

Prevalence of Camel Mange Mite and Associated Risk Factors in Gomole District, Borana Zone, Southern Ethiopia

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Abstract: Camel mange is an extremely pruritic and contagious disease of camel caused by a small parasite *Sarcoptes scabiei* var. *cameli*. It is transmitted by direct or indirect contact, is one of the most important parasitic diseases affecting camel. Camel mange is economically important disease that hinders productivity and health of camel. In Borana pastoral area camel play a pivotal role in the livelihoods; however, there was no any study on the prevalence and risk factors associated with camel mange in Gomole district of Borana zone. Therefore, a cross sectional study was conducted between May to November 2021 to determine prevalence of camel mange mites and associated risk factors in Gomole district. a total of 384 animals were randomly selected and subjected to skin scrapings to recover mange from suspected lesions which was later on examined under microscope, out of the entire camels examined 96 (25%) camels were found positive for mange mite infestation. Only *Sarcoptes scabiei* var. *cameli* was identified as the only mite species in all skin scraping samples collected from the suspected mange mite lesions. Only body condition and herd size were shown statistically significant difference in prevalence of mange mites ($P < 0.05$), while PA, sex and age showed no significant variation on mange infestation ($P > 0.05$). This study indicates that camel populations in Gomole woreda harbours mange mites which could hamper health and production status of the camels. Therefore, more emphasis should be given to improve the management system, further studies and control measures should be conducted to shrink the effect of mange mite infestation on camel husbandry.

Keywords: Camel, Gomole, Mange Mite, Sarcoptes, Skin Scraping

1. Introduction

Camels are uniquely adaptive to arid and semi-arid areas of world, where most of the resource poor farmers live [1]. It plays a crucial socio-economic roles in these ecosystems. About 85% of the camel population inhabits mainly eastern and northern Africa and the rest in Indian subcontinent and Middle East countries [2]. Ethiopia is one of the largest camel populated countries from the world possessing 4.5 million camel populations, ranking third next to Somalia and Sudan from Africa [3]. The Eastern and southern parts of Ethiopia like Afar, Somali and Borana are the major areas where camel husbandry is widely practiced as primary source of subsistence for pastoralists in the lowlands of the country

[4-6]. Camels are an important source of milk, meat and means of transportation [5]. Camel slaughter during ritual occasions is also purpose of camel rearing in pastoral areas of Ethiopia [5, 6]. Additionally, their dung is used as fires [7]. Furthermore, Camels are source of export earnings and being exported mainly to Egypt and Sudan [7].

Camels have distinctive ability of adaptation to the arid climate due to physiological characteristics [6]. It survives without water and feed for several days in harsh conditions and traditionally called “the ship of the desert” [8]. Camel continues producing milk during famine and drought when other livestock species hardly survive and stop milk

production [5]. Its ability to withstand torrid heat and extreme desiccation are of paramount importance in determining its distribution in dry areas [9]. In desert areas, the livelihood of pastoral communities is certainly ensured by camels [4].

Despite camels provide huge socio-economic advantages and are the preferred animal in the ever-changing climate, prevailing diseases, poor nutrition, traditional management systems and lack of veterinary services have hampered their potential utilization [10]. On other hand, so far camel was highly neglected by researchers and development planners [11]. (Even though camels were considered resistant to many diseases it has been proved that camels are susceptible the same as other livestock or even more to the common diseases [12]. Among these, several endo and ectoparasites have been identified as the major problems affecting the health, productivity and performance of camels [11].

Camel mange is an extremely pruritic and contagious disease of camel caused by a small parasite *Sarcoptes scabiei var cameli* [13]. It mostly affects the head, neck, flanks, inner side of the thighs and inguinal region of the animal [6]. Sarcoptes are a burrowing mite that penetrates deep into skin and lead to pruritus, development of papules, hairless areas and scab formation [14]. Sarcoptic infestation causes serious disturbance and irritation leading to poor health status of animal and decreased production and efficiency [15]. The economic values of camel mange emanate from decreased body weight, expense of therapy, deterioration of skin and occasional mortalities in untreated and young animals [16]. In addition, mange mite has enormous zoonotic and public health significance as it can be transmitted to human during handling or riding that leads to the development of pseudo scabies on different parts of the human body [17].

