Knowledge, attitude, and practice of goat farmers towards contagious caprine pleuropneumonia in Amhara region, Ethiopia

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Abstract

Contagious caprine pleuropneumonia (CCPP) is known for its high mortality, morbidity, and economic losses. A cross-sectional study using a multistage cluster sampling technique was conducted in Amhara Regional State from January to June 2019 to assess the knowledge, attitude, and practices of goat farmers towards CCPP in the region. A semi-structured questionnaire was used to collect information from the goat farmers found in 12 districts. A total of 386 goat producer respondents participated in the questionnaire survey. Out of all the households of goat farmers interviewed, 370 (95.8%) were headed by males, while 16 (4.2%) were headed by females. Of all the respondents, 73.58% did not know the disease. The remaining 26.42% were familiar with the CCPP and had seen the disease in their goats or nearby goat flocks, and from this 4%, they experienced CCPP with their goats. Half of the participants who experienced the disease in their flock reported that mixing with neighboring flocks was the major source of CCPP infection. The goat farmers who are familiar with the disease had a high-risk perception of CCPP with a mean score of 4 out of 5 for the seriousness of the disease and 4.12 out of 5 for the risk of infection. These farmers showed a good perception of the effectiveness of prevention practices with a mean score of 4 out of 5 for the usefulness of vaccinations and reporting disease outbreaks to veterinary authorities. This collective understanding demonstrates their awareness of the disease and the proactive measures they are willing to take to mitigate its impact on their flocks. They have a good practice of vaccinating and treating their goats. Most of the farmers use veterinary clinic services to control CCPP occurrence in their herds. Although the farmers familiar with the disease have a good understanding of the risk of

the disease and a positive attitude towards control measures, most farmers are not aware of the disease and hence better animal extension about the disease is needed in the study area.

Keywords: Amhara region; Attitude; Contagious caprine pleuropneumonia; Goats; Knowledge; Practice.

Introduction

Goats are important assets for ensuring the livelihood of farmers. They are an important source of income for millions of people in Ethiopia (Farm Africa, 2017). They play a significant role in the livelihood of farming communities by providing milk, meat, and income to cover various household expenditures. However, the productivity and well-being of goats are constrained by several infectious diseases, among which contagious caprine pleuropneumonia is a major one (Gelagay *et al*., 2007; Tesfaye *et al*., 2011; MoA, 2012; MoA and ILRI, 2013; Asmare *et al*., 2016).

Contagious caprine pleuropneumonia (CCPP) is one of the most severe diseases in goats. It is caused by *Mycoplasma capricolum* subspecies *capripneumoniae* (Mccp) (OIE, 2014; Spickler, 2015). *Mycoplasma capricolum* subspecies *capripneumoniae*, formerly known as Mycoplasma biotype F-38, is classified within the genus *Mycoplasma* and the family *Mycoplasmataceae* (Spickler, 2015). The disease is transmitted through the inhalation of respiratory droplets during close contact, and it can be brought into a flock by a carrier or infected animal. CCPP primarily affects the respiratory tract, leading to symptoms such as anorexia, fever, and respiratory signs including dyspnea, polypnea, productive coughing, grunting, inability to move, standing with front legs wide apart, stiff and extended neck, as well as continuous salivation and nasal discharges (Ahaduzzaman, 2021).

CCPP hampers goat production due to its high morbidity and mortality (Gelagay *et al*., 2007; Tesfaye *et al*., 2011). The economic impact of the disease is linked to several factors, including high mortality, decreased meat and milk production, expenses related to diagnosis, treatment, and control, as well as disruptions of trade of goats and the associated products (Rushton, 2009). The main preventive and control measures for this disease include vaccination,

movement restriction, medical treatment, quarantine, cleaning, and disinfection of premises (OIE, 2009).

