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PREVALENCE OF ECTOPARASITES AMONG SMALL RUMINANTS IN AND AROUND BAHIR DAR TOWN, ETHIOPIA

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ABSTRACT

External parasites are the major causes of skin diseases, which hamper small ruminant production. Lice, keds, mange mites and ticks are the major ectoparasites of small ruminants. A cross sectional study was conducted from November 2013 to April 2014 with the objectives of determining the prevalence of ectoparasites infestation in small ruminants and identifying the major risk factors associated with the occurrence of external parasites in small ruminants. A total of 400 small ruminants were sampled, out of which 56.80 % of the animals (i.e. 60.00% of Ovine and 51.30% of Caprine) were found to be infested with one or more of the ectoparasites. The major ectoparasites of small ruminants identified in the study area were lice (24.40%), ticks (12.40%), sheep ked (11.20%), mange mites (2.80%) and mixed infestation (9.20%) in Ovine; whereas in Caprine; ticks (22.70%), lice (13.30%), mange mites (6.00%) and mixed infestation (9.30%). The differences in prevalence of lice infestation between species, age, body condition, management and flock types of small ruminants were found statistically significant ($P<0.05$). The difference in prevalence of tick infestation was statistically significant ($P<0.05$) between groups of risk factors like between species, between age groups and between management types. The difference in prevalence of *M. ovinus* between age groups (χ^2 =7.39; 3.5% in young and 15.20% in adult), different body conditions (χ^2 =14.85; 18.1% in poor and 2.70% in good) and varying hair sizes (χ^2 =24.51; 0.80% in hairy and 20.60% in woolly) were found to be statistical significant ($P<0.05$). The high prevalence of ectoparasites infestation in small ruminants in and around Bahir Dar may be due to favorable climates, poor level of management, poor awareness of farmers and poor animal health extension services and the increasing threat of ectoparasites to small ruminant production may necessitate urgent prevention and control intervention.

KEYWORDS: prevalence, Ectoparasites, Small ruminants, Bahir Dar.

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. The livestock sector has been contributing considerable portion to the economy of the country. It is eminent that livestock provide animal protein, plays an important role in providing export commodities, confer a certain degree of security in times of crop failure. The livestock population of Ethiopia is estimated to be 52.13 million cattle, 24.2 million sheep, 22.6 million goats, 44.89 million poultry, 8.73 million equines and 0.99 million camel populations.[1] Small ruminants constitute about 30% of the total live stock population of the country and provide 46% of the value of national meat production, 14% of milk consumption and 58% of the value of hide and skin production.[2]

Skin diseases are major problems in small ruminant production. External parasites are the major causes of skin diseases that hamper small ruminant production in many areas of Ethiopia. Studies and reports from different parts of the Ethiopia showed that skin quality deterioration is very evident mainly due ectoparasites[3] and[4] Lice, keds, mange mites and ticks are the major ectoparasites of small ruminants in Ethiopia. The occurrence and spread of skin diseases had been shown to correlate with host factors, poor management, climatic factors, feed scarcity and inadequate veterinary services.[5]

Though there are studies showing prevalence of ectoparasites of small ruminants in Amhara region, skin diseases due ectoparasites has been a subject of vast amount of the research. Ectoparasites in small ruminants still remain a problem in the region and little has been done on the prevalence of ectoparasites of small ruminants in and around Bahir Dar and thus, this study was geared with the objectives:

- To determine the prevalence of ectoparasite infestation in small ruminants and

- To identify major risk factors associated with the occurrence of ectoparasites in small ruminants.

MATERIALS AND METHODS

Study Area

The study was conducted in and around Bahir Dar town. Bahir Dar town is located in the North Western part of Ethiopia at distance of 565 kilometers from Addis Ababa. The town is located at 11^0 29' – 11^0 41' N latitude and 37^0 16' – 37^0 27' E longitude. The landscape is flat with some small hills to the East and West. The average elevation of the town is about 1795 m.a.s.l. The town covers an area of about 16,000 hectares. The mean annual precipitation depth recorded at Bahir Dar Station in 37 years period from 1962 to 1999 is about 1437 mm. The study area experiences average annual rainfall that ranges from 1200 - 1600 mm and it has mean annual temperature of 26°C[6] and[7]

Study Population

Two groups of small ruminants based on species which included; 250 and 150 Ovine and Caprine were considered. And based on their management system, they were categorized as small ruminants under extensive (259) and semi-intensive (141) management systems. Furthermore, small ruminants were grouped to be in mixed (294) and/or not mixed (106) on the basis of flock type. The small ruminants' demographic characteristics [species, age, sex and body conditions i.e. poor (212) or good (188)] were considered important.

