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Prevalence of Major Ectoparasites on Goats in and Around Ambo Town

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Abstract: Cross sectional study was conducted from October, 2019 to March, 2020 in and around Ambo town to determine the prevalence of ectoparasites on goats. Totally 384 local breed goats of different age, sex and body conditions were selected by simple random sampling techniques. The present study showed that the overall prevalence of ectoparasites in goats was relatively high (77.30%). The associations of the overall prevalence of ectoparasites on goats were statistically insignificant ($P > 0.05$) between different age and sex groups, while it was statistically significant ($P < 0.05$) between different body condition groups. The prevalent ectoparasites of goats in the study area were ticks (66.10%), mange mites, only genus *Psoroptes* (40.60 %) and lice (only genus *Linognathus*) (7.30 %) were identifiedFurthermore, the major ectoparasites of goats in different agro – ecology of the country, regular control of ectoparasites and selection of effective, environmental friend ship medicaments with creation of awareness in the society must be done.

Key words: Ectoparasites · Goat · Prevalence

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country [1]. Livestock production is an integral part of the Ethiopian agriculture and shares about 40% of the total agricultural output [2]. In Ethiopia, livestock production remains crucial and represents a major asset among resource-poor small holder farmers by providing milk, meat, skin, manure and traction force [3]. The contribution of livestock to the national economy particularly with regard to foreign currency earnings is through exploration of live animal, meat and skin and hides [4].

Among the export products, skin and hide have the largest share of exports followed by the live animal [5]. However, the economic benefits of livestock populations remain marginal due to prevailing livestock diseases which are among the principal bottle necks of livestock performance and cause of high economic losses of the poor farmers [3]. The current levels of contributions of the livestock sector, either the macro or micro level is below the expected potential. The levels of foreign exchange earnings from livestock and livestock products are also much lower than would be expected from the larger size of the livestock population [6].

Small ruminants are important components of the livestock sector in the Ethiopian farming system. The huge number of small ruminant population of Ethiopia which is estimated to be about 49.56 million [1], provides great contribution to the food consumption, rural income and the export economy. Furthermore, wool and manure is important bi - products of small ruminant production [7]. Conversely the small ruminant production in the Ethiopia farming system is below the expected potential because of compound effects of disease, poor feeding and poor management constraints [8]. Parasitic skin disease of small ruminants caused by ectoparasites such as mites, lice, tick and sheep ked are the major disease causing serious economic loss to small holder farmers, the tanning industry and the country as a whole [9]. The value of hides and skins that were accounting for 14 - 16% of the country's total foreign trade revenues ago has actually dropped to 9% - 10% due to shortage of hides and skins

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of good quality [10]. In addition to its effect in the quality of skin ectoparasites associated skin disease occurring in small ruminants cause substantial economic losses by reducing the productivity and reproduction performance [11].

In Ethiopia, ectoparasites are among the major parasitic health problems encountered throughout the year, occupying every corner of the country and cause enormous economic loss. Among ectoparasites of veterinary importance namely lice, sheep ked, ticks and mange mites were reported to be abundant and known to affect both large and small ruminants while their prevalence and distribution varies in different agro-ecological zones [12]. Meanwhile, sheep and goats are among highly affected livestock group by these ectoparasites [13].

The growing distribution of ectoparasites of small ruminants in the country is a major threat to the tanning industry which needs a well-coordinated and management control intervention [14]. Identifying and characterizing the common ectoparasites involved in small ruminants is an important step towards developing and implementing strategic control and preventive measures [15]. Therefore the main objectives of this study was to determine the prevalence of ectoparasites that affect goats in the study area by identifying the genera of each ectoparasites and assess the associated potential risk factors.

MATERIALS AND METHODS

Study Area: The study was conducted from October, 2019 to March, 2020 in and around Ambo town, Western Shoa Zone, Oromia Regional State, Ethiopia. Ambo town is located at 107 km to the west of Addis Ababa. The latitude and longitude of land is 8°59'N and 37°51'E, respectively; and have an elevation of 2101 meters above sea level. The maximum and minimum temperature of the area is 24°C and 13°C, respectively. The area receives a bimodal rain fall in which the heavy rain is registered from June to September; whereas the low rainfall of the area is registered in March to May. It receives a mean annual rainfall ranging from 800 - 1000mm with an average of 900mm. The farming practice in the area is mixed type; that is both crop and livestock production practice is commonly observed in the area. The current livestock population of Ambo Woreda is 144, 243 cattle, 95, 661 ovine and caprine, 23, 100 equine and 92, 030 poultry [16].