In a system characterized by a lack of guidelines for both farmers and local veterinarians, as well as the absence of national strategies to prevent and control the introduction or spread of diseases, farmers' knowledge and practices have an important impact on disease occurrence. A knowledge, attitude, and practice survey is a representative study of a specific population aimed at collecting valuable information on what is known, believed, and acted upon concerning a particular topic (WHO, 2008). Such surveys help generate data on farmers' knowledge, attitudes, and practices regarding animal diseases in a resource-scarce country (Tiongco *et al*., 2012) like Ethiopia. So far, little is known about goat farmers' knowledge, practices, and attitudes towards CCPP in Ethiopia in general and in the Amhara region in particular. This study was undertaken to assess the knowledge, attitude, and practices of farmers towards CCPP in goats in the Amhara region.

Materials and methods

Description of the study area and population

The study was conducted in Amhara regional state. The region is located in the northern and western parts of Ethiopia between 9°20' and 14°20' North and 36° 20' and 40° 20' East. The region comprises 11 administrative zones: North Gondar, South Gondar, West Gojam, Bahirdar special zone, Awi, East Gojam, Wag Hemra, North Wollo, South Wollo, Oromia special zone, and North Shoa (ANRS BoFED, 2012). The region covers approximately 161,828.4 km^2 area and encompasses three major agroecological zones: highlands (above 2,300 m.a.s.l), mid-highlands (1,500 to 2,300 m.a.s.l) and lowland (below 1,500 m.a.s.l) accounting 20, 44, and 28%, of the land area respectively. In the region, the daily average temperature ranges from 16 to 27°C. The mean annual rainfall over the whole region varies from 300 mm in the East to well over 2,000 mm in the West (ANRS BoFED, 2011).

The region has a total of 16,148,390 head of cattle, 11,086,083 sheep, 7,766,661 goats, 488,626 f horses, 220,940 mules, 3,279,179 asses, 151,143 camels, 19,809,915 poultry and 1,154,094 beehives (CSA, 2018). The goat population

in the region is kept under traditional smallholder farming in an extensive management system (CSA, 2017).
For this study, one or two districts were selected from all administrative zones except Bahirdar special zones. The districts included in the study were Aberegelle, Kobo, Thehulederie, Bati, Kewet, Ankober, Hulet Ejju Enese, Wemberma, Jawi, Ebenat, Wegera, and Dembia (Figure 1).

Sampling methods

Selection of districts, kebeles, and villages

The study was carried out from January to June 2019. District, kebele, and village were primary, secondary, and tertiary sampling units. The study districts were selected purposively considering the absence of previous studies, goat population, accessibility, and representativeness of the district to the zone. After excluding the kebeles that were remote, unsafe, or unlikely to cooperate, simple random sampling was employed to select two kebeles from each district of the remaining kebeles. For each selected kebele, simple random sampling was used to select two to four villages in proportion to the number of villages available. The lists of kebeles were obtained from each district agricultural office, while the lists of villages were obtained from the respective selected kebele representatives.

Selection of farmers

The multistage cluster sampling technique was employed to select sampling units for the questionnaire survey. Before commencing the study, general information about goat production in the area was obtained from animal health experts during a preliminary visit to each selected village. The inclusion criteria for farmers were being a goat producer, having at least 2 years of experience in goat production, and being willing to participate in the interview. For each selected village, a sampling frame was constructed by obtaining a list of goat farmers from a village representative. The 'RAND' function in Microsoft Excel 2010 (Microsoft Corporation, 2018) was employed to generate random entries for the selection of households in the selected village. If the selected farmer was unwilling to participate, another randomly selected farmer who met the criteria was substituted. Farmers were informed of their selection on the day before the village visit. Verbal consent from farmers was obtained before the interviews.