Study Design

A cross sectional study was conducted from November 2013 to April 2014. Appropriate samples were collected from animals and specimens were preserved and transported to Bahir Dar Animal Health Investigation and Diagnostic Laboratory for identification of the ectoparasites. A total of 400 small ruminants (i.e. 250 sheep and 150 goats) were examined for the presence of ectoparasites. About 259 of small ruminants were managed under extensive management system; while the rest of 141 were managed under semi-intensive management system. Small ruminants were categorized as young (< 1 year age), and as adults (> 1 years age). Other risk factors such as species, sex, breed, hair size/ type, body conditions and flock type were also considered in the study.

Sampling method and Sample size determination

Simple random sampling technique was used to select apparently healthy small ruminants. The sample size required for this study was determined depending on the expected prevalence of the parasite and the desired absolute precision. The sample size was computed using the formula given in[8] as follows.

$$N = \frac{1.96^2 \times Pexp\ (1 - Pexp)}{d^2}$$

Where: N = required sample size; Pexp = expected prevalence; d = desired absolute precision.

Using expected prevalence of 50%, desired 95% confidence interval and 5% precision, the sample size was calculated to be 384. But to increase the precision 400 animals (250 sheep and 150 goats) were sampled.

Sample Collection

Sample collection was carried out in all selected animals in clinics and from selected animals in two management systems. Examination of each animal was conducted by visual inspection and palpation of skin for lesions, if any and by the eventual identification of ectoparasites. When skin lesions were evidenced the detailed history was taken from the owner and subsequently, a skin sample was taken from at least two sites covering the adequate depth and peripheral edges. Lice, ked and ticks were collected in 70% ethyl alcohol in vials for preservation until subsequent examination. Skin scraping from suspected cases of mange were collected and preserved in 70% ethyl alcohol and taken to laboratory. All samples were properly labeled as described by.[9]

Identification of Ectoparasites

Lice

The most practiced means of detecting lice was used; i.e. general inspection of sheep and goats with primary sample units of animals and secondary units of fleece pertaining to multiply on body sites and collecting the lice from the body regions (head, neck, flanks, front and rear legs and belly), using the procedure described in.[10] From clinically positive animals, specimens were collected; preserved in 70% ethyl alcohol and later they were identified by their morphological feature in the laboratory by stereomicroscopy.

Ticks

Ticks were collected using alcohol by dabbing the ticks and the surrounding skin to remove embedded living ticks. Care was taken to ensure that the mouth parts not left behind during the traction, with thumb forceps. Ticks were collected and preserved in 70% ethyl alcohol and later they were identified to the genus level and/or species level by their morphological features in the laboratory by stereomicroscopy, using appropriate procedures.[11]

Sheep ked: keds were collected by using universal bottles with 70% ethyl alcohol, and examined for their morphological features by the stereomicroscopy.

Mites: Skin scrapping from suspected cases of mange were collected and preserved in 70% ethyl alcohol. 10% KOH and/or NaOH was added to the specimen so as to get mites be released from scabs and crusts before examination, following procedures described in[36] and then were examined by using stereomicroscopy and/or compound light microscope(10x) for genus/species identification.[10]

Data Management and Analysis

The data were entered and managed in Microsoft Excel. All the data analysis was done by Statistical Package for Social Science (SPSS) software version 20. Descriptive statics such as percentages and frequency distribution were used to describe the nature and the characteristics of the data. The association of different risk factors with prevalence of ectoparasites was computed by Chi – square (χ^2) test. In all the analysis, comparisons having P-value less than 0.05 ($P<0.05$) were considered as statistically significant.

RESULTS

Overall Prevalence of Ectoparasites in Small Ruminants

Out of the total of 400 small ruminants examined for the presence of ectoparasites, 56.80% (227/400) were found to be infested with one or more of the ectoparasites and the prevalence of ectoparasites in sheep and goats were found to be 60.00% (150/250) and 51.30% (77/150) respectively. The overall prevalence 56.80% (227/400) represents the sum total prevalence of identified major ectoparasites of 20.20% (81/400), 16.20% (65/400), 9.20% (37/400), 7.00% (28/400), and 4.00% (16/400) Lice, Ticks, Mixed, Sheep ked and Mange mites infestations in small ruminants respectively. The major ectoparasites identified in the study area were lice, ticks, sheep ked and mange mites. The major ectoparasites identified in sheep were lice (24.40%), ticks (12.40%), sheep ked (11.20%), mange mites (2.80%) and mixed infestation (9.20%); however, major ectoparasites identified in goats were ticks (22.70%), lice (13.30%), mange mites (6.00%) and mixed infestation of 9.30% (Table1).

Table 1: The overall prevalence of ectoparasites in sheep and goats.

