Prevalence of Mange Mites Infestation in Small Ruminants in and Around Jigjiga, Eastern Ethiopia

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Abstract: A cross-sectional study was conducted from December 2015 to March 2016 with the objective of estimating the prevalence and associated risk factors of mange infestation in small ruminants in and around Jigjiga, Eastern Ethiopia. For this study, a total of 450 randomly selected animals; 86 sheep and 364 goats were examined. Among the examined animals 3.57% and 10.46% goats and sheep, respectively were infested by various species of mange mites. The indentified mange mites were Sarcoptes scabiei var ovis in sheep and Sarcoptes scabiei var caprae and Demodex var caprie in goats. It was noted that mange mite infestation was higher in sheep than goats and the difference being statistically significant (P<0.05). Furthermore With regard to the two sex groups, the prevalence of mange mites was 7.22% and 1.99% in female and male animals, respectively with statistically significant difference (P<0.05). On the other hand no significant (P>0.05) variation in mange infestation existed amongst different age, body condition and herd size category. Taken as a whole, this work gave a clue that small ruminants of the study area harbored a considerable level of mange parasitosis suggesting a need to organize and integrated control strategy along with other ectoparasites.

Key words: Mange · Prevalence · Sheep · Goat · Jigjiga

INTRODUCTION

Agriculture is the main stay of Ethiopian economy. It employs over 80% of the adult population and account for 45% of the gross domestic production (GDP) and 85% of the export earnings [1]. The livestock share of agricultural output in Ethiopia is about 40%. Hence, small ruminants are important contributors to food production in Ethiopia, providing 35% of meat consumption and 14% of milk consumption [2].

Ethiopia has a large population of small ruminants which comprises 24.2 million sheep and 22.6 million goats [3]. In addition to their substantial contribution to the income generation and food security of most smallholder farmers of Ethiopia, small ruminants enable the nation to earn a considerable amount of foreign currency through export of skins and other by-products. The export of processed and semi-processed skins constitutes Ethiopian’s second largest commodity. However, over the last decades, there are indications that the quality of raw material has deteriorated with an increasing number of reject grades and the appearance of skin disease called “ekek” that is mainly due to lice, keds and mange infestations [4, 5]. Mange mites are common causes of clinical and subclinical skin diseases among small ruminants in many regional states and different agro-ecologies in Ethiopia [4, 7-9].

According to tanneries report, skin diseases due to external parasites cause 35% sheep skin and 56% goat skin rejection [10]. Apart from quality degradation of skin and hides, skin diseases induce associated economic losses due to reduction of wool quality, meat and milk yield, losses as a result of culling and occasional mortalities and related with cost of treatment and prevention of the diseases. Some skin problems are easy to cure others more complicated and some like ring worm are even highly contagious to the human handlers. The effect of skin problems on animal productivity also varies from mild irritations to rapid death [11].

In Ethiopia, significant number of sheep and goat skin are rejected annually due to various factors, of which mange infestation account for 33% in sheep and 21% in goat [12]. Mange mites known to infest sheep and goats include Psoroptes communis var ovis, Sarcoptes scabi
var ovis, Psorergates ovis, Chorioptes bovis var ovis and Demodex ovis. Mange is a contagious parasitic disease of sheep, caused by the burrowing mite, S. scabiei. Affected sheep scratch, develop skin lesions (papules, crusts of dried serum and blood, excoriations), become hypersensitive and anorectic and may develop pyoderma as a result of bacterial contamination of the lesions in which the disease is usually transmitted through contact of infested animal with healthy ones [13, 14]. Sarcopes scabiei is found on the sparsely haired parts of the body such as the face and ears while Demodex species, which lightly parasitizes hair follicles and sebaceous glands of primarily hairs over the entire body, with highest populations occurring on the neck, flanks and shoulder [15].

Though the magnitude of the problem created by mange mite is believed to be huge, studies conducted in this regard in different parts of the country and information available are little in general and such kind of studies have not been conducted in and around Jigjiga area. Hence, it would be essential to have a base line data on the prevalence of mange mites of small ruminants and determine the responsible for related risk factors in the study area. Therefore, this study aimed estimating the prevalence and associated risk factors of mange infestation in small ruminants in and around Jigjiga, Eastern Ethiopia.

