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Review Article

Contagious Bovine Pleuropneumonia (CBPP): Literature Review on Distribution, Sero-Prevalence, and Associated Risk Factors which Plays Major Role in an Economic Loss of this Sector

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Abstract

Contagious bovine pleuropneumonia (CBPP) is highly contagious and infectious respiratory disease of cattle caused by Mycoplasma mycoides mycoides Small Colony type (MmmSC) which is widely spread in Ethiopia regardless of any variation in agro-ecological parameters and found to be threat to cattle health and production.

CBPP is an oldest and the noticed disease in Ethiopia. Although combined blanket vaccination was given with Rinderpest vaccine in the former times, it was not eradicated in Ethiopia. Rather the disease is distributed all over the country in various magnitudes of prevalences and made the controlling process very complex. Little is known about the Epizootiology of CBPP in Ethiopia and was thought to be the problem of low land pastoral area in which the adjacent high land do have probability to be exposed, unlike the research result of many literatures which has revealed its outbreak in high lands of Addis Ababa and North Shewa.

In Ethiopia the average physical losses from contagious bovine pleuropneumonia (CBPP) in terms of cattle deaths, traction power, cost of treatment and control is so magnificent and incalculable both in endemic and epidemic areas that many changes are expected from this sector to save the immense potential loss arising from this problem.

As a disease of intensification, animal husbandry and associated cattle movement were incriminated to be the risk factors.

In general small holder farmers of Ethiopia that covers the largest portion of agrarian community was underestimated and not understood because of which no noticeable economic change was seen despite the huge potential of livestock population in the country.

Keywords: Contagious bovine pleuropneumonia (CBPP); Ethiopia; Agro-ecology; Prevalence; Epizootiology; Risk factors

Introduction

In an economic backbone of Ethiopia that largely stems from agricultural sector, the role of livestock is very notable in that it contributes 13-16% of the total gross domestic product (GDP), 30-35% of Agricultural gross domestic product (GDP) and more than 85% of farm cash income [1]. Despite the fact that this magnificent figure is achieved from livestock sector; and making the gap of economy very narrow thereby alleviating food insecurity, diseases of animals like contagious bovine pleuropneumonia (CBPP) is playing a principal role and remarkably noticed by many scholars for not to achieve the real asset expected from this sector [2].

Contagious bovine pleuropneumonia (CBPP) is an important disease of cattle caused by Mycoplasma mycoides mycoides small colony variant (MmmSC) [3]. It is a respiratory complex disease characterized by high morbidity that ranges from 75% to 90% in which domestic ruminants are naturally at risk. Mortality rate seems to vary from 50% to 90% while the case fatality rate was found to be 50% [4], buffalo and yaks were reported to be susceptible [5]. It is a disease notified by OIE because of its economic importance. CBPP induces lesions of pneumonia and pleurisy in cattle and domestic buffaloes in which mortality may come up to 50% if left untreated [6].

According to the 1993 published paper of OIE, FAO and various reports of personal communications, CBPP was present in 23 countries of African of which Eritrea, Ethiopia, Kenya, Somali, Sudan, Tanzania, and Uganda are some of the countries quoted [7]. Because of the poor concept and lack of information about epizootiology of CBPP in Ethiopia, it has been thought to be a problem of low land pastoral area that does have a high probability to be exposed to the high land. But the outbreak of the recent past in Addis Ababa and North Shewa showed the risk it carries to the dairy industry [4].

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Table 1: Cattle population at risk in 4 CBPP affected areas of Ethiopia.