	Sheep(n=250)		Goats(n=150)		Total (N=400)	
Ectoparasite	**No of infested**	**Prevalence (%)**	**No of infested**	**Prevalence (%)**	**No of infested**	**Prevalence (%)**
Sheep ked	28	11.20	0	0.00	28	7.00
Ticks	31	12.40	34	22.70	65	16.20
Lice	61	24.40	20	13.30	81	20.20
Mange mites	7	2.80	9	6.00	16	4.00
Mixed infestation	23	9.20	14	9.30	37	9.20
Overall	150	60.00	77	51.30	227	56.80

Four species of ticks were identified both in sheep and goats. In the study, tick species of *B. decoloratus* (10.00%), *A. variegatum* (6.00%), *R. evertsi evertsi* (1.60%), *H. mariginatum* (1.60%) in sheep; and *B. decoloratus* (18.70%), *A. variegatum* (7.30%), *R. evertsi evertsi* (2.70%), *H. mariginatum* (1.30%) in goats were identified. Genera of lice identified in sheep were *Damalina* species (24.40%), *Linognathus* species (6.80%); whereas in goats *Damalina* species (6.00%), *Linognathus species* (8.00%) and *Haematopinus*(2.70%) were identified. Among the mange mites *Sarcoptes* spp., *Psoroptes* spp. and *Demodex* spp. were recovered from both sheep and goats. *Melophagus ovinus* (11.20 %) was identified in sheep (Table 2).

Table 2: Prevalence of different genera/ species of ectoparasites infestation in sheep and goats.

	Sheep(n=250)	Goats(n=250)	Total(N=400)
Ectoparasite Genera/species	**No positive (Prevalence in %)**	**No positive (Prevalence in %)**	**No positive (Prevalence in %)**
Sheep Ked			
Melophagus ovinus	28(11.20)	0	28(7.00)
Ticks			
Boophilus decoloratus	25(10.00)	28(18.70)	53(13.20)
Amblyomma variegatum	15(6.00)	11(7.30)	26(6.50)
Rhipicephalus evertsi evertsi	4(1.60)	4(2.70)	8(2.00)
Hyalomma mariginatum	4(1.60)	2(1.30)	6(1.50)
Mixed species	4(1.60)	4(2.70)	8(2.00)
Total	**52(20.80)**	**49(32.70)**	**101(25.20)**
Lice			
Damalina species	60(24.00)	9(6.00)	69(17.20)
Linognathus species	17(6.80)	12(8.00)	29(7.20)
Haematopinus	0	4(2.70)	4(1.00)
Mixed species	5(2.00)	2(1.30)	7(1.80)
Total	**82(32.80)**	**27(18.00)**	**109(27.20)**
Mange mites			

Sarcoptes spp.	1(0.40)	7(4.70)	8(2.00)
Psoroptes spp.	6(2.40)	2(1.30)	8(2.00)
Demodex spp.	3(1.20)	6(4.00)	9(2.20)
Total	**10(4.00)**	**15(10.00)**	**25(6.20)**

Overall Prevalence of Ectoparasites between Small Ruminant Species

A total of 250 sheep and 150 goats were examined for the prevalence of ectoparasites infestation, out of which 150 (60.00%) and 77 (51.30%) sheep and goats respectively were found to be infested by one or another of the ectoparasites but statistical analysis showed an insignificant (P>0.05) variation in prevalence of ectoparasites between the two species (table 3).

Table 3: Prevalence of ectoparasites between species of small ruminants.

Species	No Examined	Prevalence	χ^2	P- value
Sheep	250	150 (60.00%)	2.87	0.090
Goats	150	77 (51.30%)		
Total	400	227 (56.80%)		

Prevalence of Lice Infestation in Small Ruminants among Risk Factors

The overall prevalence of Lice infestation was recorded to be 20.20% (81/400). There was a statistical significant (P<0.05) different variation in prevalence of lice infestation between the species of small ruminants i.e. 24.40% (61/250) and 13.30% (20/150) in sheep and goats respectively. Furthermore, the prevailing study showed statistically significant (P<0.05) difference in prevalence of ectoparasites between different sexes (i.e. 25.70% in males and 16.00% in famales), ages (14.60% in young's and 23.00% in adults), body condition scores (26.40% in poor and 13.30% in good), flock types(22.80% in mixed type and 13.20% in not mixed type) and management systems (23.90% in extensive and 13.50% in semi-intensive) of small ruminants (table 1 and table 4).

Table 4: Prevalence of Lice infestation in small ruminants among risk factors.