Despite very little researches have been attempted on mange of camels in Ethiopia; it has been reported as prevailing in different Southern and Eastern parts of Ethiopia. For instance, prevalence of 10.68, 25.9 and 31.5% were reported from Dire Dawa, Borana and Fafan respectively [14, 18, 19].

Given the huge economic burden and public importance of camel mange, a comprehensive study is of paramount importance to generate accurate information and thereby, design effective disease control and prevention strategies accordingly. Particularly, the knowledge about the prevalence and associated risk factors of a given disease is crucial for any attempts towards prevention and control of the disease. In Borana pastoral area camel play a pivotal role in the livelihoods as source of milk, immediate cash income and for breeding service. However, despite Megersa and his colleagues reported camel mange prevalence of 25.9% from Yabello district of Borana zone in 2012 there was no any study on the prevalence and risk factors associated with camel mange Borana zone, particularly nothing has been done in Gomole district of Borana zone. Therefore, the Objectives of this study were to determinate prevalence of camel mange and its associated risk factors in Gomole in Gomole district.

2. Materials and Methods

2.1. Study Area

The study was conducted from May 2020 to November 2020 in Gomole district of Borana zone, Southern Ethiopia. Gomole district is located 535 km from Addis Ababa in Southern direction and it is 40 km away from the capital city of Borana zone, Yabello, in Northern direction. It is bordered by Yabelo and Dugda dawa to the North, Arero to the West and Elwaye district to the East and South directions. The annual temperature ranges from 16 to 28°C. The mean annual rainfall is 1300 mm and agro-climatic condition of the area is semi-arid and arid. There are two rainy seasons in the area, 'ganna' (June-September), used for crop production, pasture and water harvest and the short rain, 'hagayya' (February-May) that mainly used for land preparation, planting of long cycle crops collected after the 'ganna' rains, small scale production, and improving water and pastures. Animal mobility for feed and pasture shortage is common in the area especially during drought seasons. Total livestock population of this district is 696,440; of which 206,678 Cattle, 191,444 goats, 140,238 sheep, 19,152 donkeys, 43 mules, 131,857 camels and 4,488 poultry and 2,540 bee hives [20].

2.2. Study Population

The study animals were indigenous breeds of one humped camel (*camelus dromedaries*) reared under pastoral management system. Camels of all age categories and both sexes were included in the study.

2.3. Study Design

A cross sectional study was used to estimate the prevalence and associated risk factors of camel mange in the study area. The study was conducted in three purposefully selected peasant associations of Gomole districts namely; Surupha Magala, Bildimi and Haro Bake for road accessibility and abundance of the camel population. A simple random sampling method was applied to sample animals in each PAs.

2.4. Sample Size Determination

A total of 295 samples was initially obtained using 95% level of confidence interval (CI), 5% desired level of precision and with the assumption of 25.9% expected prevalence of camel mange previously reported by Megersa *et al.* 2012 in Yabello district and formula given by Thrust field [21].

$$N = 1.962 \times P_{exp} (1 - P_{exp}) / D^2$$

Where: N = required sample size;

P_{exp} = expected prevalence;

D = desired level of precision.

However, for sake of precision a total of 384 samples were collected.

2.5. Sampling Methods

2.5.1. Collection of Skin Scrapings

Skin scrapings of 384 camels with considering of peasant association, age, sex, body condition, and herd size, was taken from different camel populations in Gomole woreda. Age of studied camels was categorized into ≤ 3 years (young) and >3 years as an adult camel which was determined by dental eruption [2]. The body condition score (BCS) of sampled camels was evaluated by looking the back and flank then categorized as good, medium and poor [22]. Herd sizes as small (less than twenty), as medium (between twenty and forty) and large (greater than forty) were determined [14]. After selection of animals, each camel was restrained properly and the hairs were shaved using scalpel blade from the edges of the lesions till blood oozes out of the capillary. Skin scrapings from suspected cases of mange were collected in labelled Petri-dishes and preserved in 10% formalin and taken to Yabello Regional Veterinary Laboratory (YRVL).