Area	Administrative Zones	Cattle population	Livestock system
Western Ethiopia	Endemic Zones		
	-Western Wellega (Oromia)	1,005, 500	Mixed crop-livesock
	- Assosa (B. Gumuz)	84,200	Mixed crop-livestock
	Epidemic Zones		
	- Part of W. Wellega (Oromia)	272,700	Mixed crop-livestock
North Western Ethiopia	Endemic Zones		
	- Western Gojjam (Amhara)	1,188,000	Mixed crop-livestock
	- Awi (Amhara)	470,000	Mixed crop-livestock
North East Ethiopia	Endemic zones		
	- Afar zones (Afar)	768,000	Nomads
	Epidemic zones		
	- Southern Tigray (Tigray)	450,000	Mixed crop-livestock
	- North Wello (Amhara)	620,000	Mixed crop-livestock
	- North Shoa (Oromia)	1,018,000	Mixed crop-livestock
	- Eastern Shoa (Oromia)	1,019,000	Mixed crop-livestock
	- Arsi (Oromia)	2,509,000	Mixed crop-livestock
Southern Ethiopia	Endemic zones		
	- Borena (Oromia)	1,419,000	Nomads
	- South Omo (SNNP)	413,000	Mixed & Nomads
	- Konso S.D. (SNNP)	70,000	Mixed crop-livestock
	- Derashe S.D. (SNNP)	34,000	Mixed crop-livestock
	- Amaro S.D. (SNNP)	59,000	Mixed crop-livestock
	Epidemic zones		
	- North Omo (SNNP)	1,715,000	Mixed crop-livestock
	- Maji (SNNP)	212,000	Mixed & Nomadic
Total	Endemic zones	5,510,700	
	Epidemic zones	7,815,000	

Source: Cattle population in the Zones: CSA, Livestock, and poultry and beehives population, November, 1998.

Contagious bovine pleuropneumonia is also one of the diseases that are revealed to be the hindering factor of livestock production in Ethiopia as it was seen to be one of the emerging and economically most important diseases in the country. The disease is at an alarming rate in that it is harming the socio-economy of the country in general and of the individual farmer in particular hampering the export standard and potential of the country. Among the exacerbating factors of the impact of CBPP lack of knowledge of the real pathogenesis, vaccine and its shortcomings, and the poor diagnostic assays are the principal things which have been cited by many literatures [4,8,9].

Mycoplasma mycoides mycoides SC type is highly contagious and transmitted in between animals by aerosol and also available in discharges like saliva, urine, fetal membranes and uterine discharges. Sequestrum which is encapsulated in the lung lesions of carriers and sub-clinically infected cattle can retain the viable organism for up to two years and the animals shed the organisms when stressed [10]. Cattle movements from one to another, close or repeated contact between cattle are the main route via which the disease transmitted. Sometimes it may spread over a long distance up to 200 meter provided that the climatic conditions are favorable [11].

A wide range of severity and signs of contagious bovine pleuropneumonia has been quoted with some cattle appear to be resistant [12]. The rate of severity in endemic areas is as follows according the notification of some literatures: 13% of the animals develop the hyper acute form, 20% the acute form, and 4% the sub acute form; approximately 21% of the animals are resistant [4]. Same result has been seen in epizootic cases [13]. The frequency of subclinical forms and severity of respiratory signs are the most prominent features observed in clinical cases [12].

Large livestock population, poor supply of veterinary service, drought, concentration at watering point, dry grazing grounds combined with reduced resistance are the causes of massive livestock loss than lack of either forage or water with respect to CBPP (The World Bank, 2001). CBPP also retards genetic improvement and limits working ability of cattle. The economic impacts of CBPP in a number of African countries, including Ethiopia were calculated [14].

Magnificent loss due to death and disease of cattle has been

Table 2: Peasant association level seroprevalence of CBPP in Amaro special woreda, SNNPR, Ethiopia in relation to predisposing factors according to Tolesa et al., 2015 [8].

Variables	Category	Number of animals tested	No. positive	Prevalence (%)	Chi square	P-value
Peasant association	Jelo	100	7	7	60.95	0
	Kele	100	28	28		
	Globe	100	34	34		
	Gamule	100	58	58		
Herd size	Small	86	17	19.8	14.972	0.001
	Medium	141	38	27		
	Large	226	73	32.3		
Body condition	Poor	137	55	40	10.645	0.005
	Medium	156	50	32.1		
	Good	107	22	20.6		

The study animals were classified in different body conditions (poor, medium and good) according to Nicholsan and Butterworth (1986) [29].

noticed from the report of [4] arising from post vaccinal failure and complications apart from the purchase price of vaccine from the study that had encompassed wide area of the country.