Risk factors	Total examined No positive (Prevalence in %)	χ^2	P- value	
Species				
Ovine	250	61(24.40)	7.11	0.008
Caprine	150	20(13.30)		
Sex				
Male	175	45(25.70)	5.75	0.016
Female	225	36(16.00)		
Age				
Young	130	19(14.60)	4.78	0.029
Adult	270	62(23.00)		
BCS				
Poor	212	56(26.40)	10.62	0.001
Good	188	25(13.30)		
Mng[t] type				
Extensive	259	62(23.90)	6.19	0.013
S/intensive	141	19(13.50)		
Flock type				
Mixed	294	67(22.80)	4.43	0.035
Not-mixed	106	14(13.20)		

Prevalence of Tick Infestation in Small Ruminants among Risk Factors

The overall prevalence of Tick infestation was recorded to be 16.20% (65/400). There was a statistical significant (P<0.05) different variation in prevalence of Tick infestation between the species of small ruminants i.e. 12.40% (31/250) and 22.70% (34/150) in Ovine and Caprine respectively. In this study, statistically significant (P<0.05) difference in prevalence of ectoparasites between different ages (6.90% in young and 20.70% in adults), and management systems (20.10% in extensive and 9.20% in semi-intensive) of small ruminants were recorded. However, though there were slight Tick infestation prevalence differences between the different sex groups (i.e. 15.40% in males and 16.90% in females) and body condition scores (i.e. 18.90% in poor and 13.20% in good) of small ruminants, the differences in prevalence were statistically insignificant (P>0.05) (table 5).

Table 5: Prevalence of tick infestation in small ruminants among risk factors.

Risk Factors	No examined No positive (Prevalence in %)	χ^2	P-value
Species	250	31(12.40)	0.007
Ovine	150	34(22.70)	
Caprine		7.26	
Sex	175	27(15.40)	0.695
Male	225	38(16.90)	
Female		0.15	
Age	130	9(6.90)	0.000
Young	270	56(20.70)	
Adult		12.31	
BCS	212	40(18.90)	0.060
Poor	188	25(13.20) 3.21	
Good			
Mngt Extensive	259	52(20.10)	0.000
S/intensive	141	13(9.20) 11.76	

Prevalence of mange mite infestation on small ruminants among risk factors

In the prevailing study, With a slightly different overall prevalence of mage mite infestation investigated to be 2.80% and 6.00% in Ovine and Caprine respectively; and 3.40% in male and 4.40% in female groups of small ruminants; a statistically insignificant (P>0.05) differences in prevalence of mange mite infestation between species groups and as well as between sex groups of small ruminants were found (Table 6).

However, statistically significant (P<0.05) prevalence differences of mange mites infestations between young (0%) and adult (5.90%); poor (7.10%) and good (0.5%) body conditioned small ruminants; and small ruminants managed under extensive (5.80%) and semi-intensive (0.70%) were revealed by the current study (table 6).

Table 6: Prevalence of mange mite infestation on small ruminants among risk factors.

Risk Factors	No examined	No positive (Prevalence %)	χ^2	P- value
Spp.	250	7(2.80)	2.50	0.114
Ovine				
Caprine	150	9(6.00)		
Sex	175	6(3.40)	0.26	0.607
Male	225	10(4.40)		
Female				
Age	130	0(0.00)	8.03	0.005
Young	270	16(5.90)		
Adult				
BCS	212	15(7.10)	11.11	0.001
Poor	188	1(0.50)		
Good				
Mgt	259	15(5.80)	6.14	0.013
Extensive	141	1(0.70)		
S/intensive				
Flock	294	16(5.40)	16.09	0.000
Mixed	106	0(0.00)		
Not mixed				

3.6. Prevalence of sheep ked (*M. ovinus*) infestation in sheep within risk factors

A statistically significant (P<0.05) difference in the overall prevalence of sheep ked between categories of each risk factor was revealed with sheep ked prevalence of 12.30% and 10.30% in male and female groups of sheep; 3.50% and 15.20% in young and adult age groups of sheep; 18.10% and 2.70% in poor and good conditioned sheep; 0.80% and 20.60% in hairy and woolly sheep; 14.70% and 4.60% in extensively and semi-intensively managed sheep; 13.10% and 3.80% in sheep reared under mixed and non-mixed flock type respectively. However, a statistically insignificant (P<0.05) difference in prevalence of *M.ovis* between male (12.30%) and female (10.30%) was found (Table 7).

Table 7: Prevalence of sheep ked (*M. ovinus*) infestation in sheep within risk factors.

