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## **Contagious Caprine Pleuropneumonia: Serological Survey in Selected Districts of Jijiga Zone, Ethiopia**

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### **ABSTRACT**

Contagious caprine pleuropneumonia caused by *Mycoplasma capricolum* subspecies *capripneumoniae* is a highly contagious and serious respiratory disease of domestic goats, characterized by coughing, severe respiratory distress and high mortality rates. There is dearth of well documented information on the occurrence of contagious caprine pleuropneumonia among goats in Jijiga zone, Ethiopia. Therefore, this study was designed with the aims to determine the seroprevalence of caprine pleuropneumonia in the selected districts of Jijiga zone and to assess potential risk factors on the occurrence of the disease. Cross-sectional study design was conducted from November 2011 to March 2012 among selected districts of Jijiga zone namely Jijiga, Kebri Beyah and Tuli Guled districts. A total of 334 goat sera were examined for the presence of specific antibodies against *Mycoplasma capricolum* subspecies *capripneumoniae* using complement fixation test. Proportions and chi square test statistics were used to analyze the data. District, sex and age of the goats were considered to be the major risk factors for the occurrence of contagious caprine pleuropneumonia. The overall seroprevalence of contagious caprine pleuropneumonia in Jijiga zone was proved to be 32.63%. The seroprevalence of contagious caprine pleuropneumonia at District level was confirmed to be 34, 33.64 and 28.38% in Jijiga, Kebri Beyah and Tuli Guled districts, respectively. The result indicated that there was no statistical significant difference ( $p>0.05$ ) on seropositivity among the three districts and between the two sex of goats examined in this research. Age was found to be significantly associated ( $p<0.05$ ) with the prevalence of contagious caprine pleuropneumonia in goats. In conclusion the present study indicated that the overall prevalence of contagious caprine pleuropneumonia in Jijiga zone was high and underlines the importance of further epidemiological study of the disease and its associated risk factors and implementation of appropriate preventive and control measures. Besides to this finding suggests the need to implement strict awareness creation among goat owners on vaccination of their animals in order to decrease the prevalence of contagious caprine pleuropneumonia in Jijiga, Kebri Beyah and Tuli Guled districts.

**Key words:** Seroprevalence, contagious caprine pleuropneumonia, complement fixation test Jijiga zone, Ethiopia

### **INTRODUCTION**

Somali Regional State of Ethiopia is well known for its large number of small ruminants. According to the report of Central Statistical Agency (CSA, 2008), the small ruminant population

of Somali region is 1,162,743 sheep and 1,374,540 goats. Despite all these, the country fails to properly utilize this huge resource as diseases take a lion share among several factors that hamper the productivity of the sector. However, less attention is given to increase their productivity, the majority of the goat populations do exist in lowland under pastoral production system, where the animal health service delivery is very poor and diseases like Contagious Caprine Pleuropneumonia (CCPP), Blue Tongue, Peste des Petits Ruminants (PPR), Brucellosis, External and Internal parasites are rampant (Mekuria and Asmare, 2010).

Contagious caprine pleuropneumonia, caused by *Mycoplasma capricolum* subsp. *Capripneumoniae* (Mccp), is one of the most severe diseases of goats (Thiaucourt and Bolske, 1996). Contagious caprine pleuropneumonia affects the respiratory tract and is extremely contagious and frequently fatal. In naive flocks, the morbidity rate may reach 100% and the mortality rate can be as high as 80%. Contagious caprine pleuropneumonia causes major economic losses in East Africa and the Middle East, where it is endemic. During the only confirmed outbreak in wild ruminants, the morbidity rate was 100% in wild goats and 83% in Nubian ibex. The mortality rates in these two species were 82 and 58%, respectively. Goats are the primary hosts (Arif *et al.*, 2007).

Contagious caprine pleuropneumonia, a disease of major economic importance, poses substantial economic losses to goat production. The direct losses are due to high mortality reduced milk and meat yield, cost of treatment, preventive vaccination, disease diagnosis and surveillance. Additionally, indirect losses result from trade restrictions (Eshetu *et al.*, 2007). In Ethiopia the presence of CCPP has been suspected since 1983 and later confirmed in 1990 (Mekuria and Asmare, 2010). The current situation CCPP has been reported from almost all regions of Ethiopia and is a special problem of goats in pastoral areas of the country including Afar, Borana, Omo Valley and in the lowlands of Tigray where there is large population of goats (Tarekegn *et al.*, 2012).

In spite of the aforementioned prevailing situation and the presence of a number of problems due to CCPP there is dearth of well-documented information on the occurrence of CCPP among goats in Jijiga zone, Ethiopia. Therefore, this study was designed with the aims to determine the seroprevalence of CCPP in the selected woredas of Jijiga zone and to assess potential risk factors such as District, sex and age of the goats for the occurrence of CCPP.