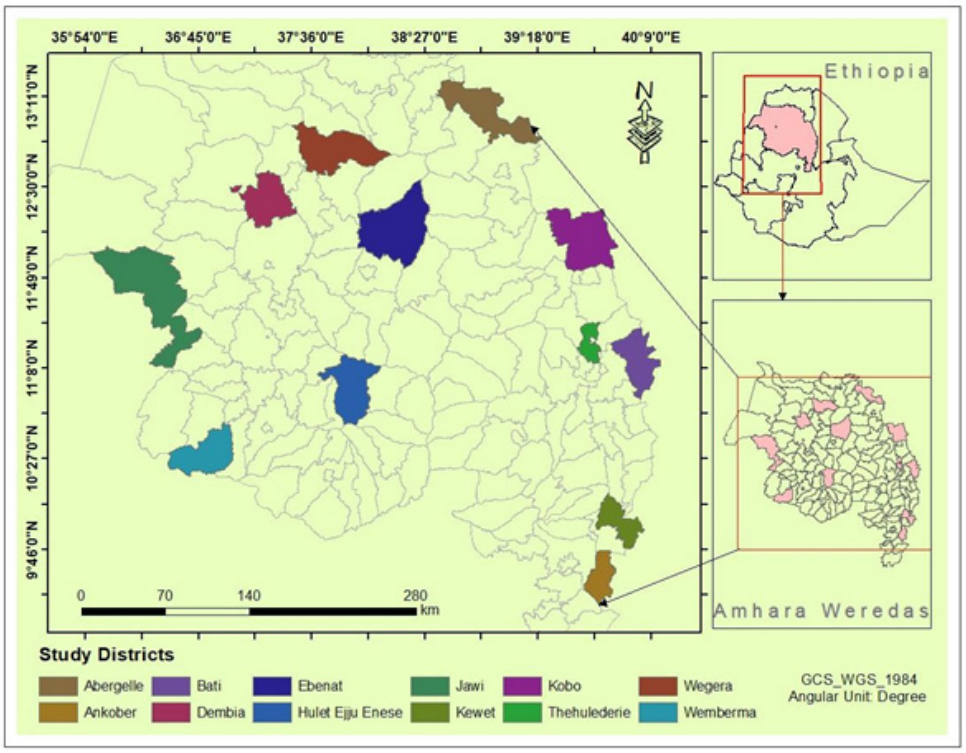

Figure 1. Map of the study areas

Sample size determination

For the questionnaire survey, the sample size was determined using Cochran's sample size formula for categorical data (Bartlett *et al.*, 2001).

$n=(Z)^2 * p(q))/d^2$

Where Z = the value for a selected alpha level of 0.05 = 1.96. (p)(q) = estimate of variance across the population with 0.5 value for each. P = proportion of the population that knew about the disease, **q** = proportion of the household who did not know about the disease, **d =** acceptable margin of error = 0.05. A total of 384-sample size was determined and 386 households were interviewed from twelve districts.

Study design and data collection procedure

A cross-sectional study design was employed for data collection. The questionnaire survey on management factors, the occurrence of CCPP, and attitude towards the disease were developed according to the guidelines of Frary (1998). The questionnaire had four components for collecting the data: socio-demographic characteristics of goat farmers, previous occurrence of goat diseases, farmers' practices for goat disease management, and their attitude, practice, and knowledge of CCPP. Both open and closed-ended questions were incorporated into the list of questions. Before starting an actual data collection, a pretest was conducted on goat farmers to see the gap in the questionnaire.

The socio-demographic data were related to location, educational status, household size, and goat flock size. Knowledge of the disease was assessed by asking questions on manifested goat disease, clinical signs of CCPP, morbidity, mortality, and case fatality rate. For this purpose, a case definition of CCPP developed previously was used as a guide (FAO, 2010). Accordingly, if a respondent mentioned a combination of the following clinical signs (labored breathing, nasal discharge, inability to move or stand with front legs wide apart, stiff and extended neck, and continuous drooling of saliva); postmortem lesions (fibrous pleuropneumonia, massive lung hepatization, straw-colored fluid in the pleura, enlargement of lung lymph nodes); and epidemiological situations (high morbidity, high mortality, affecting all age and both sex), he/she was considered knowing the disease. This was followed by further questions about his/her knowledge, attitude, and practices towards CCPP. If the respondent did not know CCPP based on the case definition above, the interview was stopped there.