Risk Factors	No examined	No positives (Prevalence in %)	χ^2	P-value
Sex				
Male	114	14(12.30)	0.25	0.620
Female	136	14(10.30)		
Age				
Young	86	3(3.50)	7.39	0.005
Adult	164	25(15.20)		
BCS				
Poor	138	25(18.10)	14.85	0.000
Good	112	3(2.70)		
Hair Size				
Hairy	119	1(0.80)	24.51	0.000
Woolly	131	27(20.60)		
Mgt				
Extensive	163	24(14.70)	4.49	0.029
S/intensive	87	4(4.60)		
Flock				
Mixed	198	26(13.10)	4.44	0.033
Not-mixed	52	2(3.80)		

DISCUSSION

The prevailing study identified an overall 56.80% prevalence of ectoparasites infestation; out of which 60.00% and 51.30% in Ovine and Caprine respectively. The study revealed ticks, lice, sheep ked and mange mites to be common ectoparasites of small ruminants in the study area. The study showed the prevalence of ectoparasites infestation in small ruminants to be 56.80% and this was comparable with the works of[12], [13] and[14] who had reported ectoparasite infestation with prevalence of [(61.40% in Ovine and 57.69% in Caprine), in Western Ethipopia], [(50.50% in Ovine and 56.40% in Caprine), in Northern Ethiopia] and [(55.50% in Ovine and 58.00% in Caprine), in Northern Ethiopia] respectively. However, the overall prevalence (56.80%) of ectoparasite infestation recorded was much lower than the 85.50% prevalence of ectoparasite infestation that was reported by[15] at Sebeta tannery. Though, it was not statistically significant (P>0.05), the study revealed a higher ectoparasite infestation of (60.00%) in Ovine than (51.30%) in Caprine (Table1). The higher prevalence in Ovine may be explained by better self grooming, licking, scratching, rubbing and grazing behaviors which would contribute to rapid ectoparasites elimination in Caprine.[16] The major identified ectoparasites with their respective prevalence were Lice (24.4%), Ticks (12.4%), Sheep ked (11.2%), Mange mites (2.8%) and Mixed infestation (9.2%) in Ovine; whereas Ticks (22.7%), Lice (13.3%), Mange mites (6.0%) and Mixed infestation (9.3%) in Caprine (Table 1).

In the study, louse infestation was the most prevalent ectoparasite recorded in Ovine and the second most prevalent ectoparasite in Caprine (Table 1). *Damalina* species was abundantly found in Ovine (24.00%) than in Caprine (6.00%), but genus *Haematopinus* was only recovered from Caprine with the prevalence of 2.70% (Table 2). The overall prevalence of lice infestation in this study (i.e. 60.00% in Ovine and 51.30% in Caprine) was higher than the previous prevalence reports of 7.45% in Ovine and 5.13% in Caprine; 0.00% in Ovine and 0.50% in Caprine; and 2.00% in Ovine and 1.50% in Caprine reported; in western Ethiopia, by[12]; in southern range land by[17]; in central Ethiopia by[18] respectively. But it was lower than researches reported with prevalence of lice infestation of 39.80% in Ovine and 29.20% in Caprine[3], in northern part of the country and 25.70% prevalence reported around Wolaita soddo by[19],[15]

The different risk factors like species, age, sex, body condition, management systems and flock type were found important in influencing the prevalence of lice infestation with statistical analysis showing a significance (P<0.05) difference in prevalence of lice infestation. The overall prevalence of lice infestation in the current study was 14.60% and 23. 30% in young and adult small ruminants respectively. Similar results had been reported by[20]; [13] also reported overall lice infestation with prevalence of 51.05% and 54.20% in young and adult Ovine and Caprine respectively, in North East Ethiopia. However, in contrast to the above agreement,[12] and[13] had reported higher prevalence of lice infestation in young small ruminants than the adults.[21] explains that young animals are heavily infested and the number decrease as they become mature.[22] observed a greater susceptibility of young animals to ectoparasite and attributed it to a higher ratio of accessible surface to body volume and a poor grooming behavior.

In this study, tick infestation was the most prevalent ectoparasite recovered in Caprine and the second most prevalent ectoparasite in Ovine (Table 1). Four genera of ticks (namely, *Boophilus, Amblyomma*, *Rhipicephalus* and *Hyalomma*) and four species of ticks (namely, *B. decoloratus, A. variegatum, R. evertsi evertsi* and *H. mariginatum*) were identified both in Ovine and Caprine (table 2). *Boophilus decoloratus* and *Amblyomma variegatum* were found to be abundant both in Ovine and Caprine. Similar results were reported by[23], in Sidama zone of Southern Ethiopia and.[24] The overall prevalence of tick infestation in small ruminants (higher in Caprine than in Ovine) in the study area, 16.20% (i.e. 12.40% and 22.70% in Ovine and Caprine respectively) was comparable with reports by[23], who reported prevalence of 23.80% and 16.00% in Caprine and in Ovine respectively; by[12], who reported prevalence of 25.44% and 13.72% in Caprine and in Ovine respectively. In contrary,[25] reported tick prevalence of 65.60% in Ovine and 33.0% in Caprine in Dire Dawa region of Eastern Ethiopia; and[19] investigated tick prevalence of 31.80% in Ovine and 18.60% in Caprine in Wolaita Sodo.