Study Animals: The study animals were goats of endemic breed of different age groups (young and adult); sex groups (male and female) and goats with different body conditions (poor, medium and good) kept under extensive management system in Ambo town and the surrounding kebeles.

Sampling Techniques and Sample Size Determination: A cross sectional study was employed to assess the ectoparasites of goats in the area, their prevalence and the magnitude of these parasites in relation to age, sex and body condition. Sample Size Determination.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 Thrusfield [17] as follows:

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

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

There was the previous study on prevalence of ectoparasites in small ruminants, which has been conducted in the study area with 10.2% (13/127) prevalence of ectoparasites on goats by Zeryehun and Atomsa [18]. Therefore, to increase the precision of the study, 384 goats were examined using desired 95% Confidence Interval (CI), 50% expected prevalence and 5% precision.

Study Design: The study kebeles were selected and goats were selected by simple random sampling techniques. The selected goats were examined physically to determine the age, sex and body condition score of each animal. Kids those were less than 6 months old were considered as “young animals, ” whereas those were equal to or more than 6 months of age were considered as “adult” group; while the body condition score was determined by using the method that was described by Thompson and Meyer [19].

Each individual animal was visually examined for the presence of ectoparasites, skin scraps and skin lesions. In the presence of any skin lesions and/or skin scrapings, the animal code was registered and the animal was examined visually to know the presence of external parasites (ticks, lice and flea) and skin scrapings were collected for determination of microscopic parasites.

The appropriate samples were collected and taken to Ambo University Veterinary Laboratory Technology for ectoparasites investigation.

Sample Collection: Sample collection was carried out in the morning when both the free range and penned goats were at their sleeping quarters in the field. Ectoparasites sample collection and examination was carried out from goats independent of whether they were treated with acaricides or not. 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. Some of the approaches used for diagnosing skin diseases are presented as follows lice, fleas and ticks were collected in 70% ethyl alcohol in universal bottles/vials for preservation until subsequent examination, as was described by Taylor [20] Skin scrapings from suspected cases of mange were collected and preserved in 10% formalin and taken to laboratory. All samples were clearly labeled with the date of sampling, the type of sample, the group of animals and the kebeles where the samples were collected.

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 statistics such as percentages and frequency distribution were used to describe the nature and the characteristics of the data. The prevalence of ectoparasites was analyzed using percentages. The association of different risk factors with prevalence of ectoparasites was computed by Chi – square (χ^2) test.

RESULTS

Overall Prevalence of External Parasites in Goats: From a total of 384 examined goats, 297 (77.3%) were found to be infested with one or more ectoparasites. The overall prevalence of external parasites in goats by age, sex and body condition score of the study area were: ticks (66.0% and 66.2%); lice (11.8% and 4.3%); mange mites

Table 1: Overall prevalence of external parasites in goats by age, sex and body condition score

	Age		Sex		Body condition score		
Ectoparasites	< 6 months (n=153)	≥ months (n=231)	Males (n=127)	Females (n=257)	Poor (n=85)	Medium (n=94)	Good (n=205)
Ticks	101(66.0%)	153(66.2%)	83(65.4%)	171(66.5%)	72(84.7%)	77(81.9)	105(51.2%)
Lice	18(11.8%)	10(4.3%)	10(7.9%)	18(7.0%)	22(25.9%)	3(3.2%)	3(1.5%)
Mange mites	59(38.6%)	97(42.0%)	54(42.5%)	102(39.7%)	45(52.9%)	47(50.0)	64(31.2%)
Total ectoparasites	124(81.0%)	173(74.9%)	97(76.4%)	200(77.8%)	83(97.6%)	83(88.3)	131(63.9%)

Table 2: Overall prevalence of ectoparasites at genus level in goats

Species of ectoparasites	No of goats infested by each genera (n=384)	Prevalence (%)
Ticks		
Amblyomma spp.	6	1.60
Hyalomma spp.	6	1.60
Boophilus spp.	186	48.40
Rhipicephalus spp.	157	40.90
Lice *Linognathus* spp.	28	7.30
Mites *Psoroptes* spp.	156	40.60