The attitude of farmers towards disease occurrence was collected by asking questions related to the nature of the disease, risk of illness, and handling of the disease by clinicians. Data associated with controlling and preventing goat diseases were collected by asking questions about the prevention and treatment approaches employed when diseases occur.

For the ranking of goat diseases, the index value of each respondent's disease prioritization was calculated based on the guidelines provided by Kosgey (2004), using the following formula: -

Index = Sum of (n x number of households ranked first) + (n-1) x number of households ranked second + (n-2) x number of households ranked third +…+ 1 x number of households ranked last) for one factor divided by the sum of (n x number of households ranked first + (n-1) x number of households ranked second +…. +1 x number of households ranked last) for all factors, where n = the number of factors under consideration. The variable with the highest index value was the most economically important disease occurring commonly.

Knowledge, attitude, and practice were considered latent variables and were assessed using item questions and statements. The attitude was measured on an ordinal scale, including options such as strongly agreed, agreed, neither agreed nor disagreed, disagreed, and strongly disagreed. The mean score of farmers' perceived attitudes regarding the risk of infection and prevention of CCPP was calculated by dividing the total sum score by the number of respondents.

Data management and analysis

Data were recorded, cleaned, coded, and edited in Microsoft Excel. The analysis was conducted using STATA software version 14.1 (Stata Corp, 2014). Tables, frequencies, percentages, proportions, and pie charts were utilized to describe the characteristics of the study population, as well as the attitudes of farmers towards prioritization of economically important diseases and disease control practices.

Ethical consideration

Farmers were made aware of the purpose of data collection and how the researchers planned to use the collected information. Verbal consent was obtained from each participant and data were collected based on their willingness.

Results

Socio-demographic description of the participants

The general characteristics of interviewed households were presented in Table 1. Among the total goat farmer households interviewed, 370 (95.8%) were

male-headed, and 16 (4.2%) were female-headed households. Regarding the respondent's literacy, 41.7% were illiterate, 16.3% were adult education level, 31.3% were primary school completed, 8.8% were secondary school completed and the remaining 1.8% were college diploma level. The household size of respondents ranges from 4.5-6.8.

Table 1. Background characteristics of 386 goat producer respondents in selected districts of Amhara region, 2019

Zone	District	Number of kebeles Sampled	No. of villages sampled	Number of partici pants (%)	Average house hold size	Sex of partici pant						
						Female	Male	Prim ary sch ool	Secon dary school	Illite rate	Adult educ ation	College diplo ma
Wag Humira	Abergele	2	6	37 (9.6)	6.8	0	37	10	6	12	7	2
North Shoa	Kewet	2	4	33 (8.5)	6.1	0	33	1	1	11	20	0
	Ankober	2	5	41 (10.6)	6.3	0	41	16	10	5	10	0
Oromia Liyu zone	Bati	2	4	31 (8.0)	6.0	3	28	9	4	16	1	1
North Gondar	Dembia	2	4	30 (7.8)	5.7	1	29	6	1	18	4	1
	Wegera	2	2	18 (4.7)	6.2	1	17	0	0	18	0	0
South Gondar	Ebenat	2	5	36 (9.3)	6.1	1	35	15	0	16	5	0
East Gojam	Hulet Eju Enese	2	4	36 (9.3)	5.9	0	36	10	0	21	5	0
Awi	Jawi	2	5	34 (8.8)	4.7	2	32	8	2	21	3	0
South Wollo	Thehule dere	2	4	26 (6.7)	4.5	2	24	14	3	5	4	0
West Gojam	Wembe rma	2	3	31 (8.2)	6.6	6	25	13	2	11	2	3
North Wollo	Kobo	2	3	33 (8.5)	6.2	0	33	19	5	7	2	0
Total		24	49	386 (100%		16 (4.2%)	370 (95.8%)	121 (31.3%)	34 (8.8%)	161 (41.7%)	63 (16.3%)	7 (1.8%)