2.5.2. Laboratory Investigation

Skin scrapings from suspected cases of mange were collected in labelled Petri-dishes and preserved in 10% formalin and taken to laboratory and 10% potassium hydroxide (KOH) was added to digest or clean the scraped material of skin, hair, and other debris so that mites released from scabs and crusts before examination following procedures indicated by Soulsby [23]. All scraped tissues were carefully placed on microscopic slide for microscopic examination (10 x or 40 x magnifications) and identification of the mange mite species based on the morphological characteristics described by Urquhart [24].

2.5.3. Statistical Analysis

Microsoft excel spread sheet program was used to store all the data and Statistical Package for Social Sciences (SPSS) version 22.00 software was used to analyze the data. Prevalence of mange mites was computed as the number of each sample items positive for mange divided by total

number of the samples examined. Chi-square (χ^2) was used to test the presence of association between variables. When P value was less than 0.05, the presence of significance difference was considered.

3. Results

3.1. Overall Prevalence of Camel Mange

The overall prevalence of camel mange mites in this study was found to be 25% (96/384) (figure 1). In this study, only *sarcoptes scabiei* var. *cameli* was identified as the only mite species in all skin scraping samples collected from the suspected lesions.

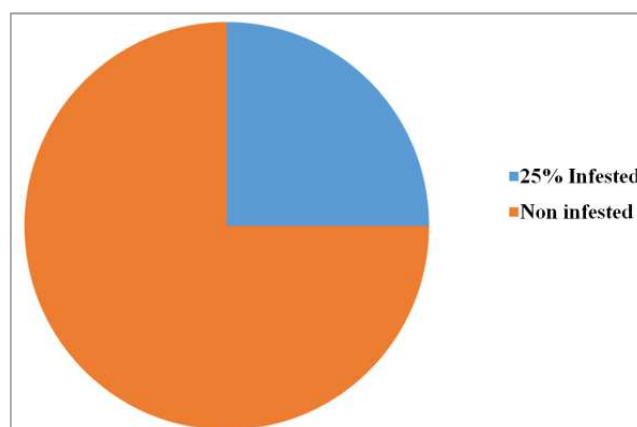


Figure 1. Overall prevalence of camel mange in study area.

3.2. Prevalence of Camel Mange Based Peasant Associations

In the study area, Gomole kebele were found with slightly higher prevalence followed by S/magala having 28.1%, 24.6% and 22.1% respectively (Table 1). There is no statistically significant difference in the occurrence of camel mange among peasant associations ($p > 0.05$).

Table 1. Prevalence of mange infestation in camels of the study area with risk factors/variables.

Risk factor/Variable		No. Examined	No. Positive	Prevalence (%)	χ^2	P-value
PA	S/magala	128	36	28.1	1.212	0.545
	Bildimi	122	27	22.1		
	H/bake	134	33	24.6		
Sex	male	149	34	22.8	0.618	0.432
	female	235	62	26.4		
Age	young	85	27	31.8	2.664	0.103
	adult	299	69	23.1		
BCS	poor	160	53	33.1	13.142	0.001
	medium	153	35	22.9		
	good	71	8	11.3		
Herd size	small	137	24	17.5	7.733	0.021
	medium	177	48	27.1		
	large	70	24	34.3		
Total		384	96	25		

3.3. Sex Based Prevalence

The sex wise prevalence of camel mange mite in the study

area was revealed 26.4% and 22.8% in female and male respectively. There was no statistically significance difference between the two sex groups ($P > 0.05$) (Table 1).

3.4. Age Based Prevalence

The current study showed a higher prevalence of mange mites infestation in young age group of camels (31.8%), than adult age group of camels (23.1%), and the difference was not statistically significant ($p > 0.05$) (Table 1).

3.5. Body Condition Scores Based Prevalence

In this study, the prevalence of camel mange was higher in camels with poor body condition (33.1%), followed by medium (22.9%) and good body conditioned camels (11.3%) and the variation was statistically significant ($P < 0.05$) (Table 1).

3.6. Herd Sizes Based Prevalence

The analysis result of this study revealed that small (< 20), medium (20-40) and large (> 40) herd sizes had the prevalence of 17.5%, 27.1% and 34.3% respectively and the variation was statistically significant in their prevalence ($P < 0.05$) (Table 1).