Table 3: Association of prevalence of ectoparasites with different risk factors

Risk factors	No of animals examined	No of Positive animals	Prevalence (%)	χ^2	P –value
Age					
< 6 months	153	124	81.00	1.989	0.158
≥ 6 months	231	173	74.90		
Sex					
Male	127	97	76.40	0.101	0.751
Female	257	200	77.80		
BCS					
Poor	85	83	97.60	47.57	0.00
Medium	94	83	88.30		
Good	205	131	63.90		

Table 4: Association of prevalence of tick infestation in relation to risk factors

Risk factors	No of animals examined	No of Positive animals	Prevalence (%)	χ^2	P- value
Age					
< 6 months	153	101	66.00	0.002	0.96
≥ 6 months	231	153	66.20		
Sex					
Male	127	83	65.40	0.05	0.81
Female	257	171	66.50		
BCS					
Poor	85	72	84.70	43.91	0.000
Medium	94	77	81.90		
Good	205	105	51.20		

Table 5: Association of the prevalence of lice infestation in relation to risk factors

Risk factors	No of animals examined	No of positive animals	Prevalence (%)	χ^2	P- value
Age					
< 6 months	153	18	11.70	7.53	0.006
≥ 6 months	231	10	4.30		
Sex					
Male	127	10	7.90	0.09	0.76
Female	257	18	7.00		
BCS					
Poor	85	22	25.90	56.10	0.000
Medium	94	3	3.20		
Good	205	3	1.50		

Table 6: Association of the prevalence of mange mite infestation in relation to risk factors

Risk factors	No of animals examined	No of positive animals	Prevalence (%)	χ^2	P- value
Age					
< 6 months	153	59	38.60	0.45	0.503
≥ 6 months	231	97	42.00		
Sex					
Male	127	54	42.50	0.28	0.595
Female	257	102	39.70		
BCS					
Poor	85	45	52.90	16.23	0.000
Medium	94	47	50.00		
Good	205	64	31.20		

(38.6% and 42.0%); fleas (6.5% and 3.0%) and overall ectoparasites (81.0% and 74.9%) in goats with age of less than 6 months and with those at the age of 6 months and above, respectively (Table 1).

DISCUSSION

Ectoparasites are the most prevalent diseases of goats in Ethiopia and causes high economic losses in the country. The absence of improved husbandry practices and inadequate veterinary services, favorable climatic conditions, low input of feeds and poor awareness of goats owners on the effects of ectoparasites have great contribution for wide occurrence of infestation of goats by ectoparasites.

In this study, attempts were conducted to assess the prevalence of ectoparasites in goats found in and around Ambo town. In addition, the association of the prevalence of ectoparasites with different risk factors was also assessed. The present study showed that ticks, mites, lice and fleas were common ectoparasites of goats in the study area. The result of the present study showed that the prevalence of ectoparasites in goats in and around Ambo town was relatively high (77.30%). Similar reports had been reported by Tadesse *et al.* [23]; by Tewodros *et al.* [24] Which were (73.30%) and 72.02%, respectively; the research works that were conducted in and around Wolaita Sodo, Southern Ethiopia and in and around Gondar town, respectively. The relative higher prevalence in the present study could be attributed to the

frequent exposure of animals to the same communal grazing land that favored the frequent contact of goats and also the bad management system of goats in the area. However, in the present study the prevalence of ectoparasites in goats was higher than those were reported by Amare [25], which was (43.50%), a study that was conducted in three selected districts of Northwestern Amhara Region; by Tefera [26] with the prevalence of (56.40%), a study that was conducted in selected districts of Amhara Regional State.

The prevalence of ectoparasites of goats in the present study was also higher than the research works that were reported by Mulugeta *et al.* [13], which was (58.00%) in Tigray Regional State; by Zeryehun and Atomsa [18] which was (10.2%), a research work that was conducted in selected sites in Ambo town of Western Shoa Zone, Oromia National Regional State; and by Sertse and Wossene [27] which was (56.40%), a research work that was conducted in different agro- climatic zones of eastern Amhara region of Ethiopia. But, it was lower than the report of Bekele *et al.* [28] with prevalence of 96.92% in goats in Wolmera District of Oromia region, Central Ethiopia. This difference in prevalence of ectoparasites in goats might be due to the presence of different factors like agro - ecology of the study areas, animal husbandry practice like feeding and management, the presence or absence of veterinary service and it might be the difference in sampling techniques that were used in research works.