**MATERIALS AND METHODS**

**Study Area:** The study was conducted from December 2015 to March 2016 in Jig-jiga town, Somali Regional state of Ethiopia (SoRSE). Jigjiga town is one of the nine administrative zones of the SoRSE. The zonal and also regional capital, Jigjiga city, is located 620 km southeast of Addis Ababa. The zone is situated in the northern part of SoRSE and borders in the East with Republic of Somalia, in the West with Oromia regional state and Fik zone of SoRSE, and in the south with Degahbour zone. It has eight districts namely Jigjiga, Kebribeyah, Harshin, Babile, Awbare, Gursum, Tullu Gule and Gololchen. The total land cover is 40,861 km² of which the rangeland extends over 36,629 km². About 52.6%, 31% and 7% of the landscape of the zone can be categorized as flat to gentle slopes, hills and steep slope, respectively. Midland (1500–2300 m.a.s.l.) agro-ecology constitutes about 95% of the Jigjiga zone. Temperature of the area is generally high all the year round with mean minimum and maximum values being around 20 °C and 35°C, respectively. The mean annual rainfall is 660 mm and bimodal. There are 1.316 million sheep and 548,000 goats in jijiga zone [16].

**Study Design and Population:** The study employed a cross-sectional study design. The study population was all animals brought, to Jig-jiga veterinary clinic between December 2015 and March 2016. For this purpose, 450 animals were subjected to detailed examination for the presence of skin lesions and mange mite infestation. Of the 450 small ruminants examined, 86 sheep and 364 goats. Records were taken with regards to age, infestation status, herd size, sex and body condition of each selected animals. Body condition score was taken as poor if the spine was prominent and sharp and good when the spine was smooth and round. Likewise, age was also determined as young (up to 2 years) and adult (above 2 years) by considering the rate of eruption of teeth. These determinations of age and body condition score were carried out by modifying the method described by Gatenby [17] and Steele [18].

**Sampling Method and Sample Size Determination:** Animals presented to Jigjiga Veterinary regional clinic for any disease were subjected to detail examination for the presence of ectoparasites. The animals were selected by using systematic random sampling using regular interval and the sample size required was obtained using the formula given by Thrusfield [19].

\[
N = 1.962 \times \text{pexp} \times \text{q/d2}
\]

where, \(N\) = sample size required

\[
\text{pexp} = \text{expected prevalence}
\]

\[
\text{q} = 1 - \text{pexp}
\]

\[
\text{d} = \text{desired absolute precision}
\]

Sample size determination was based on 50% expected prevalence, 5% precision and 95% level of significance. Accordingly, the minimum sample size required for this study was 384, but in order to increase the precision a total of 450 small ruminants were sampled.

**Collection and Identification of Ectoparasites:** After the animal was restrained physically, clinical examination for skin lesion and mange was performed by visual inspection and palpation of skin for parasites and/or lesions on all parts of the animal. When skin lesions were evidenced
skin scraping from suspected cases of mange was collected. Mite identification was made according to Wall and Sharer [20] and Taylor et al. [21]. The collected ectoparasites were identified to genus level at the parasitology laboratory of the School of Veterinary Medicine, Jig-jiga University under 40 x microscopes.

**DISCUSSION**

The present work showed an overall prevalence of 4.66% mange mite infestation in small ruminates in the studied area. This finding was lower than the finding reported by Kedir [22] in Tigray, Zelalem [23] in Dire Dawa, Zeryehun [24] in Kombolcha, North-East of Ethiopia, Sertse and Wosene [25] and Numery [26] in Kombolcha. This prevalence difference might be due to the control action taken by the region and in addition, it may be due to better management practices applied in the area. However, it was higher than the previous studies conducted in Southern rangelands Oromia [27] and Sidama Zone [28], who reported the overall prevalence of 0.94% and 1.39% respectively. This discrepancy might be attributed to differences in agro-climate.

This study revealed two genera of mange mites namely, Sarcoptes and Demodex, in the study area. The overall prevalence of Sarcoptes was 3.56% and it was observed that goats (3.84%) were predominantly infested by Sarcoptes than sheep (2.33%). This result agrees with previously reports in by Kassaye and Kebede [29], Shiferaw et al. [12] and Numery [21]. However, the difference was not statistically significant (p>0.05). As was reported by Sertse [1] and Shiferaw et al. [12] the genus Sarcoptes was the most dominant mange mite which is similar within the current study. Of the mange mite affecting sheep and goats, Sarcoptes is the most prevalent species in Ethiopia [30].