The study indicated *Boophilus decoloratus* to be the first and most abundant tick in the study area with the prevalence rate of 10.00% and 18.70% in Ovine and in Caprine respectively (table 2) and this result was in a disagreement with the findings of[26], who reported that *B. decoloratus* to be the second most abundant species of tick in small ruminants next to *A. cohaerens* in Bedelle district;[27] who reported that *B. decoloratus* to be the second most abundant tick species in small ruminants next to *A. variegatum. A. variegatum* was the second most abundant tick species in the current study i.e. 6.00% in Ovine and 7.30% in Caprine, (Table 2) which indicated a disagreement with the work of[26], where it was the fourth abundant tick species in Bedelle district; and to the study that was conducted in Wolaita Zone by[28] which showed that *A. variegatum* was the second most abundant tick species in small ruminants.

The statistically insignificant (P>0.05) difference tick infestation prevalence of 15.40% (27/175) and 16.90 %(38/225) in male and in female small ruminants respectively was comparable with the findings of[19] and.[29] However, this finding was not in agreement with the work of[30] who reported the presence of a significant difference in prevalence of tick infestation between male and female.

The statistically insignificant (P>0.05) difference in prevalence (18.90% and 13.20% in poor and good body conditioned animals respectively) was in total agreement with the works of[31] and.[12]

In the study, an overall prevalence of 4.00% mange mite infestation, out of which 2.80% and 6.00% in Ovine and in Caprine respectively, was recovered in small ruminants (Table1). *Sarcoptes, Psoroptes* and *Demodex* mange mites were recovered from both Ovine and Caprine. In this study sarcoptic mange was more prevalent in Caprine (4.70%) than in Ovine (0.40%) (Table 2). This finding was in total agreement with previous studies by:[32], who reported 0.00% and 6.90%,[33], who reported 2.10% and 4.30% and[13], who reported 0.40% and 6.60% in Ovine and Caprine respectively. However, higher overall infestation of mage mites was reported by:[34] and.[12]

The study showed a statistically insignificant (P>0.05) prevalence difference of mange mites between species of small ruminants (i.e. 2.80 % and 1.60% in Ovine and Caprine respectively) and the prevalence in each species was lower than the report of[25], who reported prevalence of mage mite infestation in Caprine from Dire Dawa region with prevalence of 52.20% with Ovine reported to be none infested. Another study conducted in Wolaita Zone by[19] reported only one case of mange (*Demodex caprae*) in Caprine with the prevalence of 0.98%. The insignificant association of the prevalence of mange mite infestation between sex groups of small ruminants, in this study, was in line with the reports of[19] and.[29] But this was inconsistent with the report of[34] where the prevalence of mange mites was indicated to be higher in female (31.1%) than male (25.50%) Caprine.

Sheep ked (*M. ovinus*) was the third most prevalent (11.20%) ectoparasite observed on Ovine. The result was comparable with prevalence reports[35], [13] and[14]; that reported the prevalence of 11.67%, 12.50% and 19.10% respectively. However the prevailing report was higher than the prevalence report of[12], who reported overall 3.07% prevalence of sheep ked in south western parts of Ethiopia. The study result indicated that the prevalence of sheep ked infestation significantly (P<0.05) varied with hair size/type (i.e. 0.80% and 20.60% in hairy sheep and in woolly sheep respectively). Similar result was reported by[13]; who reported higher prevalence of sheep ked in woolly sheep's (41.20%) than in hairy sheep (0.00%). The higher prevalence *M. ovinus* on woolly sheep than in hairy sheep is suggestive of the fact that sheep ked prefers coarse, long and sparsely grown hairs to get enough ventilation and shelter. The result was in agreement with those described by[36] and[16] who stated that woolly breeds are susceptible to ked infestation.

The differences in prevalence reports of the prevailing study and previous works of different researchers might be attributed to the differences in: study methodology used, the sensitivity of the diagnostic method used, environmental conditions (agro-climatic conditions), study season and/or period, feeding and management practices, veterinary service, hygienic conditions of animals and etc.