In this study, the abundant prevalent ectoparasites of goats were ticks (66.10%). The higher prevalence of tick infestation among the ectoparasites of goats could be due to various factors including the fact that ticks are easier to find as compared to other ectoparasites of goats. For example, fleas, which jump frequently are difficult to catch them, Mange mites need to collect appropriate sample for microscopy etc. This finding was almost similar with the research work of Yacob *et al.* [11] with the overall prevalence of (46.30%) in small ruminants, a study that was conducted in and around Wolaita Sodo, Southern Nations and National state. But, the prevalence of tick infestation in the current study was lower than the report of Abunna *et al.* [29] who reported (89. 90%), a research work that was conducted in Meisso district of Oromia Regional State. However, it was higher than the report of Tadesse [30] and Haffize [31] who reported (15.50%), (1.70%) and (0.00%), a research work that was conducted in Bedelle districts, Central Ethiopia and Adama, town of Oromia Regional State, respectively. The difference might be due to agro – ecological difference, the season of the year when the studies were conducted as temperature and relative humidity are the major ecological determinants for reproduction and growth of tick population [32].

The association of the prevalence of tick infestation with different age groups of goats was assessed; and it was found that the prevalence of tick infestation in goats was 66.00% and 66.20% in goats those were found at the age below 6 months and goats at the age of 6 months and above, respectively. The difference was statistically insignificant ($P > 0.05$). Similar reports were reported by different researchers like Yacob *et al.* [11] and Tefera [26] in which the prevalence of tick infestations in small ruminants were 15% and 53%; 51.05% and 54.20% in young and adult small ruminants, respectively. On the other hand, dissimilar report was reported by another researcher like Tewodros *et al.* [24] in which the prevalence of tick infestations in small ruminants was 28. 30% and 20.40% in young and in adult small ruminants, respectively; and the difference was statistically insignificant ($P > 0.05$).

Similarly the association of tick infestation with different sex groups of goats was assessed; and it was found that the prevalence of tick infestation in goats was (65.4%) and (66.5%) in male and female groups of goats, respectively. The current study showed that the difference was statistically insignificant ($P > 0.05$), which was in total agreement with work of Abebe *et al.* [33] and Kassaye and Kebede [34].

The current study showed that there was difference in prevalence of tick infestation between different body conditions of these animals. It was 84.90%, 81.90% and 51.20% in poor, medium and good body condition groups of goats, respectively. The difference was statistically significant ($P < 0.05$), which was in total agreement with the work of many researchers like Abebe *et al.* [33] and Kassaye and Kebede [34]. Prevalence difference between animals of different body conditions might be due to the difference in the level of infestation as poorly nourished animals appear to be less competent in getting rid off tick infestation as compared to that of well-managed animals.

Lice infestation in Ethiopia is the most frequently reported and the most important skin disease of small ruminants as lice are found to be the cause of cockle [35]. In current study, the overall prevalence of lice infestation in goats was (7.30%); and genus *Linognathus* was the only genus of lice that was identified in this study. Almost similar reports were reported by Tefera and Abebe

[36] research work that was conducted in Amhara region, Abebe *et al.* [33], research work that was conducted in Tigray region, with the prevalence of 2.4% and 6.1%, respectively. However, many studies showed that the prevalence of lice infestation by genus *Linognathus* in goats was higher than the current study. Yacob [35] research work that was conducted in Central Ethiopia; Sertse and Wossene [27] research work that was conducted in Amhara region; Kebede *et al.* [37] a research work that was conducted in goats in Central Oromia; Fantahun *et al.* [38] a research work that was conducted in goats in and around Gondar; Sisay *et al.* [39], a research work that was conducted in north west Amhara region; Tesfaye *et al.* [40], a research work that was conducted in Bahir Dar; and Amuamata *et al.* [41], a research work that was conducted in and around Bahir Dar showed that the prevalence of lice infestation by genus *Linognathus* was 28.30%, 29.20%, 16.50%, 48.10%, 27.00%, 9.7% and 32.40%, respectively. Such difference in prevalence of lice infestation might arise from differences in agro-climatic conditions, seasonal difference when the studies were conducted and difference in management, sanitation and in utilization of veterinary service in the study areas. Lice infestations can be aggravated by some other underlying problems such as malnutrition and chronic diseases [13]. On the other hand, in Ethiopia most lice populations on animals vary seasonally, depending on the condition of the host. Lice populations on animals are greater during the rainy months [42].

