

Prevalence of Major Skin Diseases in Ruminants and its associated Risk Factors at University of Gondar Veterinary Clinic, North West Ethiopia

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Abstract

A cross-sectional study was carried out during the period between November, 2013 to April, 2014 to determine the prevalence of major skin disease and to identify the dominant risk factors for this disease in Gondar university veterinary clinic. A total of 1296 ruminants that came to the Clinic were involved in the study. Out of this 513 (39.6%) cattle, 631 (48.7%) sheep and 152 (11.7%) goat was included. Skin scraping, morphological identification and clinical presentation were the methods employed for identification of mange mites and Dermatophilosis, gross ectoparasites and viral skin disease respectively. 468 (36.1%) were infested with one or more skin diseases. The prevalence of skin diseases in cattle, sheep and goats were 142 (27.68%), 268 (42.47%) and 58 (38.12%) respectively. The difference in the prevalence of skin diseases among the three host species was statistically significant ($p < 0.05$). The major skin diseases identified on ruminants were tick 116 (8.95%), mange 31 (2.39%), lice 91 (7.02%), sheep ked 72 (5.56%), lumpy skin disease 29 (2.24%), Dermatophilosis 9 (0.69%), orf 45 (3.47%) and sheep and goat pox 77 (5.94%). The study demonstrates that skin disease is among the most important health constraints of ruminants in and around Gondar town, hence requires immediate attention and control interventions.

Keywords: Prevalence; Risk factor; Ruminants; Skin disease

Introduction

Ethiopia has the largest livestock inventories in Africa, including, about 53.99 million cattle, 25.5 million sheep, 24.06 million goats, 1.91 million horses, 6.75 million donkeys, 0.35 million mules, 0.92 million camels and about 50.38 million poultry are estimated to find in the country [1]. It performs multiple functions in the Ethiopian economy by providing food, input for crop production and soil fertility management, raw material for industry, cash income as well as in promoting saving, fuel, social functions and employment. The sector's contribution to national output is underestimated, because traction power and manure for fertilizer are not valued. Livestock contributes 12-15% of total export earnings, the sub-sector is the second major source of foreign currency through export of live animals, meat, hides and skins [2]. At the household level, livestock contributes to the livelihood of approximately 70 percent of Ethiopians. Women play a critical role in livestock production, both directly in primary production of small ruminants, and indirectly through the contribution of livestock to household assets. Livestock offers a particular package of benefits to pastoralists, for whom few alternative livelihoods exist [3]. Hides and skins averaged a yearly export value of \$52,160,000 USD, livestock averaged \$3,390,000 USD, and meat \$2,380,000 USD. Over this twenty-one year period, hides and skins provided on average 90% of official livestock sector exports, livestock provided 6% and meat 4%. For a time in the 1990s, hides, skins and leather were Ethiopia's second largest export earner after coffee [4]. Despite the large number of livestock, there has been a decline in national and per capita production of livestock and livestock products, export earnings from livestock and per capita consumption of food from livestock origin in comparison to other African countries due to disease and other constraints [2].

Even if much number of tanneries is involved in production of finished and semi-finished leather products, the sector and the country are losing revenue due to a decline in leather quality. A considerable portion of these pre-slaughter defects are directly related to skin diseases or secondary damage that occurs when the animal scratches itself to relieve the itching associated with some of these diseases [5]. The existence of various skin diseases affecting ruminants is frequently

reported from different parts of Ethiopia. These different skin diseases in Ethiopia are accountable for considerable economic losses particularly to the skin and hide export due to various defects, 65% of which occur in the pre slaughter states directly related mostly to skin disease and skin and hides are often rejected because of poor quality. The most common ruminant skin diseases reported in Ethiopia are Dermatophilosis, lumpy skin disease, pediculosis, acariasis, ked, sheep and goat pox and orf [6].

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 [7].