4. Discussions

The current study showed an overall prevalence of 25% mange mite infestation among camel herds. This result was in line with the work done by Bekele *et al.* (2010) in Borana (Yabello district) who reported prevalence of 25.9% [12]. Similarly, Abebe (2001) and Teka *et al.* (2017) also reported concordant prevalence of 27.8 and 32.4% respectively from Eastern Ethiopia [22, 25]. However, this finding was higher than the reports of Awol *et al.* [13] in Raya-Azebo district, northern Ethiopia, Zahid *et al.* [15] in Punjab, Pakistan, Dinka *et al.* [18] eastern Ethiopia, Lawal *et al.* Sokoto [26], Nigeria and Chaudhry *et al.* [27] Cholistan, Pakistan whose results were 16.7, 11.28, 10.7, 3.5 and 3.14% respectively. These discrepancies in the prevalence of camel mange mite among different studies could be due to variations in environment, study seasons, level of awareness of the community with regard to methods of transmission and control and animal husbandry and managements.

Sarcoptes scabiei var. *cameli* was identified as the only mite species in all scrapings collected from suspected skin lesions. The same findings have been encountered by numerous authors [12, 13, 15, 25].

Even though both sarcoptic and chorioptic mange mites have been reported, Sarcoptic mange caused by *Sarcoptes scabiei* var. *cameli* is by far the most common, contagious and serious condition in camels [11].

There was no significant variation in the prevalence of camel mange mite infestation between the peasant associations, sexes, and age ($P > 0.05$). This finding was in general agreement with reports of Teka *et al.* from eastern Ethiopia [25] and Bekele *et al.* in Borana [12]. This relation might be due to similarities in management and the availability of same veterinary services as well as micro climatic condition of the study area. But there was significant differences of prevalences of mange mite infestation among body condition scores and herd size of camel ($P < 0.05$). This

result was not in agreement with the results reported by Bekele *et al.* in Borana, Southern Ethiopia [12] and Awol *et al.* in Azebo district, Northern Ethiopia [13]; it could be due to a variation in environment, study seasons and management practices.

On the other hand, the increment of prevalence of female animals than that of male animals in the study might be due to hormonal influences i.e. the higher level of prolactin and progesterone hormones could make the females more susceptible to any infection. Additionally, pregnancy and lactation stress could also aggravate the susceptibility of the female camels to infections. Furthermore, the breeding behavior of mange infected males could also be attributed to the transfer of the disease to a number of females [28].

Higher prevalence of mange mite was recorded in the young animals than the old one ($P < 0.05$). This finding is in agreement with the others work [13, 18, 29]. The age of camels might be important factors in mange infestation, in which both very young and very old camels are particularly susceptible. The increased prevalence of mite infestation in young camels with < 4 years of age than the rest age groups could be probably reflecting lowered immunity status of young animals. Furthermore, close interaction of the sucklers with infested lactating females could also be another factor which makes them more liable to the disease, leading to a higher prevalence in this age group.

With regards to herd size, the present study shown an escalation in the prevalence of *Sarcoptes scabiei* in herds with larger size which is most probably to the fact that camels from large herd sizes are more prone to be exposed to diseased animals supporting the contagious nature of mite infestation and contacts during herding, housing and interactions at watering points and auction marts favours the establishment and spread of mite infestation.

5. Conclusion and Recommendations

This study was conducted to determine prevalence of camel mange mite and associated risk factors in Gomole woreda. Therefore, 384 camels were examined for presence of the parasite and from the total camel examined 96 (25%) were found positive. *Sarcoptes scabiei* var. *cameli* is the main causal agent of mange in camels of the study area. In the current finding the infestation of camel mange was higher in animals with poor body condition and large herd size animal among the risk factors assessed during the study. Feed scarcity to the camel population in the area are a favoured close contact of these animals at available communal watering points and enhanced the establishment and transmission of mite infestation. This study showed that camels of harbor high mange mite which could have significant implication on the health and production performance of these animals. Based on the results of these findings the following recommendations were forwarded:

- 1) Good animal health services have to be established in the area.
- 2) Regional programs for controlling Ecto parasites should

be expanded.

- 3) Further studies on the seasonal pattern of camel mange should be conducted.
- 4) Awareness rising in the community about mange and its control approaches has to be in place.

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