The prevalence of lice infestation was different with different risk factors (age, sex and body condition). It was found that the prevalence of lice infestation was 11.70 % and 4.30% in young (less than 6 months) and in adult (6 months and above), respectively. It was also found that the prevalence of lice infestation was 25.00%, 3.20% and 1.50% in poor, medium and good body condition groups of goats, respectively. The differences were statistically significant ($P < 0.05$) between different age and body condition groups of goats. The higher prevalence in lice infestation in young animals could be attributed to their poor grooming behavior. Moreover, acquired immunity added to the relative thicker skin of older animals may also contribute to greater resistance against ectoparasites in older age category. Animals in poor body condition, which are fed improperly and exposed to debilitating diseases carry heaviest infestations of lice since debilitated animals do not groom themselves and live the lice undisturbed causing anemia [43]. On the other hand, the prevalence of lice infestation was 7.90% and 7.00 % in male and female groups of goats, respectively. The difference was statistically insignificant ($P > 0.05$) between sex groups. This finding was in total agreement with the work of Fantahun *et al.* [38], Sisay *et al.* [39] and Tesfaye *et al.* [40] research works that were conducted in different areas of Ethiopia.

In the current study, the overall prevalence of mange mite infestation in goats was 40.60 % from the total ectoparasites of goats. Genus *Psoroptes* was the only genus of mange mite that was identified in goats in the study area. This finding was almost in total agreement with the work of Etagegnehu [44], who reported the prevalence (32.87%), a research work that was conducted in Cheffe state farm found in Oromia special zone of Amhara region. However, many previous works showed that the prevalence of mange mite infestation in goats was lower than the current finding. Kumilachew *et al*. [45] a research work that was conducted in Northeastern Ethiopia; Shibeshi *et al.* [46] a research work that was conducted in Guta – Gudda East Wellega; Fantahun *et al*. [38], a research work that was conducted in and around Gondar; and Kebede *et al.* [37], a research work that was conducted in Central Oromia showed that the overall prevalence of mange mite infestation in goats were 29.40%, 18.60%, 8.10%, 8.90%, respectively. The difference in prevalence of mange mite infestation of goats might be due to the differences in management, climatic conditions, study design, seasonal variation when studies were conducted and the presence or absence of usage of acaricides or other anti ectoparasitic drugs. The higher temperature, humidity and sunlight, which prevail in lowlands and midland, might have accounted for the differences in prevalence as has been reported by Pangui [47].

The prevalence of mange mite infestation was different with different risk factors (age, sex and different body conditions of goats). The prevalence was 38.60% and 41.90 % in young goats (less than 6 months of age) and adult goats (at the age of 6 months and above), respectively. The prevalence of mange mite infestation was 42.50 % and 39.70 % in male and female groups of goats, respectively. The differences were statistically insignificant ($P > 0.05$) between different age and sex groups of goats. However, the prevalence of mange mite infestation in goats was 52.90%, 50.00% and 31.20 % in poor, medium and good body condition groups of goats, respectively. The difference was statistically significant ($P < 0.05$) in different body condition groups of goats. This finding was in total agreement with the previous works of Mulu [48] and Sertse and Wossene [27].

CONCLUSION AND RECOMMENDATIONS

In Ethiopia, among ectoparasites of veterinary importance namely lice, sheep ked, ticks and mange mites were reported to be abundant in the country and known to affect both large and small ruminants. The growing distribution of ectoparasites of goats in the country is a major threat to the tanning industry of the country which needs a well-coordinated and management control intervention. So that identifying and characterizing the common ectoparasites involved in goats and other animals is an important step towards developing and implementing strategic control and preventive measures. The economic loss is mostly associated with economic loss to small holder farmers, the tanning industry and the country as a whole. With this anxiety, this study was tried to determine the prevalence of the major ectoparasites of goats found in and around Ambo town. This study showed that ectoparasites of goats were prevalent in the study area. Therefore the prevalence of ectoparasites of goats in different agro – ecological zones and management practices and the most prevalent ectoparasites of goats must be identified and effective, environmental friend ship, cost effective treatment methods must be selected and practiced in the country.

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