External parasites are the most serious threat since they feed on body tissues such as blood, skin and hair. More significant, however, is that any blood-sucking arthropod may transmit diseases from infected animals to healthy ones. In addition, arthropod pests also may reduce weight gains, produce general weakness, severe dermatitis, and create sites for secondary invasion of disease causing organisms. In general, infected livestock cannot be healthy or efficiently managed to realize optimum production levels [8].

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The potential economic loss the country is experiencing necessitates the nation-wide detailed investigation on the distribution of important skin disease. Since Ethiopia is known to be use and export ruminant skin among the livestock it has, it is necessary to study the disease which affects the skin of those animals. Even though the prevalence of different skin disease are investigated in different parts of Ethiopia; yet there is no research conducted that shows prevalence of major skin diseases in ruminants and its associated risk factors at Gondar university veterinary clinic. Therefore the objectives of this thesis are:

- To determine the prevalence of major ruminant skin disease in and around University of Gondar veterinary clinic
- To assess the relationship among different risk factors with the Occurrence of ruminant skin disease.
- To identify the different risk factors for skin diseases occurrence in the study area.

Material and Methods

Study area

A cross sectional study were conducted from November, 2013 to April, 2014 in Gondar University veterinary clinic at Gondar town which is the Capital city of North Gondar zone in Amhara regional state. It is located 740 km northwest of the capital city, Addis Ababa. It is situated between 12°36'N and 33° 28'E at an altitude of about 2300 m above sea level (m.a.s.l) with an average temperature of 20°C and an average annual rainfall of 1800 mm. The human population size of Gondar town in 2008 is about 112,249. Out of which 60,883 are males and 51,366 are females. The livestock population in the area comprises of cattle (8,202), goat (22,590), sheep (2,695), horse (1,065) and donkey (9,001) (CSA, 2008) [9]. These animals in and around Gondar is used for traction power, meat and milk production and for transportation of materials and man from place to place.

Study animals

The study animals were cattle, sheep and goat that had brought to Gondar university veterinary clinic and it include both sex, all breeds and all age groups weather they are from intensive or extensive farming system. The age of the animals will be determined primarily based on the information obtained from the owners and also by looking the dentition pattern of animals. Animals were divided into two groups according to their age, namely young (less than or equal to 2 year old) and adult animals (above 2 year old) [10].

Study methodology

Clinical examination: In this study, animals were sampled during sample collections and the related risk factors such as sex, age, breed, body condition, species, season and manage mental conditions were recorded before sampling. The tags of study animals were properly recode during sampling and then each animal were also carefully inspect for the skin pathogens. The samples were taken to Gondar University laboratory for identification. Clinical skin disease investigations were conducted by examination of skin of each animal through visual inspection and palpation. For positive cases on clinical examination, detailed husbandry and health history were taken from the owner of the animals. Depending upon the clinical presentation of skin diseases, samples such as, skin-scrapings, hair specimens, pustules, abscesses and externally visible parasites were collected and subjected to a proper laboratory investigation. Viral infections like Lumpy Skin Disease (LSD) and Pox Disease were diagnosed based on their occurrence in a

flock and observable clinical pictures such as wide spread skin lesions on and around the muzzle, ears, scrotum and udder [11].

Laboratory investigation: Specimen of hair plus skin will plucked from lesions suspected of dermatophytosis using forceps, put in dry Petri dish and transport to the laboratory to demonstrate characteristic disease causing agent from lesion scraping. Deep scrapings of pustules and abscess were collected for demodicosis suspected cases and smears of their content were examined for the presence of demodectic mites at 10x magnification of light microscope [12]. For the mange mite infestations, skins crapings (till capillary blood oozes) were taken from the periphery of active lesions. The specimens were placed in test tubes and were treated by 10 ml KOH (10%) and examined based on the standard procedures [13]. Exudative crusts were taken by pairs of forceps and were transport to the laboratory in dry Petri dish where they are subjected to Giemsa staining for demonstration of *Dermatophilus congolensis*. Lice and tick were collected in 70% alcohol by parting the hair and were identified using the standard procedures [12].