CONCLUSION AND RECOMMENDATIONS

The present study indicated a high prevalence of ectoparasites infestation among small ruminants with the overall prevalence of 56.80%; by which prevalence of 60.00% and 51.30% was recorded in Ovine and Caprine

respectively. The major ectoparasites identified to infest small ruminants were lice, keds, ticks and mites. Furthermore, *B. decoloratus*, *A. variegatum*, *R. evertsi evertsi* and *H. mariginatum; Damalina* species, *Linognathus* species and *Haematopinus*; *Sarcoptes* spp., *Psoroptes* spp. and *Demodex* spp. were species/genera of Ticks, Lice and Mange mites respectively; recovered from both Ovine and Caprine but *Melophagus ovinus* was identified from Ovine only. Though statistically not significant (P>0.05), a difference in prevalence of ectoparasite infestation was observed between species of small ruminants. Favorable climates, poor level of management, poor awareness of owners and poor animal health extension services are believed to have contributed for widespread occurrences and the resulting high prevalence of ectoparasites. The major risk factors such as species, sex, age, management system, state of body condition, hair type/size and flock type were proved to be influencing factors for the occurrence of ectoparasite infestations. The high prevalence of ectoparasite infestation in small ruminants; being a threat to small ruminant production; would necessitate urgent prevention and control interventions/measures.

Based on the prevailing findings, the following outlooks were forwarded:

- Thorough disease prevention and control packages be established and implemented to different levels of governmental organizations.
- Effective extension programs that would raise public awareness on effect of ectoparasites should be designed and implemented.
- Further detailed studies should be conducted on the seasonal dynamicity and epidemiology of ectoparasites in the study area; to set appropriate measures.

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REFERENCES

1. CSA (Central Statistical Agency) (2012): Ethiopian Agricultural and livestock population of Sample Survey report.
2. Rahmeto, A., Makelesh, T., Megersa, B. and Desie, S., (2011): Prevalence of Small Ruminant Ectoparasites and Associated Risk Factors in Selected Districts of Tigray Region, Ethiopia. *Global Veterinaria*, 7: 433 - 437.
3. Tefera, S., (2004): Investigation on Ectoparasites of Small Ruminants in Selected Sites of Amhara Regional State and Their Impact on the Tanning Industry. *Journal of Small Ruminant Research*, 47: 77 - 82.
4. Tadesse, H., (2005): Pre-slaughter Defects of Hides/Skin and Intervention Options in East Africa, Harnessing the Leather Industry to Benefit the Poor. In: Regional Workshop Proceedings, April 18 - 20, Addis Ababa, Ethiopia. 19 - 30.
5. Ayele, S., Assegid, W., Jabbar, M. A., Ahmed, M. M., Belachew, H., (2003): Livestock Marketing in Ethiopia. A Review of Structure, Performance and Development Initiatives. Socioeconomic and Policy Research Working Paper, ILRI, Nairobi, Kenya, 35 - 52.
6. CSA, (2010): Report on livestock and livestock characteristics. Vol.-2, Addis Ababa, Ethiopia.
7. Markos, A., (2012): Web GIS for Tourism Development of Bahir Dar Town and Its Surroundings, Ethiopia. College of social studies, Addis Ababa University, Addis Ababa, Ethiopia, MSc Thesis, Unpublished, 88.
8. Thrusfield, M., (2005): Veterinary Epidemiology. 3rd ed., Blackwell publishing, UK, 433.
9. Wall, R. and Shearer, D., (2001): Veterinary Ectoparasites; Biology, Pathology, and Control, 1st ed., UK. Blackwel Science, 23-54.
10. Walker, A. R., Bouattour, A., Camicas, L. L., Estrada-Pena, A., Horak, I. G., Latif, A. A., Pegram, R. G., and Preston, P. M., (2003): Ticks of domestic Animals in Africa; A Guide to Identification of species and genus's. Bioscience Reports, 1-221.
11. Shibeshi, B., Bogale, B., and Chanie, M., (2013): Ectoparasite of Small Ruminants in Guto-Gidda District, East Wollega, Western Ethiopia. *Acta Parasitologica Globalis*, 4: 86 - 91.
12. Tefera, S., Abebe, W., (2007): Effect of Ectoparasites on the Quality of Pickled Skins and Their Impact on the Tanning Industries in Amhara Regional State, Ethiopia. *Journal of Small Ruminant Research*, 69: 55 - 61.
13. Mulugeta, Y., Yacob, T. and Ashenafi, H., (2010): Ectoparasites of Small Ruminants in Three Selected Agro - ecological sites of Tigray Region. *Tropical Animal Health Production*, 42: 1219 - 1224.
14. Yesehak, E., (2000): A Study on Ectoparasites of Fresh Sheep Pelts and Assessment of Pickled Skin Defects Processed at Sebeta Tannery, Ethiopia. *Global Veterinaria*, 29: 191-195.
15. Wall, R. and Shearer, D., (1997): Veterinary Entomology, Arthropod Ectoparasites of Veterinary Importance. 1st ed., Great Britain, Chapman and Hall, UK, Pp 439.
16. Nura, M., (2002): Epidemiological Study on Skin Diseases of Small Ruminants in the Southern Range land of Oromia. *Ethiopia Global Veterinaria*, 7: 273 - 299.
17. Mohammed, H., (2001): Study on Skin Disease of Small Ruminants in Central Ethiopia., Ethiopia. *Journal of veterinary Parasitology, 37*: 1545 - 1551.
18. Yacob, T., Nesanet, B., Dinka, A., (2008): Prevalence of Major Skin Diseases in Cattle, Sheep