Epidemiology of CBPP

Mycoplasma mycoides subspecies mycoides SC type, the causative agent of CBPP is with two principal clusters; the European and Afro-Australian cluster according to the isolate of strains collected over the last 50 years. Moreover, the African isolates are the one seen to surpass that of the European on the basis of degree of virulence [15].

CBPP is an endemic disease in Africa, Asia, Eastern Europe, and the Iberian Peninsula [16]. Housed, transit, and cattle moving on foot are the one estimated to be at risk hence suitable for extension of outbreaks to happen thereby facilitate the disease to spread at ease.

CBPP is characterized by long incubation period, direct contact transmission, possibility of early mycoplamal excretion (about 20 days), during course of the disease and after recovery in “lungers” (up to 2 years). Lack of reliable early screening test to isolate the agent from early carriers and lungers on top of the aforementioned problems necessitate the essence of cattle movement control to limit the spread of disease. Cattle movement is solely incriminated for maintenance and extension of the disease as there is no wild reservoir to make the transmission route complex [17].

In OIE, 1995 report, CBPP was wide spread in 24 countries in Africa including Ethiopia (Table 1).

Review of some of the Associated Risk factors (Environment and Host related demographics)

Diagnosis and diagnostic techniques used for CBPP

Cultural examination: Samples like nasal swabs, broncho-alveolar washings, pleural fluid obtained by puncture are collected from live animal. Samples taken to necropsy are lung lesions, lymph nodes, pleural and synovial fluid from animals with arthritis. The causal organisms can be isolated culturally from animals during febrile phase or shortly after postmortem from blood, pleural exudates (chest fluid) and/or affected lung tissue & lymph nodes. Because of ‘fastidious’ nature of the agent, samples should be submitted to the laboratory as soon as possible after collection [18] (Table 2-6).

Table 3: Prevalence of CBPP in bulls (Borena, Bale, Arsi origins) at Eastern Ethiopia livestock export industry in the context of Tadese B., 2014.

Origin	No.examined	Positive result	Prevalence %	P-value
Borana	857	61	10.5	0.03
Bale	1432	128	8.9	
Arsi	2019	156	7.7	
Total	4321	345	8	

Source: Tadese B., 2014.

Table 4: Individual animal level seroprevalence of CBPP in western part of Oromia, Ethiopia on the basis of Tesfaye M., 2016 [26].

District	No. of animals tested	No. of positive (%)	95% CI	X^2 (p-value)
Bako-Tibbe	100	19(19)	118-28.06	64.13 (0.001)
Horro	70	4(5.7)	1.5-14.0	
Gobbu-Sayyo	216	87(40.3)	33.6-47.1	
Total	386	110(28.5)	24.04-33.2	

Source: Tesfaye M., 2016 [26].

Table 5: Animal level seroprevalence of CBPP in the sampled villages of the three districts at 95% CI in the manner stated by Tesfaye M., 2016 [24].

Site	No. of animals tested	No. of positive (%)	
Ongobo	67	27(40.2)	X^2(p-value)
Kejo	51	30(58.8)	73.73(0.001)
BARC farm	98	30(30.6)	
Gitilo	29	2(6.8)	
Lakku	41	2(4.8)	
Sadan qixxe	52	5(9.6)	
Dambi Dima	48	14(29.01)	
Total	386	110(28.4)	

Source: Tesfaye M., 2016 [24].

Biochemical test: Mycoplasma mycoides mycoides small colony type is sensitive to digitonin, does not produce ‘film spots’, ferment glucose, reduces tetrazolium salts (aerobically and anaerobically), does not hydrolyze arginine, has no phosphatase activity, and has no or weak proteolytic properties [19]. It is where immunological tests give uncertain results that biochemical test is preferred.

Serology: To detect latency and chronically infected animals,

Table 6: The relative prevalence of CBPP at abattoirs based on associated risk factors as was described by Biruhtesfa, 2015 [25].