Data management and analysis: A cross-sectional study was conducted to determine the current prevalence of major skin diseases in the study area. The total numbers of ruminants that were attended in Gondar university veterinary clinic from November to April were sampled. After Data collection it was recorded in Microsoft excel spread sheet and preliminary analysis were done in it. The laboratory data were coded and the associations of risk factors with the occurrence of the diseases were assess using Chi-square and Fisher's Exact Test. The Chi-square (X^2) test was used to assess differences in the prevalence of skin diseases among species, breed, sex, body condition, age groups, management, Predilation site and season of diseases occurrence. All statistical analyses were conducted using SPSS (Version 16) statistical software and $p < 0.05$ were taken as significance.

Result

Over all prevalence of skin diseases in ruminants (cattle, sheep and goat)

A total of 1296 ruminants were examined to determine the prevalence of major skin disease in Gondar university veterinary clinic. Of these, 468 (36.1%) were primarily infested by skin disease or infested with skin diseases secondary to other systemic disease. The overall prevalence of skin diseases in cattle, sheep and goats were 142 (27.68%), 268 (42.47%) and 58 (38.16%) respectively. The difference in the prevalence of skin diseases among the three host species was statistically significant ($p < 0.05$). From the total animal population examined 628 (48.45%) male and 668 (51.54) female were included in the examination. Some skin disease were most common to one of ruminant host; as result sheep ked is found only in sheep and lump skin disease was found only in cattle during the study. In addition to this orf and sheep and goat pox was found mainly in sheep and goat (Table 1).

Ectoparasite covers 65.81% and the remaining 34.19% were other infectious disease. The major ectoparasites identified on ruminants were tick 116 (37.66%), mange 32 (10.38%), lice 91 (29.55%) and sheep ked 72 (23.38%). However, there was no statistical significant variation ($P > 0.05$) among the three host species of ectoparasite infestation except sheep ked which was specifically affect sheep and it had statistically significant ($P < 0.001$) with the occurrence on sheep.

With regard to age wise comparison, among the 1296 animals examined 526 (40.7%) and 768 (59.3%) were young and adult ruminants respectively; from these animals 204 (15.74) young and 104 (8.024) adult ruminants were positive for skin disease. Young ruminants

were susceptible to skin diseases than the adult age group; as a result the infection rate among the two age categories were statistically significant ($P < 0.05$).

Prevalence of skin diseases in cattle

The overall prevalence of skin diseases in cattle was 142 (27.68%) from 513 cattle examined; of which 69 (13.45%) male and 73 (14.23%) female (Table 2). All animals were mono-infected and ectoparasites were responsible for 72.54%; while 27.46% was attributed to other skin diseases. The common infestation sites of lice were the shoulder, neck, sides and back regions where as the most common infestation area of tick, dermatophilosis, mange mite and lumpy skin disease were soft skin area like (scrotem, ventral body part and anus), back side

of the animal, head and neck region and whole body parts of cattle respectively. Young, cross breed and poor body condition cattle were more affected by skin disease than adult, local breed, good and medium body condition cattle; this has statistically significant association ($X^2 = 39.132$ and $p < 0.001$, $X^2 = 17.34$ and $p < 0.001$ and $X^2 = 51.65$ and $P < 0.001$ respectively) with disease occurrence (Table 2).

$P = p$ - value, NS = non significance, BCS = body condition score, LSD = Lumpy skin diseases Young, poor body conditioned and local breed cattle were more susceptible to tick than adult, medium and good body conditioned and cross breed animals respectively. Tick infestation had been highly significant association ($p < 0.001$) with age, body condition and breed of cattle (Table 3). *Demodex* infection