and Goats at Adama Veterinary Clinic, Oromia Regional State, Ethiopia. *Acta Parasitologica Globalis*, 159: 455 – 461.
19. Rasmi, G. R., Glinsharifodini, M., Sarvi, S., (2007): Prevalence of Ixodid Ticks on Cattle and Small Ruminants in Mazandaran Province, Iran. *Korean Journal of Veterinary Parasitology*, 45: 307 - 310.
20. Radostitis, M. O., Blood, C. D. and Gay, C. C., (2007): Veterinary Medicine. Text Book of Disease of Cattle, Sheep, Goat, Pig and Horse. 10th ed. British, Bailliere Tindal, London, 1396 – 1398.
21. Lehman, T., (1993): Ectoparasites: Direct Impact on Host Fitness. *Parasitology Today, 9*: 8 -13.
22. Teshome, W., (2002): Study on Small Ruminant Skin Disease in Sidama Zone, Southern Ethiopia, Ethiopia. *Tropical Animal Health Production,* 27: 63 - 67.
23. Mekonnen, S., (1995): Ticks, Tick-borne Diseases and Control Strategies in Ethiopia. In: Tick Borne Pathogens at the Host Vector Interface. A Global prospective, August 28 - September 1, 1995, Kruger National Park, South Africa, 441 - 446.
24. Zelalem, T., (1994): Survey of Mange Mites of Small Ruminants in Dire Dawa Region, Ethiopia. *Tropical Animal Health Production*, 36: 1555 - 1561.
25. Messele, A., Mohammed, T., Abebe, R., Argaw, K., Bekele, J., (2010): Survey of Ixodid Ticks in Domestic Ruminants in Bedelle District, South Western Ethiopia. *Tropical Animal Health Production*, 42: 1677 - 1683.
26. Seyoum, Z., (2005): Distribution and Host Parasite Relationship of Ixodid Ticks in Eastern Amhara, Kombolcha Regional Veterinary Laboratory, Kombolcha, Ethiopia. *Ethiopian Veteterinary Journal*, 31: 118 - 123.
27. Dessie, S., and Getachew, A., (2006): Cattle Tick Dynamics in Different Agro Ecological Zones of Wolyta, Southern Ethiopia. *Ethiopian Veterinary Journal,* 10: 85 - 99.
28. Kedir, M., (2002): Study on Mange Mite Infestation in Small Ruminants and Camels in two Selected Agro Climatic Zone in Tigray, Northern Ethiopia. *Journal of veterinary Parasitology*, *41*: 353 - 361.
29. Johnson, N. N., (2004): Integrated Control Programs for Ticks on Cattle; An Examination of Some Possible Components of FAO, Animal Production and Health paper, *Journal of veterinary Parasitology*, 11: 402 - 432.
30. Regassa, A., (2001): Tick Infestation of Cattle in the Borena Province of Ethiopia. *Journal of Veterinary Research*, 68: 4 - 5.
31. Nigussie, C., (2001): Study on Skin Disease of Cattle, Sheep and Goats in and around Wolyta Soddo, Ethiopia. *Tropical Animal Health Production*, 5: 111 - 118.
32. Worku, T., (2002): Study on Small Ruminants Skin Disease in Sidama Zone, Ethiopia. *Tropical Animal Health Production,* 55: 433 - 437.
33. Kumilachew, W. A., Sefinew, T., Wudu, N., Haileleul and Hailu, M., (2010): Study on Prevalence and Effect of Diazinon on Goat Mange Mites in Northeastern Ethiopia. *Global Veterinaria*, 5: 287 - 299.
34. Kassaye, E. and Kebede, E., (2003): Epidemiological Study on Mange Mite, Lice and Sheep ked of Small Ruminants in Tigray Region, Northern Ethiopia. *Ethiopian Veterinary Journal*, 14: 51 - 65.
35. Soulsby, E. J. L., (1982): Helminthes, Arthropods and Protozoa of Domestic Animals. 7th ed., LEA and FEBIGER, Philadelphia, USA, 357 - 507.