Factors	No. tested	Number positive	Prevalence %	p-value
Origin				
Adama	181	21	11.6	0.08
Bishoftu	118	6	5.08	
Harar	55	3s	5.4	
Age				
<4years	36	2	5.7	0.64
4-9years	305	24	7.8	
>9years	43	4	9	
Body condition				
Poor	11	2	18	0.037
Medium	64	8	12.5	
Good	309	20	6.4	

almost all serological tests are suitable. Complement fixation test (CFT) has been prescribed by OIE to undergo a reliable test in an international trade in which interpretation can be held at herd level.

The other is competitive ELISA (c-ELISA) which does have equal sensitivity and great specificity. It was seen to be easy to perform than complement fixation (CF) test but its performance characteristics has not yet been fully assessed [19].

Control strategies

The options for control of contagious bovine pleuropneumonia (CBPP) include cattle movement control and quarantine, stamping out, test and slaughter, treatment and vaccination with T1 vaccines [3]. One should be very aware and very equipped with veterinary knowledge and practices not to commit contagious bovine pleuropneumonia post-vaccinal reactions termed Willem's reaction to happen; hence it has produced many direct and indirect losses as was seen on Table 7 and 8 [4]. CBPP can disappear from a country with movement control (Newton and Norris, 2000). However, movement control is difficult and often impractical because of need for transhumance, trade, socio-cultural practices and inadequate veterinary personnel [20].

The major control strategy practiced in Ethiopia is vaccination. It was the main control strategy practiced in Ethiopia for the last 30 years in combination with Rinderpest vaccine which has rendered protection and restrained the disease to relatively low level until 1992/93. Currently, CBPP vaccination in Ethiopia is based on targeted and ring vaccination in the face of outbreaks [21].

Table 8: Attack, mortality, and case fatality rates due to post vaccinal reaction in the zones investigated as was mentioned by Teshale, 2005 [26].

	Areas studied					
	Westen Borena	South Wellega	Omo	Total	Chi-square	p-value
Vaccinated population	176,750	37, 710	71,788	296,248		
Number affected	413	1477	1120	3010		
Number died	41	283	173	497		
Attack rate (%)	0.23	3.91	1.37	1.02	x^2=4331.47	0
Mortality rate (%)	0.023	0.75	0.21	0.17	x^2=994.256	0.001
Case fatality rate (%)	9.9	19.2	15.4	16.5	x^2=21.43	0.005

Source: (Teshale, 2005) [26].

Economic importance

The economic importance of contagious bovine pleuropneumonia (CBPP), especially losses due to the chronic disease, is difficult to assess. Losses include mortality, loss of weight, reduced working ability, reduced fertility, reduced growth rate, and losses caused by control program (due to vaccination campaigns, quarantine, and restrictions on cattle trade) [22].

In Ethiopia the average physical losses from CBPP in terms cattle deaths are 25,115 heads (8,372 in endemic areas and 16,743 in epidemic, 1,852 and 13,396 metric tons of beef and milk respectively). In terms of animal power average of 3,135,000 oxen (farming) days are lost. Ethiopia experiences the largest number of cattle deaths and reduction in cattle products under both endemic and epidemic conditions relative to other African countries, due probably to its large cattle population [14].

It should be noted that the economic evaluation of losses due to CBPP has not been performed systematically throughout Africa. Priority should therefore be given to the cost- benefit analysis of control or eradication campaigns [22].The following is the tabular summary of the two main ways via which economic losses are possibly happened directly and indirectly.

Discussion

Contagious bovine pleuropneumonia (CBPP) has been frequently indicated as a disease of cattle in many literatures with various ranges of parameters required for a given animal for its susceptibility. Even though many controversial ideas are there about breed differences with respect to susceptibility, European breeds are the one in which

Table 7: Direct Economic Loss Due to CBPP Post Vaccinal Reaction in the Affected Zones according to Teshale, 2005 [26].

No	Type of cost	Data used For calculation	Western Wellega	South Omo	Borena
1	Mortality	•Price of cattle•per age/sex at Mendi and Inango Markets •Mortality rate in•vaccinated animals per age/sex	ETB 145,030	ETB 89,288.76	ETB 21,160.92
2	Treatment costs	•The population of•affected cattle •Average cost per•treated animal (16.70 per animal)	ETB 24,665.90	ETB 18,704	ETB 6,897.10
3	Other costs	•Fuel, lubricants &•per diem	ETB 12,354.80	Not available	Not available
4	Total	ETB 318,351.48			

Source: (Teshale, 2005) [26].

many scholars believe for their susceptibility relative to the native zebu [23].

