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Study on Prevalence of Mange Mites and Associated Risk Factors on Small Ruminants in Kindo Koysha District of Wolaita Zone, Southern Ethiopia

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Abstract: *A cross sectional study was conducted from May 2016 to February 2017 with the objective of estimating the prevalence of mange mites' infestations on small ruminants and identifying the potential risk factors and major species of mites in Kindo Koysha District, Wolaita zone, Southern Ethiopia. A total of 384 small ruminants randomly selected, of which 154 sheep and 230 goats were examined for the presence of mange mites, from which 7(4.55%) and 23 (10.0%) sheep and goats were found positive respectively. The overall prevalence of both species was 7.81%(n=30). The genera of mange mites identified with the study were Demodex 8(2.08%) and Sarcoptes 20(5.2%), and mixed infection 2(0.52%), of these; the genus Sarcoptes was more prevalent in the study area. It was observed that the prevalence of mange mites infestation was significantly higher in small ruminants with poor body condition score ($p<0.05$). But age, sex, species of animals, season of a year and agro-ecology were not affected the prevalence of mange mites of small ruminants.*

Keywords: *Kindokoysha, mangemites, prevalence, risk factors, small ruminants*

1. INTRODUCTION

Small ruminants constitute about 30% of the total live stock population of the country and important contributors to food production in Ethiopia providing 35% of meat, 14% of milk consumptions and accounts for 40% of cash income and 19% of the use household consumptions (Bayou, 1998; Yacob *etal,* 2008). Small ruminants are considered as investments and insurance to provide income food during seasons of crop failure and to meet seasonal purchase such as improved seed fertility and medicine for rural household. They have essential attributes like fertilizer, short generation time interval and adaptation even in harsh environment (Asfaw, 1997).

Mange is a collective name for allergic dermatitis caused by ectoparasitic infestations by mites that are obligate parasites and spread from animal to animal by direct contact. Mange usually appears as a skin conditions associated with irritation and scratching that leads to inflammation, exudation, crusts and scabs forming on skin. Untreated mange leads to thickening of skin and loss of condition of the animal. The disease is often seen in animals in generally poor condition and during the winter season and characterized by a variety of clinical signs depends on the species (Blood and Radostitis, 1989; Dorny *et al.*, 1994; Lusiluka *et al.*, 1995; Pangui, 1994; Radostitis *et al.*, 2007; Taylor *et al.*, 2007; and Wall and Shearer, 1997).

Mange mite infestations are widespread among small ruminants across the sub-saharan region. Clinically affected and carrier animals are the sources of infestation. Transmission occur animals by overcrowding in houses, markets, dips and communal grazing lands facilitate rapid spread of the parasites (Agyomang *et al.*, 1991: Hall, 1988**).** Poor nutrition and intercurrent infections increase the susceptibility of animals to mange mites (Lusiluka *et al.*, 1995; Radostitis *et al.*, 2000). Transmission appears to occur during the earlier days of suckling (Taylor *et al.*, 2007). Some spend their entire life on the host and other spend only part of their life (Ballwerber, 2001) and relatively small in relation to the size of their host. Each individual consumes only relatively small amounts of food per day and have short generation time and very high potential rates of population growth (Richard, 2007).

Mange, a contagious disease of animals caused by parasitic mites, is characterized by variety of clinical signs depends on the species. The ectoparasitic mites of sheep and goats feed on blood, lymph, skin debris or sebaceous secretions, which they ingest by puncturing the skin, scavenge from the skin surface or imbibe from epidermal lesions (Taylor *et al.*, 2007). The mites have complex taxonomy occupying at least eight different families, and for veterinarians it is more useful to consider them according to their location on the host as burrowing and non-burrowing mites (Urquhart *et al*, 1996).

Mange mites can spread rapidly and can have severe economic sequences on animal health. The host reaction to mites results in intense itching accomplished by hair loss which can predispose the host to secondary bacterial infections (Gregory, 2010). The appearance and location of mange lesions are generally characteristic for the particular mite; also specific diagnosis depends on microscopic examination of the mouth parts (Blowey and Weaver, 2011; Kambarage, 1992 and Soulsby, 1998). Deep skin scrapping is one of the most common diagnostic tools used in evaluating animals with dermatological problems. Before the skin scraping, the blade is dipped in drops of mineral oil in the slide. The skin scrapped for mite that lives in tunnels until the capillary oozes occur (Yakchali and Husseine, 2006).