Goat management, flock size, and production goals

The management practices and purpose of goat rearing are shown in Table 2. Majorities (93.52%) of the respondents practiced a sedentary husbandry system and larger portions (79.27%) of the households used communal grazing (Table 2). Of the total respondents, 26.94% (95% CI: 22.7-31.6%) used housed barn type while 68.65 (95% CI: 63.8-73.1) used fenced type of housing. Concerning treatment practice, 91.97% (95% CI: 88.8-94.3%) of the goat farmers used modern treatment. Regarding the purpose of goat keeping, 68.8% of respondents rear goats for meat and cash income, 27.2% for cash income only, and 5% for meat, milk, and cash income.

Table 2. Description of management systems employed by goat farmers in selected districts of Amhara region, 2019

Management practice	Frequency	Percent	95% CI
Type of housing			
Fenced stable barn	265	68.65	63.8-73.1
Housed barn	104	26.94	22.7-31.6
Both fenced stablers and housed barn	17	4.4	2.7-6.9
Type of treatment used			
Modern	355	91.97	88.8-94.3
Traditional	11	2.85	1.6-5.1
Both modern and traditional	20	5.18	3.4-7.9
Who care goats			
Husband	98	25.39	21.3-29.9
Children	218	56.48	51.5-61.4
Other family members	54	13.99	10.9-17.8
Wife	1	0.26	0.04-1.80
Keeper	15	3.89	2.3-6.3
Type of husbandry system			
Sedentary	361	93.52	90.6-95.6
Trans-human	25	6.48	4.4-9.4
Type of grazing			
Fencing/paddock	30	7.77	2.31-13.56
Both paddock and communal	50	12.95	6.50-23.34
Communal	306	79.27	64.32-85.21

The average number of goats at the household level was 15.67 (95% CI: 13.2-18.56 %), whereas the minimum and maximum number of goats were 2 and 150, respectively. From a physiological category perspective, the average number of bucks, does, kids, and doelings were 11.79, 10.9, 8.97, and 4.58, respectively.

Priority goat diseases reported by farmers

According to 386 respondents' responses, goat diseases in the study districts of the Amhara region were prioritized (Figure 2). Peste des Petitis Ruminitis (PPR), Pox, CCPP, Mange, Anthrax, and Orf were the most common disease problems in the twelve districts of the Amhara region.

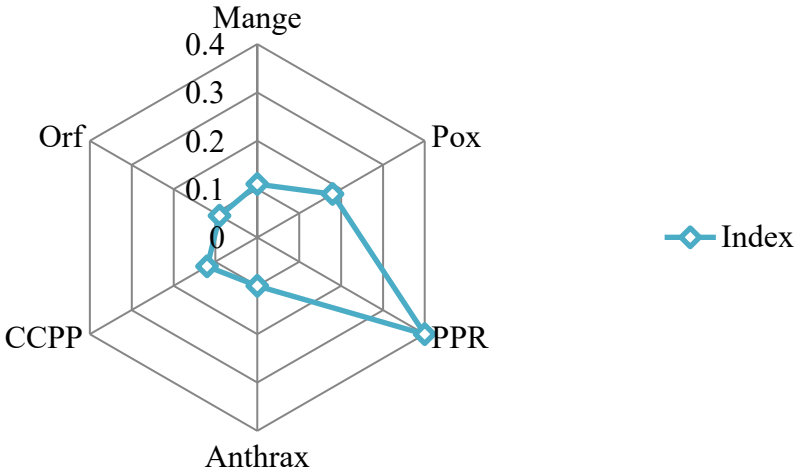

Figure 2. Radar plot of prioritized goat disease problems in the study district of Amhara region, 2019

Knowledge and attitude of farmers towards contagious caprine pleuropneumonia

Regarding CCPP knowledge, 73.58% (284) of the respondents had not heard of CCPP before participating in this survey. The remaining 26. 42% (102) of the goat farmers were familiar with CCPP and had seen the disease in their goats or nearby goat flocks and out of these 4.14% % (n = 16) of the respondents experienced CCPP with their goats. Fever, weakness, lethargy, coughing, difficulty

breathing, frothy nasal discharge, stringy saliva, and poor appetite were the reported clinical signs of the disease by these farmers.