Skin diseases Genus	Cattle	Sheep	Goat	Total	P-value
Ectoparasites	104 (33.76%)	177 (54.46%)	27 (8.76%)	308 (65.81%)	
Tick					
Boophilus	21 (6.81%)	16 (5.19%)	5 (1.62%)	42 (13.63%)	.334
Amblyomma	9 (2.92%)	10 (3.24%)	4 (1.29%)	23 (7.46%)	.680
Hyalomma	18 (5.84%)	18 (5.84%)	3 (0.97%)	39 (12.66%)	.485
Rhipicephalus	6 (1.94%)	6 (1.94%)	-	12 (3.89%)	.415
Mange mite					
Demodex	6 (1.94%)	6 (1.94%)	1 (0.32%)	13 (4.22%)	.842
Sarcoptes	5 (1.62%)	6 (1.94%)	1 (0.32%)	12 (3.89%)	.934
Psoroptes	2 (0.64%)	3 (0.97%)	2 (0.64%)	7 (2.27%)	.202
Sheep	-	72 (23.37%)	-	-	72 (23.37%)
Lice					
Damalina	17 (5.51%)	23 (7.46%)	5 (1.62%)	45 (14.61%)	.918
Linognathus	20 (6.49%)	17 (5.51%)	6 (1.94%)	43 (13.96%)	.397
Other disease	36 (22.5%)	87 (54.37%)	29 (18.12%)	160 (34.19%)	
Dermatophilosis	7 (4.37%)	-	2 (1.25%)	9 (5.62%)	.140
Lumpy skin disease	29 (18.12)	-	-	29 (18.12%)	.000
Orf	-	31 (19.37%)	14 (8.75%)	45 (28.12%)	.000
Sheep and Goat pox	-	64 (40%)	13 (8.12%)	77 (48.12%)	.000

Table 1: Over all prevalence of skin diseases at genus level in ruminants.

Factor	Categories	No Examined	No Examined	Prevalence (%)	Chi-square	p-value
Positive						
Breed	Local	420	100	33.81	17.34	.000
	Cross	93	42	45.16		
	Total	513	142	27.68		
Sex	Male	242	69	28.51	.158	.691
	Female	271	73	26.93		
	Total	513	142	27.68		
Age	Young	209	89	42.58	39.13	.000
	Adult	304	53	17.43		
	Total	513	142	27.68		
Body condition	Good	42	11	26.19	51.65	.000
	Medium	404	88	21.78		
	Poor	67	43	64.12		
	Total	513	142	27.68		
Management	Extensive	401	111	27.68	.033	.984
	Semi intensive	38	11	28.94		
	Intensive	73	20	27.4		
	Total	513	142	27.68		
Season	Spring	90	28	31.11	4.444	.108
	Ottoman	248	58	23.39		
	Intensive	175	56	32		
	Total	513	142	27.68		

Table 2: Association of risk factors with prevalence of skin diseases in cattle.

has significant association ($P < 0.001$) with body condition. *Sarcoptes* and lice infestation had significance association ($p < 0.05$) with body condition and age of the cattle respectively with prevalence rate of 4.87% young and 2.34% adult for lice infestation and 0.78% poor body condition, 0.19% medium body condition and no good body condition *Sarcoptes* infection were prevalent in cattle. All dermatophilosis positive animal were female and it has significant association ($p < 0.05$) with sex of the animal while the other skin disease had not significant association ($p > 0.05$) with sex, age, body condition score and breed of cattle (Table 3).

Prevalence of skin diseases in small ruminants (sheep and goats)

Out of 309 male and 322 female sheep and 77 male and 75 female goats examined, 268 sheep (42.47%) and 58 goats (38.16%) exhibited skin diseases: among these 126 (40.77%) male and 142 (44.1%) female and 27 (35.06%) male and 31 (41.33%) female sheep and goat respectively. The skin disease was more frequently observed in young animals than in adults ($X^2 = 76.586$, $p < 0.001$ for sheep; $X^2 = 25.156$, $p < 0.001$ for goats) and in poor body condition than in good and medium body condition animals ($X^2 = 11.326$, $p < 0.05$ for goats and $X^2 = 23.388$, $p < 0.001$ for sheep). Among diseased small ruminants, 176 sheep (27.89%) were infected by one or more ectoparasites: 109 (17.27%) sheep were infected with only one ectoparasites while 67 (10.62%) sheep were poly-infected mainly by tick and sheep ked whereas only mono-infestations were encountered in the 31 (20.39%)