Mange not only causes direct economic loss to the farmers due to animal mortality, poor growth and reproduction; the skin of mange infested animals often must be downgraded or rejected at the tannery. This leads to economic losses to the tannery industry and ultimately to the country through reduced foreign earnings (Bayou, 1998; Donald *et al.*, 2007, Taylor *etal.*, *2007*, and Urquhart e*tal*. 1996). Small ruminants have significant contribution of high economic value for the farmers and ensuring food security for the community of study area. Therefore, economic losses due to morbidity, mortality and reduced productive performance as a result of such diseases should be reduced. Moreover, the impact of the disease in causing skin damage is severely limiting the performance of the tanning industry which in turn, affects the country foreign exchange earnings.

Though, mange infestations in small ruminants prevalent in the area; their distribution, species identification and associated risk factors to the mange were not adequately studied in the area. Therefore, the objective of the study was:

- To determine the prevalence, distribution, major species identification and the associated risk factors of the mange mites of small ruminants in selected sites of Kindo Koysha district of Wolaita zone.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted in Kindo Koysha district, Wolaita Zone, Southern Ethiopia which is located at 6079-7^0 06N latitude and $37^0$39-37^0 63E longitude which is 431km from Addis Ababa to South-East direction on the way to Jimma. The altitude of the area ranges from 700-2280m.a s. l. The annual rainfall ranging from 400mm to 1400mm per annum with bimodal pattern. The area has an average annual maximum and minimum temperature of 30.7^0c and 19.2^0c respectively. The district has 218,620 Cattle, 26,896 Ovines, 71,041 Caprines, 8,621 Equines and 193,995 Poultry (WZAD, 2017).

2.2. Study Animals

A total of 384 traditionally managed small ruminants, of which 230 goats and 154 sheep were randomly selected from backyard production system. Totally 150,150 and 84 goats and sheep were selected from lowland, midland and highland areas respectively. The total number of ruminants required for the study was calculated by formula given by Thrusfield (1995). In this study, sample size will be calculated taking 50% prevalence as follows;

$$N = \frac{1.96^{2(}P^{ep})\ (1\text{-pexp})}{d^2}$$

Where

N=sample size

P= expected prevalence

d=desired level of precision (5%)

Therefore, $N = \frac{1.96^2 (0.5)(1-0.5)}{0.0025} = 384$

According to Thrusfield (1995), a minimum of 384 ruminants will be sampled.

2.2.1. Study Design and Methodology

A cross-sectional study was conducted to assess the prevalence of mange mites and associated risk factors to the mange mite infestation. During the clinical examination: origin, age, sex, body condition, season of year and species of animals were recorded. The clinical examination was performed by using visual inspection, palpation of skin for lesions on all parts of animal body.

2.2.2. Sampling and Transportastion

During the study period both deep and superficial skin scrapings were taken from suspected cases which showing the clinical signs of hair loss, scratching, and itching and crusts as well as apparently healthy animals. Then, the sample was taken to Bele veterinary clinic laboratory and identified according to the procedure described by Alterio e*t al.*, (2004); Gupta and Kumber, (2003); Kaufmann, (1996), and Yakchali and Hussein, (2006). Determination of the age and body conditions core (BCS) of the goats and sheep was carried out according to Gatenby (1991) and Steele (1996).

2.2.3. Laboratory Methodology

According to Gupta and Kumber (2003), mites remain embedded either superficially or deep into the skin of their hosts and can be collected by taking the skin scrapping as follows: The mites infested lesion is selected and the hairs over the edge of the lesion are clipped. Then scalpel blade and rim of Petri plate should coated first with an oily substance which may be liquid paraffin or Vaseline. Then scrape the skin over the edge gently and take material in the Petri plate. This process should be continuing till a slight amount of blood oozes out. This is done in order to contain the deep seated mites if any. Cover the petsriplate with its lead and bring the material in to the laboratory and examine it. The skin scrapping can be examined by the following ways.

