)
Can you write any disease of cattle you know which cause respiratory disease	Nakersa	TB	9(6.3)
	DhibeSimbira	Could be CBPP	19(13.2)
	Gororsa	Pasteurellosis	13(9.0)
	Don'tknow	-	59(41.0)

Table 4. Farmer's knowledge regarding to symptoms of CBPP.

Symptoms of CBPP	Participants (N=144)		
	Yes	No	Never
Do you know the following signs of CBPP disease?			
Chest pain	*29(20.1)*	*61(42.4)*	*54(37.5)*
Stand with the elbows abducted	21(14.6)	72(50.0)	51(35.4)
Standing with back arched	27(18.8)	76(52.8)	41(28.5)
Head extended coughing	101(70.1)	12(8.3)	31(21.5)
Labored& painful breathing	56 (38.9)	39(27.1)	49(34.0)
Grunting when exhaling (coughing)	26(18.1)	56(38.9)	62(43.1)
Frothy saliva at the mouth	*65(45.1)*	*71(49.3)*	*8(5.6)*
Dilation of nostril and mucoid discharge	69(47.9)	36(25.0)	39(27.1)
Swelled throat and dewlap	111(77.1)	21(14.6)	12(8.3)
Polyarthritis particularly in young	24(16.7)	73(50.7)	47(32.6)

Table 5. Respondents knowledge about the way of disease transmission.

Way of disease transmissions	Participant response (N=144)		
	Yes (%)	No (%)	Don't know (%)
Possible way of contagious diseases transmission			
Ingestion	41(28.5)	35(24.3)	68(47.2)
Sexual contact	11 (7.6)	24(16.7)	109(75.7)
Direct contact	121(84.0)	5(3.5)	18(12.5)
Air	75 (52.1)	19 (13.2)	50(34.7)
Contaminated materials	23(16.0)	56(38.9)	65(45.1)
Transplacental transmission	*69(47.9)*	*28(19.4)*	*47(32.6)*
Fetal membrane and uterine discharge	17(11.8)	59(41.0)	68(47.2)
Long distance in the air	30 (20.8)	65(45.1)	49(34.0)
Saliva or urine of a diseased animal	18(12.5)	51(35.4)	75(52.1)
Coughing droplet	109(75.7)	9(6.3)	26(18.0)

Table 6. Knowledge of farmer about impact of disease on economy.

Economic impactof the disease	Response category (N=144)		
	Yes (%)	No (%)	Don't know (%)
Cattle mortality	47(32.6)	83(57.6)	14(9.7)
Body weight loss	128(88.9)	4(2.8)	12(8.3)
Reduce working ability	105(72.9)	25(17.4)	14(9.7)
Reduce fertility	75(52.1)	39(27.1)	30(20.8)
Reduced growth rate	61(42.4)	54(37.5)	29(20.1)
Can cause loss of production loss	*96 (66.7)*	*27(18.8)*	*21(14.6)*

Table 7. Disease prevention and controlling method used by the respondents.

Disease prevention and control methods	Response category (N=144) %		
	Yes	No	I don't know
Vaccination	88(61.1)	36(25.0)	20(13.9)
Treatment	131(91.0)	9(6.3)	4(2.8)
Killing of affected animals	12(8.3)	99(68.8)	33(22.9)
control of movement	43(29.9)	78(54.2)	23(16.0)
Quarantine	67(46.5)	64(44.4)	13(9.0)
Decontamination of infected premises	46(31.9)	41(28.5)	57(39.6)

et al. [33] and Cherinnat TM [9] who reported the presence of a significant association between animals with previous respiratory disorder and CBPP antibody circulation. This might be due to the fact that previous diseased animals are a carrier of CBPP in lung tissue and disease was transmitted were get appropriate condition.

Among the risk factor assessed at herd-level midland agro ecology and CBPP antibody show statistical significance which in line with reports of Alemayehu [30] which reported statistical significant association between the midland agro ecology and seroprevalence of anti- *MmmSC* antibodies. This might be due to the fact that midland agro ecology was more favorable for the occurrence of a disease. Seven lung tissues sample were checked for presence of disease and 6 (85.7%) were detected against *MmSC* antigen. But by PCR amplification of the genomic DNA results, *MmmSC* was detected in six tissue samples (85.7%) and eleven nasal swab samples (91.7%). This positive lesion was accepted as due to CBPP. The absence of lesion in one lung sample which positive for both c-ELISA and PCR tests are agreement with finding of Cherinnat TM [9] who reported (50%) lesion observed and 100% PCR positive for *MmmSC* results. This might be due to antibiotic treatment which can cause stops the extension of lesions. On the other hand, PCR can detect dead antigens, and also died antigens can induce antibody production.

From well-known diseases in the area assessed farmer by questionnaire survey direct contact with positive cattle (84%) and inhalation (52.1%) are main route of disease transmission which agreement with the reported of Cherrinet TM [9] who reported 77% of disease were transmitted through direct contact with affected cattle and 67.3% through inhalation. Prevention and controlling method used by farmers of the area are treatment, vaccination, isolation of newly purchased animals from the herd and test and killing of affected animal. This finding was related to the findings of Cherrinet TM [9] in selected districts of East Wollega and West Shewa zone, and Tola E, et al. [23] at a selected district of Horro Guduru Wollega Zone, and those who reported that the majority of respondents were more depends on the option of treatment and vaccination as a means of controlling and prevention of the diseases.

Conclusion and Recommendations

The sero prevalence of CBPP in the study area both at individual animal and herd-level was high as compared to the findings of different investigator in different area about the disease. This result gives clues that the disease was higher in study areas. Cattles kept in these areas are always at the risk of having CBPP because there were statistically significant associations with age, history of respiratory diseases, herd size; poor body condition and agroecology risk factors. Also, PCR isolation of *MmmSC* detected the presence of CBPP in the area. In Dawo farmers know how to prevent the respiratory disease but they have no information about CBPP. Therefore there were knowledge and attitude gaps among the farmer toward the study disease. Therefore, based on this study the following recommendations were suggested:

1. The farmers should be made aware of contagious bovine pleuropneumonia
2. Appropriate preventive measures should be implemented against CBPP.

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Data and Materials Requirements

Up on the requirement all data supporting the conclusions of this article will be available from the 1st and co-author.

Statistical Analysis

Collected data from questionnaire and laboratory were analyzed by Statistical Package for Social Sciences (SPSS) version 20 and descriptive statistics and logistic regression were used to summarize the result.

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Ethics Approval and Consent to Participate

Study participants were informed about the study objective of the study as per the recommendation of Ambo University research ethical guideline. The questionnaire was administered to farmers after getting permission to participate. After the protocol of the study was reviewed and approved by Ethic and research review committee of Ambo University (Reference AUEAG/EC010/2021) process was performed. The procedure was approved via IRB and sample was collected after we got permission from farmer and farm owner.

Disclosure

No conflicts of interest in this work.

Author Contributions

Both authors contributed from drafting of idea, data collection, carried out laboratory work, data analysis and write-up, article revising, summited final approval of the version to be published, agreed to the submitted journal and agrees to be accountable for all aspects of the work.

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