According to 16 respondents who had experienced the disease in their goats and owned a total of 202 goats, the morbidity, mortality, and case fatality rate of goats due to CCPP was 40.60%, 17.3%, and 42.7%, respectively. They also reported that mixing with neighboring flocks (50%), mixing with traded animals (18.75%) and purchasing animals from the market (31.25%) were the major sources of goats' infection.

The mean score of farmers' perception was higher on the seriousness of CCPP (4.00), the risk of CCPP infection for goats (4.12), the dependability of CCPP vaccine (4.0), and the importance of reporting CCPP occurrence (4.00) (Table 3).

Table 3. Perception of farmers about the risk of infection and prevention of CCPP in goats of Amhara region, 2019 (N=16)

Attitude statements	Responses					Sum (Total score)	Mean
	SA	A	ND	D	SD		
1. CCPP is a serious or important disease	8	3	3	1	1	64	4.00
2. Goats are at risk of CCPP infection	7	5	3	1	0	66	4.12
3. Spread of CCPP from goat to goat can be prevented	1	1	3	5	6	34	2.12
4. Vaccination of goats against CCPP is trustful (if available)	7	4	3	2	0	64	4.00
5. Healthcare providers can handle CCPP outbreaks very well	6	4	3	3	0	61	3.81
6. Reporting of sick or dead animals by CCPP to the local authorities/ veterinary officers	7	3	5	1	0	64	4.00

Remarks: SA= Strongly agreed, A = Agreed, ND = Neither agreed nor disagreed, D = Disagreed,

SD = Strongly Disagreed, SA = 5, A = 4, ND = 3, D = 2, SD = 1

The practice of prevention and control of contagious caprine pleuropneumonia

The practice of farmers for controlling CCPP, when it occurs, is presented in Figure 3. The majority of the farmers (56%) control CCPP by using conventional veterinary treatment (Figure 3).

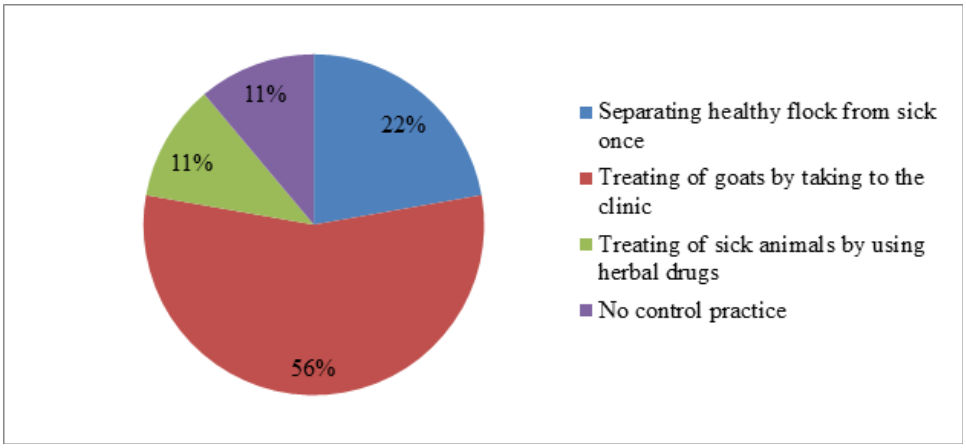

Figure 3. Control practice of farmers on the occurrence of CCPP in goats of Amhara region, 2019 (N=16)