2.2.4. Direct Smear

Put the Petri plate containing the skin scrapings directly under stereomicroscope and look for mites. The mites, if present can be spotted by their movements within the scrapings or petriplate can be heated a little and then the movement may be observed. Otherwise, take small amount of skin scrapings on a glass slide, then pour 2-3 drops of liquid paraffin over it, and cover it with cover slip and examine.

2.2.5. Examination After Boiling

If mites not seen by direct examination boil the scrapings by 5-10% KOH solution for 5-10 minutes, then centrifuge a little the material, after that the sediment is examined on a glass slide under the microscope.

2.3. Data Management and Analysis

The data obtained from the study were recorded in computer Microsoft excel spread sheet and coded before analysis. All the data analyses were performed on Intercooled Stata 7.0 (Stata

Corporation 1985-2001) software. Factors thought to be associated with the prevalence of mange mites infestation (sex, age, species, agro-climate, season of a year and body condition) were analyzed by using proportion and chi-square. P- Value < 0.05 at 95% confidence interval was considered for significance.

3. RESULTS

The overall prevalence of the mange mite infestation in present study was 7.8 %(30), from which 20(5.2%), 8(2.08%) and 2(0.52%) accounted for Sarcoptes, Demodex and mixed (Sarcoptes and Demodex) infestations respectively. A total of 230 goats and 154 sheep were examined, of which 23(10%) goats and 7 (4.55%) sheep were found affected by mange mites.

This study revealed that totally 8.63% adult and 2.08% young, and the total prevalence rate of 6.4% in female and 8.64% male small ruminants were affected by mange mites. There was no significant

difference in mange mites prevalence between young and adult animals, P=0.114), between the female and male animals (P=0.4270), between the wet and dry season (P=0.4379), between the sheep and goats (P=0.4780), between the different agro-climate of the area (P=0.1070).

Table1. *The proportions of the animals species infested by the different mange mites' genera during the study period in the area are shown.*

Identified genera of mites	Animal Species		Overall prevalence
	Goats(23)	Sheep(7)	
Sarcoptes	14(3.65%)	6(1.56%)	20(5.2%)
Demodex	7(1.82%)	1(0.26%)	8(2.08%)
Mixed	2(0.52%)	0(0%)	2(0.52%)

Table2. *Prevalence of mange mites genus identified in the study area from sheep and goats based on body condition.*

Identified spp. of mite	Body condition score		Overall prevalence
	Good	Poor	
Sarcoptes scabies	0.26%(1)	4.95%(19)	5.2%(20)
Demodex caprie	0.52%(2)	1.3% (5)	2.08%(8)
Mixed in C*aprine*	----------	0.52%(2)	0.52%(2)

This study showed that there was significantly higher infestation of small ruminants in poor body condition ($p<0.05$) than good body condition with the prevalence rate of 10.40% and 2.42% respectively.

Table2. *Mange mites' prevalence comparison between age, sex, species, origin of animals, season of year and Body Condition score of small ruminants was shown in the table-3.*

Factors for analysis	Total animals examined	Mange mites percent (prevalence) value	p-
Agro climate			0.1070
Lowland	150	6.67% (10)	
Midland	150	12.67%(19)	
Highland	84	1.2%(1)	
Age			0.114
Young<2years	48	2.08%(1)	
Adult>2years	336	8.63%(29)	
Sex			0.427
Female	141	6.4%(9)	
Male	243	8.64%(21)	
Species			0.4870
Sheep	154	4.55% (7)	
Goats	230	10.00%(23)	
Body condition score			0.0060
Poor	160	10.40%(27)	
Medium	140	2.42% (3)	
Good	84	0%(0)	
Season of year			0.4379
Dry	192	6.77%(13)	
Wet	192	8.85%(17)	
Total	384		7.8% (30)

4. DISCUSSION

The prevalence of mange mites infestation found in the current study was 7.8%, and this result higher than 3.11% prevalence reported by Yifat *et al.*,(2013) and 3.98% prevalence reported by Dessie *et al.*,(2010) in selected sites of Wolaita zone.