According to the testimony of [24], in three selected districts of west Oromia, an overall sero-prevalence of 28.5% (out of 386 sera samples examined for the presence of specific antibodies against MmmSC type by c-ELISA) was investigated. Significant variation (P<0.05) in sero-prevalence of Mycoplasma antibodies was discovered amongst the districts (40.3%, 19%, and 5.7% in Gobu Sayyo, Bako Tibbe and Horo districts respectively) with no remarkable variation (P>0.05) in animal related risk factors like sex, age, breed, and body condition with the serological status of the animal. The same was shown on the research of Tadese B., 2014 in that site difference is still an important factor and significant for the sero prevalence though the overall sero prevalence (8%) was by far less than Tesfaye. According to the research conducted by [8], in Amaro special woreda of SNNPR Ethiopia, an overall sero prevalence of 31.8% was registered and a bit higher than the two. Environment was found the principal risk factor followed by body condition and herd size, and again similar with Tesfaye M., 2016 with respect to animal related demographics. According to the investigated of [25], (Table 6) the potential predisposing factors like origin and age of animals were not associated significantly (P>0.05) with the occurrence of the disease and was in agreement with [8,24] who found no significant difference between age groups, but different with respect to the origin. And with the overall seroprevalence of 8.4% which is very nearer to the result of Tadese B., 2014 who reported an overall prevalence of 8%.

An overall sero prevalence of 11.9% was registered in southern Tigray by [26] and was nearly found in agreement with Tadese and Biruhtesfa. According to [26], age and sex were not seen to be significant (P>0.05) predisposing factors for seroprevalence of CBPP, but agro-ecology was found to be very significant (P<0.05) and agrees with few of the aforementioned literatures.

In the study conducted in to Somali zones, namely Jijiga and Shinille, the result of an epidemiological survey aimed at assessing the distribution, prevalence and indicative risk factors showed that agro-ecology based sero-prevalence investigation was found signicant (low land excels mid-altitude 39% by 6.7%). Animal husbandry and associated cattle movement were entitled to be the major risk factors (i.e. pastoral area with the most significant sero-prevalence with about 36%), and no remarkable variation in the herd sero-prevalence of transhumance and sedentary management techniques. In nearly all animals showing clinical signs the causative agent Mycoplasma mycoides SC type was recovered by culturing the lung tissue obtained from this study area [9] indicating that the clinical signs are nearly specific.

On the other way round prevalence studies of 56% (1996) in north Omo of western Ethiopia, 39% (2004) in to two Somali zones (Jijiga & Shinille), 28% (2001) in Bodji district of west Wollega, 9.4% (2004) in Borena, 4% (2013) in and around Adama, (66.3%, 47.7%, 33.3% Banja, Dangila, and Denbecha respectively (1998) in Western Gojjam & Awi zones) [24] are the indicative for the widely distribution of CBPP with various prevalence rates in Ethiopia and growing in magnitude of prevalence.

On top of direct economic loss arising from cattle death and cost of treatment, there had been a significant depression of production (mainly milk production), traction power, manure body weight and etc. A direct economic loss amounting to ETB 318,151.48 (Table 7) had resulted.

The principal natural setting in small holders like husbandry practice, feed resources, purpose of keeping the production system, and environmental interaction which are the vital factors for production and productivity of livestock are not been properly underway; hence momentarily resulted in production loss from these huge resource potential [27]. Lack of marketing standard for livestock and livestock products in case of small holders was the challenge not to generate income and support the livelihood of individuals.

On the other way round, production systems may vary due to factors like climate, human population, disease incidence, level of economic development, research support and government economic policies according to [28].

Conclusion and Recommendations

The impact that contagious bovine pleuropneumonia (CBPP) can impart in an economy of a given country is so vast and tremendous that it is not advisable to overlook like any of the ordinary routine disease of livestock that can be easily removed by treatment or self cure.