Discussion

Assessment of goat disease information from goat farmers is crucially important for developing intervention strategies to control and prevent animal diseases. The study population in this study was in a mixed crop-livestock production setting, where transhumant and sedentary husbandry systems were practiced by 6.48% and 93.52% of the goat farmers, respectively. Both reported production practices could favor the transmission of CCPP. Traditional livestock production is commonly practiced in developing countries, especially in Africa, which increases the likelihood of the spread of CCPP among goats gathered at watering and grazing areas. Effective transmission occurs through close contact with infected animals and the inhalation of infective aerosols from infected goats (Lefevre *et al.*, 1987).

Most of the respondents (68.65%) used a fenced stable barn, which exposes the animal to wind, rain, and hunters, with poor hygiene floors and narrow spaces. This type of housing induces stress on goats so that it decreases their ability to fight against disease and makes them more susceptible to respiratory infection. Around 79.27% of households used communal grazing, an important predisposing factor for CCPP transmission. This condition allows animals to congregate in the grazing area, and there could be close contact with other animals. In the study area, when goats get sick, the farmers take them to a veterinary clinic for treatment. The treatment is primarily based on modern veterinary drugs (91.97%) rather than using local herbal medicines. This observation differed from a pastoral community practice highly dependent on local medicinal plant materials to treat and prevent animal diseases (Githiori *et al*., 2005; Giday and Teklehaymanot, 2013).

The respondents ranked CCPP as the third most important disease, following PPR and Pox. This ranking was based on factors such as economic losses associated with morbidity, frequency of occurrence, mortality rate, contagious nature of the disease, and the probability of recovery. However, this finding contradicts the results of a participatory investigation of CCPP in Southern Ethiopia, where farmers ranked the disease as the primary health problem in goat production (Mekuria *et al*., 2008). This variation may be attributed to the differences in socio-economic activities between the study areas. The previous studies were conducted in areas inhabited by pastoral communities whose livelihoods primarily depend on goat production. These communities undergo seasonal movement during the dry season towards the Omo River in search of feed and water for their animals, leading to a mixing up and aggregation of flocks that favor CCPP infection. Nevertheless, our study aligns with the report by Bett *et al*. (2009) in the Turkana Southern district of Kenya and Atim's (2010) in the Agagao districts of Uganda. Philemon *et al*. (2014) reported in the Manyara region of Tanzania that 61.5% of household respondents ranked CCPP as a more severe disease than other goat diseases. According to Senait (2012), CCPP is the second most significant goat disease, following foot and mouth disease, in the Ghindae sub-region of Eritrea. Kipronoh *et al*. (2016) in Kenya also reportedly stated that the occurrence of CCPP causes high morbidity and mortality in most goat flocks in the Rift Valley region of Kenya. Generally, CCPP is a common problem in pastoral production systems, which heavily rely on strategic mobility to access grazing land and water (Mekuria and Asmare, 2010).

The present study has shown that some goat farmers (26.7%) have experienced the occurrence of CCPP disease within their own and neighboring goat populations. The observed clinical signs were consistent with the documented case definition of CCPP (Radostits *et al*., 1994; Thiaucourt *et al*., 1996; Wesonga *et al*., 2004; FAO, 2010; OIE, 2014). However, the majority of respondents (73.6%) did not know CCPP, indicating an awareness gap among goat farmers regarding this disease. This knowledge gap could be partly attributed to the complexity of the disease, as it is often confused with other respiratory diseases such as PPR and pasteurellosis. It might also be influenced by recall bias due to the time elapsed between the occurrence of the disease and the study period. Furthermore, it could be associated with a lack of animal health extension services addressing each specific disease. These findings are consistent with studies conducted in Southern Ethiopia (Mekuria *et al*., 2008), pastoral areas of the Afar region (Gezahegn, 2006; Amare, 2012), in the regions of Somali, Oromia, Afar, and Southern Nation Nationalities of Ethiopia (Berhanu *et al*., 2017), Agago district of Uganda (Atim, 2010), and Manyara region of Tanzania (Philemon *et al*., 2014). Understanding the timing of disease occurrence is critically important for the development of disease prevention and control strategies.