A prevalence of 0.26% finding demodecosis in sheep in the current study was lower than the prevalence of 2.63% demodecosis, but almost similar with 0.44% prevalence in sheep and 1.82% prevalence demodecosis found in goats was almost comparable with 1.36% prevalence goat demodecosis reported by Numery Abdulhamid (2001) and Yifat *et al.,*(2013*)*, in central and southern parts of Ethiopia.

10.00% prevalence of goat mange mite infestation found in the current study was higher than 3.64% prevalence reported by Yifat *et al.,(*2013*),* comparable with 11.8% (Gashaw Takele, 1986), but lower than 16.45% in goat, (Molu Nura, 2002), higher than 6.8% (Zerhun Tadesse, 1994), 5.85% (Dessie *et al.*, 2010), and 8.11% (Enquebaher and Etsay, 2010), the prevalence of goat mange mites infestation reported from Southern, Harraraghe, Southern rangeland of Oromia Eastern, Southern, and Northern parts of Ethiopia, respectively. This differences might be related to variatation in agro-climate, season of study and management system.

10.00% prevalence of goat mange mite infestation found in the current study was higher than 3.57% (Dansure and Bela., 2018*),* 3.96% (Mohamed Husseine, 2001) and 4.27% (Worku Tadesse, 2002), prevalence of goat mange mites infestations reported from southern, central and Southern parts of Ethiopia, respectively.

4.55% prevalence of sheep mange mite infestation found in the current study was lower than 10.46 %(Dansure and Bela., 2018*)* in Jigjiga area, 1.99% (Dessie *et al.*, 2010) in selected sites of Wolaita zone, but lower than 7.85% (Gashaw Takele,1986) in Harraraghe region, 67.65% (Shenkutie Ashine, 1987) in Robie areas, and 14.64% (Molu Nura, 2002) in southern rangeland of Oromia.

The prevalence 10.40% in poor body conditioned animals of this study was higher than 4.4%(Dansure and Bela., 2018) of Eastern Ethiopia. The significant difference in the prevalence of mange mite infestation by body condition, in which high prevalence in animals with poor body conditions than others might be suggested due to that poor nutrition and other disease conditions causing poor body condition, which in turn, resulted in an increase the susceptibility of animals to mange mite infestations (Radostitis, *et al.*, 2000). The Demodectic mange in goats in the present study was lower than 3.77% prevalence Yifat *etal.*, 2013 ().

Generally, Sarcoptic mange affects more commonly goats than sheep and the genus Sarcoptes is the most prevalent species in Ethiopia (ESGPIP, 2008 and Tefera Serste, 2004), which is similar with this report. It is known that Sarcoptes occur more frequently on the sparsely haired parts (Kettle, 1995) and Demodectic mange is rare in sheep (Radstitis *et al.*, 2000) is also coincided with the present observation. Absence of significant difference in mange mite infestation due to sex, age, agro-climate, season of a year and species of animal in the present study was similar with other reports such as Dessie *et al.*, (2010). This similarity might be related to similarity of agro-ecology.

5. Conclusion and Recommendation

Mange mites are very contagious, can spread rapidly and can have severe economic sequences on animal health. The overall prevalence of the mange mite infestation in present study was 30(7.8%), from which 20(5.2%), 8(2.08%) and 2(0.52%) accounted for Sarcoptes, Demodex and mixed (Sarcoptes and Demodex) infestations respectively. From this study result, it is possible to conclude that body condition score attributed to the variation in the distribution and abundance of mange mites in small ruminants while sex, age, season of a year, species of small ruminants and agro-ecology do not have contribution for the prevalence of mange mite infestation.

Based on the present study finding, the following recommendations are forwarded:

- Detailed further study should be done regularly to have full picture of the distribution, identification of major mite species and seasonal occurrence of mange in the area.
- Design a disease control strategy that will ensure the full participation of the rural affected population.
- Sick and infested animals should be treated with acaricides to reduce transmission of mange mites to non-infested animals.

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