## **MATERIALS AND METHODS**

**Description of study area:** Jijiga administrative zone is divided into three separate Livelihood zones as sedentary agriculturalists, agro-pastoralists and pastoralists. As an administrative zone, it borders Shinile administrative zone to the North, the Hararghe highlands of Oromia Region to the West, Dagahbur to the South and Somalia to the East. The estimated total livestock population of the zone includes 248,435 cattle, 666,130 sheep, 503,881 goats, 72,390 camel and 10,548 poultry. The zone consists of seven districts namely, Jijiga, Babili, Gursum, Awbare, Kebribayah, Harshin and Tuli-Guled. There are no permanent rivers running through the zone. However, Fafan River which is seasonal, passes through parts of the zone between Jijiga and Bombas. Other valleys that are important for grazing and that carry water during rainy seasons are Jerer and Dakhata valleys. Jijiga, Kebribayah and Tuli Guled districts are found at 630, 692 and 663 km, respectively, east of Addis Ababa. Generally, the Jijiga zone represents a vast lowland area of SNRS. The climate is generally semi arid and arid with annual average rainfall records 560 mm the annual daily minimum and maximum temperature ranges from 13-27°C (CSA, 2011).

**Study design:** A cross-sectional seroepidemiological study was conducted in Jijiga, Kebribayah and Tuli Guled districts; Jijiga zone, Eastern Ethiopia, from November 2011 to March 2012. The serological survey was carried out to determine the individual animal seroprevalence and to identify the risk factors associated with seropositivity to CCPP in extensive goat production system of the Jijiga zone.

**Study population:** The target study population comprised goats of all ages and both sex in the selected districts of Jijiga zone.

**Sample size:** To calculate the total sample size, the following parameters were used: 95% level of confidence (CL), 5% desired level of precision and 32% prevalence of CCPP in the zone confirmed by Mohammed (2008), the sample size was determined using the formula given in Thrustfield (2005):

$$n = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{d^2}$$

Where:

n = Required sample size

P<sub>exp</sub> = Expected prevalence

d = Desired absolute precision

Therefore, based on the above formula, the total sample size was calculated to be 334. Thus, a total of 334 blood samples were collected from goats for further laboratory investigation.

**Sampling technique:** The three districts of the zone were selected purposively taking in to account that no previous study has been conducted in the districts. Peasant Association were selected purposively based on their location, accessibility and goat population. Flocks and individual animals sampling were selected randomly.

**Serum sample collection:** Animals were restrained by owners and 10 mL of blood sample were collected from the jugular vein using vacutainer tubes. The samples were kept under the shade in a slant position for four hours and centrifuged. The sera sample were transferred to serum tubes and kept at -20°C until brought to the laboratory for analysis. Corresponding to each sample, the age and sex of every animal and georeference information were collected and registered on a separate case book (Table 1).

Table 1: Samples collected and analyzed during the study period

Districts	No. of male	No. of female	Total
Jijiga	48	102	150
Kebribayah	35	75	110
Tuli-Guled	30	44	74
Total	113	221	334

**Complement fixation test:** Collected serum samples were examined for the presence of specific antibodies against *M. capricolum* sub species *capripneumoniae* by Complement Fixation Test (CFT) in the National Veterinary Institute (NVI), Debre Zeit, Ethiopia. The test was undertaken according to the standard operating procedures of OIE (2004).

**Data analysis:** The collected data were stored in Microsoft office Excel 2007 spreadsheet. Laboratory investigation results were analyzed using descriptive statistics by STATA version 8. A statistical test of Chi-square was used. In all the analyses, confidence level was at 95% and  $p < 0.05$  was taken for significance.

## RESULTS

In this study, a total of 334 goat sera samples were collected from selected districts. All samples were tested for the presence of serum antibodies against CCPP infection using CFT with *Mccp* antigens. The overall seroprevalence of CCPP was proved to be 32.63% using CFT (Table 2).

The highest CCPP seroprevalence was observed in Jijiga (34%) and the lowest seroprevalence was recorded in Tuli Guled (28.38%). There was no significant difference ( $p > 0.05$ ) in CCPP seroprevalence among Jijiga, Kebribayah and Tuli Guled districts.

The age of the study animals were categorized into three groups: age group-1 (<2 years), age group-2 (2-4 years) and age group-3 (>4 years) old. The three age groups were compared for the seropositivity of CCPP. The seroprevalence of CCPP was proved to be highest in those animals which were above 4 years old (38.59%). The seroprevalence of CCPP was known to be lowest in younger goats (25.17%). Statistical analysis of the data showed that there was significant difference ( $p < 0.05$ ) in seroprevalence of CCPP among age groups (Table 3).