In this study, the morbidity, mortality, and case fatality rate of goats due to CCPP were 40.60%, 17.3%, and 42.7%, respectively. This is in contrast to what is commonly quoted in the literature, the morbidity of CCPP can reach 100% and mortality can reach 70% in susceptible goat populations. However, the current findings indicate lower rates, which might be related to the endemicity of the disease in the study area. Nevertheless, our findings are comparable to a study conducted by Philemon *et al.* (2014) in the Manyara region of Tanzania, where the estimated mortality and morbidity rates were 11.5% and 38.5%, respectively. The morbidity rate is higher than the rate reported by Amare (2012), which was 30%, while the mortality rate is lower than the estimated rate of 31.7% in the Gulina district of the Afar region. Swai and Eselle (2010) reported an estimated morbidity and mortality rate of 31.6% and 61.4%, respectively, in the Maasai flocks of Northern Tanzania. The Maasai ethnic group, mainly relying on goat production, is found in both Kenya and Tanzania regions and is prone to drought and mobility with their livestock during the dry season in search of grazing areas and watering points, which increases exposure to infectious diseases. Mixing with neighboring flocks, trading animals, and purchasing animals from the market were identified as major sources of infection. The results indicate that members of the interviewed households

believe that the mixing of infected and uninfected stock, whether through communal grazing, watering, or markets, significantly contributes to the spread of CCPP from one flock to another. This finding is consistent with the report by Philemon (2014) in Tanzania.

Those farmers who had exposure to the occurrence of CCPP were asked to express their perception by using six-item statements. Most of the farmers showed high perception scores about the seriousness of CCPP, the risk of CCPP to goats, the capability of animal health providers to handle CCPP outbreaks, the reporting of CCPP cases, and the importance of vaccines in the prevention of CCPP (if they had access). These perceptions reflect the right attitude for easy control and implementation of intervention strategies. However, a higher number of farmers disagreed (strongly disagreed and disagreed) on the preventability of CCPP spread from goat to goat (mean score = 2.12), which has adverse implications for the prevention of CCPP. This discrepancy in perception could be associated with differences in farmers' knowledge levels. The level of knowledge can influence farmers' behavior regarding disease risk management, and each specific practice is also influenced by their attitudes (Jansen *et al*., 2009; Ellis-Iversen *et al*., 2010; Garforth *et al*., 2013).

Goat farmers control the occurrence of CCPP by separating healthy flocks from sick ones (22%), treating goats by taking them to the clinic (56%) and using herbal medicines (11%) to treat sick animals. Treating sick animals is one of the control measures for CCPP, as indicated by Thiacourt *et al*. (1996). However, approximately 11% of respondents did not implement any control measures when CCPP occurs. These practices indicate a low awareness among farmers regarding disease transmission and its impact. This lack of action poses a significant obstacle to the implementation of intervention strategies. In various questions, respondents were asked to recall information from the last 24 months, and study participants might have provided inaccurate information due to poor reminiscences from the past, this might be taken as a weakness of the study.

Conclusions

Most goat farmers in the study areas are not familiar with CCPP. Farmers who knew the CCPP perceived that it is a serious disease and goats in the study areas are at high risk of CCPP infection. These farmers who are familiar

with the disease had also a positive attitude towards vaccination and CCPP case reporting to a veterinarian, and good practice in vaccinating and treating their goats. Generally, although the farmers familiar with the disease have a good understanding of the risk of the disease and a positive attitude towards control measures, most farmers are not aware of the disease and hence better animal extension about the disease is needed in the study areas.

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Conflicts of Interest

No conflict of interest.

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