In Ethiopia where great majority of cattle management and the production fashion was not technically and scientifically supported; and of either semi-intensive or completely extensive that enhance close or repeated contact of cattle, the propagation of CBPP is so simple and the output is very worsening.

As a transboundary animal disease listed by OIE, its presence in Ethiopia can produce a magnificent problem on the trade export of the country. Moreover due to the direct effect of this disease on cattle, traction power, milk production, death of cattle, impairments of genetic improvement and weight loss are inevitable to happen. Moreover, the indirect losses like cost of treatment and control are not simple and worth mentioning.

The variation in prevalence registered in different parts of the country may be due to differences in agro-ecology, cattle management, production systems, population density and the type of tests used. It was also seen in some circumstances that the associated risk factors of either environment or animal related demographics described in various data analysis as influential or non-influential can bring about changes in prevalence studies of different literatures.

More over the degree of significance of the associated risk factors for the prevalence of the individual or overall seroprevalence of CBPP can be limited by the quantity and quality of data used for processing the research, talent and devotion of the researcher and season when the research was underway.

The fact of the reviewed articles indicated that the disease (CBPP) is widely distributed in different agro-ecological zones of the country without any limitations in parameters and has showed me that the disease is growing in magnitude of prevalence which designated that our country is at an alarming rate in that it has induced me to forward the following recommendations as a professional personnel:

- Controlling and limitation of CBPP via animal movement control and vaccination.
- Mass blanket vaccination supported by regular diagnosis, isolation of animals, stamping out of outbreaks.
- Endorsing of intensive sero-surveillance in different agro-ecological zones.
- Frequent training of veterinary personnel about diagnostic techniques.
- Avoiding of re-introduction, close or frequent contact of cattle from neighboring countries or herds suspected of CBPP.
- Awareness creation among the society about the nature of CBPP without whom participation controlling process shouldn't be undertaken at ease.
- Producing marketing standards for livestock and livestock products for small holder farmers which do have paramount importance for generation of income to support livelihood of individual thereby increase participation of small holders in the disease controlling process.