The seroprevalence of CCPP were confirmed to be higher in female goats (33.03) than male goats (29.20%). However, there was no significant difference ( $p > 0.05$ ) in CCPP seroprevalence between the two sex (Table 4).

Table 2: Seroprevalence of CCPP among goat in selected districts of Jijiga zone

District	No. of examined	No. of positive	Seroprevalence (%)	95% CI	$\chi^2$	p-value
Jijiga	150	51	34.00	24.67-43.33	0.7872	0.675
Kebri Beyah	110	37	33.64	22.80-44.48		
Tuli-Guled	74	21	28.38	16.24-40.52		
Total	334	109	32.63	26.50-38.76		

Table 3: Seroprevalence of CCPP among ages of goats

Age (year)	No. of examined	No. of positive	Seroprevalence (%)	$\chi^2$	p-value
<2	147	37	25.17	6.6558	0.036
2-4	73	28	38.36		
>4	114	44	38.59		
Total	334	109	32.63		

Table 4: Seroprevalence of CCPP between sexes of goats

Sex	No. of examined	No. of positive	Seroprevalence (%)	$\chi^2$	p-value
Female	221	73	33.03	0.0468	0.829
Male	113	36	29.20		
Total	334	109	32.63		

## **DISCUSSION**

The overall seroprevalence of CCPP in the study areas was 32.63% (CI = 26.50-38.76%). The finding in the present study was in line with the findings of Mohammed (2008), Hadush *et al.* (2009), Eshetu *et al.* (2007) and Ingle *et al.* (2008), who reported seroprevalence of 32% in Jijiga, 32.68% in Northern Ethiopia, 31% in export abattoir Debre Zeit and 33.67% in Nagpur District of Vidarbha region of Pakistan, respectively.

The overall seroprevalence of CCPP in the present study was lower than the findings of Mamo (1996) and Degefa (1993) who reported seroprevalence of 51.1% in east Shoa and 66.7% in Yabello, respectively. However, the overall seroprevalence of CCPP in this study was higher than that of Beyene (2003), Mathiase (2009), Tesfaye *et al.* (2011), Mekuria and Asmare (2010) and Regassa *et al.* (2010) who reported seroprevalence of 6% in and around Dire Dawa, 10.88% in and around Dire Dawa, 13.2% in Southern Ethiopia, 18.61% in Southern Ethiopia 22.49% in Afar Region, respectively. The variations in the prevalence of CCPP reported from different parts of Ethiopia could be due to differences in the agro-ecological system, management, production systems, population density, the type of tests used to evaluate the seroprevalence of CCPP and the time of sampling as compared to the present study.

The Seroprevalence of CCPP in the three districts of Jijiga zone was 34, 33.64 and 28.38% in Jijiga, Kebribayah and Tuli Guled districts, respectively. The results showed that higher prevalence were reported in Jijiga and Kebribayah this could be related to large number of animals reared by an individual farmer and animals have large grazing land so they have an access to contact with an infected animals and the results were compared using chi-square method and revealed that the difference was not statically significant ( $p > 0.05$ ). Similar suggestion was also given by Eshetu *et al.* (2007), Hadush *et al.* (2009) and Lefevre *et al.* (1987).

Seroprevalence of 25.17, 38.36 and 38.59% were recorded in young, adult age and old age categories, respectively. The differences in seroprevalence among the age categories were statistically significant ( $p < 0.05$ ). Old age and adult age category has showed significantly different seroprevalence as compared to the young age category ( $p < 0.05$ ). The higher prevalence of the disease in old age category when compared to the young age category might be explained by the fact that humoral immunity to CCPP is influenced by age. So that age has affected the epidemiology of CCPP and the adult are more susceptible than young. The seroprevalence of CCPP observed in this study was in agreement with previous reports of Tesfaye *et al.* (2011), Regassa *et al.* (2010) and Mohammed (2008) who reported a statistically significant difference among ages.

The sex specific prevalence of CCPP was proved to be 33.03% in female and 29.20% in male goats. The occurrence of the disease across sex factor showed that there was no significant statistical difference ( $p > 0.05$ ) between male and female goats. This result was contradicted with Mohammed (2008) and Regassa *et al.* (2010). But this result was compatible with similar observations made by Mekuria and Asmare (2010) who reported sex of the animal was not associated with seropositivity and also had agreed (Hadush *et al.*, 2009). Tesfaye *et al.* (2011) Gezahegn (1993) and Mekuria *et al.* (2008) in studies conducted in different parts.

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