The overall prevalence of mange mite infestations were recorded in sheep and goats, respectively in the present study which is higher than the previous prevalence of 0.4 % in Sheep and 6.6 % in goats in Amhara Regional State [25] 2.1 % in sheep and 4.3 % in goats in Sidama zone [28], 0 % in sheep and 0.98 % in goats in Wolayta Sodo [31], 1.2 % in sheep in central Oromia [8]. This differences in the prevalence among different studies could be due to variations in environment, study seasons, owners knowledge of in controlling mites and animal husbandry and managements.

In this study the prevalence of infestation by mange mites in different age groups revealed a higher prevalence in adults (5.5%) compared with the young ones (3.25%) (Table1). But, the difference was not statistically significant (p>0.05) between the prevalence of mange mites in the two age groups in both host species. Similar result was reported by Zeryehun [24] in Kombolcha and Al-Shebani [32] in Al-Diwaniyah province.
Table 1: Prevalence of mange mite infestation in sheep and goats in relation to sex, age and species

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category level</th>
<th>Number examined</th>
<th>Number positive</th>
<th>Prevalence (%)</th>
<th>$\chi^2$</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>201</td>
<td>4 (4/201)</td>
<td>1.99</td>
<td>6.56</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>249</td>
<td>18 (18/249)</td>
<td>7.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Young</td>
<td>123</td>
<td>4 (4/123)</td>
<td>3.25</td>
<td>0.975</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>327</td>
<td>18 (18/327)</td>
<td>5.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Caprine</td>
<td>364</td>
<td>13 (13/364)</td>
<td>3.57</td>
<td>7.11</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Ovine</td>
<td>86</td>
<td>9 (9/86)</td>
<td>10.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Prevalence of mange mite infestation in sheep and goats in relation to body condition score and herd size

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category level</th>
<th>Number examined</th>
<th>Number positive</th>
<th>Prevalence (%)</th>
<th>$\chi^2$</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCS</td>
<td>Poor</td>
<td>135</td>
<td>6 (6/135)</td>
<td>4.4</td>
<td>1.01</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>299</td>
<td>16 (16/299)</td>
<td>5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herd size</td>
<td>&lt; 10</td>
<td>281</td>
<td>10 (10/281)</td>
<td>3.6</td>
<td>5.44</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>10-20</td>
<td>148</td>
<td>12 (12/148)</td>
<td>8.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 20</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

which expresses young animals may have poor access to grazing or pasture than adult ones. On contrary, Kasaye and Kebede [29] and Shiferaw [12] reported higher prevalence of mange mite in young animals than the old age group. This might be due to the environmental difference of study area.

With regard to the two sex groups, the prevalence of mange mites was 7.22% and 1.99% in female and male animals, respectively with statistically significant difference ($P<0.05$). This result was in agreement with result reported by Zeryehun [24] in Kombolcha. However, this finding was not in agreement with result reported by Yacob et al. [11] and Kasaye and Kebede [29] that showed sex has no significant effect on the prevalence of mange mites.

The present study also showed that there was no significant difference on overall prevalence of mange mites between sheep and goat in poor, medium and good body condition of animals. This result was not in agreement with result reported by Zeryehun [33] in Nekemte, Sertese and Wosene [25] in Amhara region. It could be due to a variation in environment and management practices. There was no statistically significant variation detected between herd size groups and rate of mange mite infestation ($P>0.05$).

CONCLUSION

This cross-sectional study of mange mites in goats and sheep revealed an overall prevalence of 4.66% in and around Jigjiga. It was noted that the infestation was significantly higher in sheep than goats. Among the different risk factors considered, infestation was observed to vary only in relation to species and sex of animals. Furthermore, the study revealed that Sarcoptes is the predominant mite in both species. Taken as a whole, this work gave a clue that small ruminants of the study area harbored a considerable level of mange parasitosis suggesting a need to organize and integrated control strategy along with other ectoparasites.

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