References

1. Tsedeke Kocho & Endrias Geta. Agro-ecological Mapping of Livestock system in small holders crop-livestock mixed farming of Wolaita and Dawuro districts, Southern Ethiopia. Livestock research for rural development. 2011.
2. M. Lesnoff, M. Diedhiou, G. Laval, P. Bonnet, A. Workalemahu, D. Kifle. Demographic parameters of domestic cattle herd in a Contagious-Bovine-Pleuropneumonia infected area of Ethiopian Highlands. Revue Elev. M. vet. Pays trop. 2002; 55: 139-147.
3. Radostits OM, Gay CC, Blood DC, Hinchcliff KW, et al. Veterinary Medicine. A Text book of disease of Cattle, Sheep, Pigs, Goats, and Horses. Saunders; London, UK: 2000.
4. Teshale S. Contagious Bovine Pleuropneumonia (CBPP) Post - vaccinal complications in Ethiopia. Intern J Appl Res Vet Med. 2005; 53: 4.
5. Contagious bovine pleuropneumonia. The Merk Veterinary Manual, 2006. Retrieved 2007-06-14.
6. Aboubakar YAYA, Lucia Manso-Silvan, Alain Blanchard, Francois Thiaucou. Genotyping of Mycoplasma mycoides subspp. Mycoides SC type by multilocus sequence analysis allows molecular epidemiology of contagious bovine pleuropneumonia. Vet. Res. 2008; 39: 14.
7. Food and Agricultural Organizations of the United Nations (FAO)/Office International Des Epizooties/World Health Organization (1994). Animal health year book 1993. FAO, Rome, 228.
8. Tolesa E, Eyob H, Fasil A. Study on Seroprevalence and risk factors of contagious bovine pleuropneumonia in Southern Nation and Nationality People of Ethiopia Regional State in Amaro Special District. Sci. Technol. Arts Res. J. 2015; 4: 106-112.
9. Gedlu M. 'Serological, Clinical, and Participatory epidemiological survey of CBPP in Somali region', Thesis for degree of Masters of Veterinary Epidemiology, Faculty of Veterinary Medicine, Addis Ababa University, Addis Ababa. 2004.
10. Rovid SA. Contagious bovine pleuropneumonia. The centre for food security and public health, Iowa state university. College of veterinary medicine. 2012.
11. Masiga WN, Domenech J. and Windsor RS. Manifestation and Epidemiology of CBPP in Africa. In Animal mycoplasmoses and control. Rev. Sci. Tech. Off. Int. Epiz. 1996; 15: 1283-1308.
12. M. Lesnoff, Gerud Laval, Pascal Bonnet, Asseguid Workalemahu. A mathematical model of contagious pleuropneumonia (CBPP) within herd outbreaks for economic evaluation of local control strategies: an illustration from a mixed crop-livestock system in Ethiopian highlands. Anim. Res. 2004; 53: 429-438.
13. Turner AW. Epidemiological Characteristics of bovine contagious pneumonia. Aust Vet J. 1994; 30: 312-317.
14. Tambi EN, Maina OW. Regional impact of CBPP in Africa. In: Regional workshop on Validation of strategies to control CBPP in participative PACE countries. Conakry, Guinea. In press. 2004.
15. Vilei EM, Abdo EM, Nicolet J, Boteiho A, Goncalves R, Frey J. Genomic and antigenic differences between the European and African/Australian clusters of Mycoplasma mycoides subsp. mycoides SC. Microbiology. 2000; 146: 477-486.
16. Radostits OM, Gay CC, Blood DC. Veterinary Medicine A Text book of disease of Cattle, Sheep, Pigs, Goats, and Horses. 8th ed. Bailliere Tindall. 1994; 910-913.
17. Bessin R. and Connor RJ. The PACE strategy for supporting the control of CBPP. In: Report of second meeting of the FAO/OIE/OAU/IAEA consultative group on CBPP. Rome, Italy. 2000; 39-45.
18. Walker LR. Mollicutes In Hirsh DC. and Zee YZ. Veterinary Microbiology. Blackwell Science, Inc. 1999; 165-172.
19. Office International Des Epizootics (OIE), Manual of standards for Diagnostic Test and Vaccines. 2002.
20. Wanyyoike SW. Assessment and mapping of Contagious Bovine Pleuropneumonia in Kenya past and present. Msc Thesis, Frei University of Berlin and Addis Ababa University. 1999.
21. MOA, Livestoick Development project. Ministry of Agriculture, the Federal Democratic republic of Ethiopia. 1997.
22. Masiga WN, and Domenech J. Overview and Epidemiology of contagious bovine pleuropneumonia (CBPP) in Africa. Rev. Sci. Tech. Off. Int. Epiz. 1995; 14: 611-620.
23. Bemrew A, Asmamaw S, Wassie M. Contagious bovine pleuropneumonia (CBPP) in Ethiopia (review article). Academic Journal of Animal Disease. 2015; 4: 87-103.
24. Tesfaye M, Sero-prevalence of CBPP and its potential risk factors in selected sites of westen Oromia, Ethiopia. Ethiopia veterinary Journal. 2016; 20: 31-41.
25. Biruhtesfa A, Henok G, Hundera S, Surafel K. Seroprevalence of CBPP in abattoirs at Bishoftu and export oriented feedlots around Adama. 2015.
26. Teshale T, Temesgen T, Tsigabu N, Birhanu H, Solomon W, Tesfaye A. epidemiological status of CBPP in southern zone of Tigray region. Animal and Veterinary sciences. 2015.
27. Alemayehu Y, Tegegne A, and Kurtu M. The livestock production systems in three peasant associations of the Awassa woreda. In: Proceedings of 8th conference of Ethiopian society of animal production, Addis Ababa, Ethiopia. 2000.
28. Devendra C, and Thomas D, Crop-animal systems in Asia: Importance of livestock and characterization of agro-ecological zones. Agricultural systems. 2002; 71: 5-15.
29. Nicholson MJ, and Dutterworth MH. A Guide to Condition Scoring of Zebu Cattle. International livestock centre for Africa, Addis ababa , Ethiopia. 1986.

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