goats with ectoparasites and the remaining 27 (17.76%) were infected with other viral and bacterial skin diseases (Table 4). The common area of these ectoparasite was anterior body part (neck, ear, face and thorax region), hair less region (scrotem, inguinal area, tough and around the umbilicus), head and tail region (face, ear, neck, tail and rump) of sheep and goat for lice, tick and mange mite respectively. Among the sheep that brought to Gondar university clinic, high proportion (51.03%) was covered by female and the remaining (48.96%) was male. Poor body condition and young sheep were frequently affected than good and medium body condition and adult sheep. In winter season sheep were more affected than in spring and ottoman season. Age, body condition of sheep and season diseases occurrence has significant relation ($X^2 = 76.586$, $P < 0.001$ for age, $X^2 = 23.39$, $p < 0.001$ for body condition and $X^2 = 7.749$, $p < 0.05$ for season) with the prevalence of skin disease of sheep; whereas management and sex had not significance relation ($p > 0.05$) (Table 4).

These diseases were affect young sheep than adult sheep and there was a significant relationship ($P < 0.001$ in tick, $P < 0.05$ in *Psoroptes* mange, $P < 0.05$ in lice, $P < 0.001$ in sheep ked and $P < 0.05$ in sheep and goat pox) between age and prevalence of tick, *psoroptes* mange, lice, sheep ked and sheep and goat pox. Tick, *Sarcoptes*, *Demodex* and *Psoroptes* preferentially affect poor body conditioned than good and medium body condition sheep and there was statistical significance ($P < 0.001$ for tick and $P < 0.5$ for *Sarcoptes*, *Demodex* and *Psoroptes*manges) between body condition score and occurrence of Tick, *Sarcoptes*, *Demodex* and *Psoroptes* manges). The other skin diseases observed in

Skin disease	Sex			Age			BCS				Breed		
	Male (n=242)	Female (n=271)	P	Young (n=209)	Adult (n=304)	P	Poor (n=67)	Medium (n=404)	Good (n=42)	P	Cross (n=93)	Local (n=420)	P
Tick	32	22	NS	36	18	<.001	30	6	18	<.001	24	30	<.001
Demodex	5	1	NS	4	2	NS	5	1	0	<.001	2	4	NS
Sarcoptes	4	1	NS	4	1	NS	4	1	0	<.001	2	3	NS
Psoroptes	1	0	NS	1	0	NS	0	1	0	NS	0	1	NS
Lice	12	25	NS	25	12	NS	<.05	5	1	NS	7	30	NS
Dermato philosis	0	7	<.05	1	6	NS	2	4	1	NS	3	4	NS
LSD	14	15	NS	13	15	NS	3		7	NS	5	24	NS

Table 3: Association of risk factors with major skin diseases of cattle.

Factor Positive	Categories	No Examined	No Examined	Prevalence (%)	Chi-square	p-value
Sex	Male	309	126	40.77	.712	.399
	Female	322	142	44.1		
	Total	631	268	42.47		
Age	Young	258	163	61.12	76.586	.000
	Adult	373	105	28.15		
	Total	631	268	42.47		
Body condition	Good	52	13	25	23.39	.000
	Poor	88	56	63.63		
	Total	631	268	42.47		
Management	Extensive	593	252	42.49	4.47	.107
	Semi intensive	35	13	37.14		
	Intensive	33	-	100		
	Total	631	268	42.47		
Season	Spring	123	28	0.23	7.749	.021
	Ottoman	317	58	18.3		
	Winter	191	56	29.32		
	Total	631	268	42.47		

Table 4: Association of risk factors with prevalence of skin diseases in sheep.

sheep in this study were sheep and goat pox and contagious ecthyma or orf in sheep with the prevalence rate of 8.87% and 5.07% in sheep and goat pox and contagious ecthyma respectively. These viral diseases had not statistically significant association ($P > 0.05$) with sex, body condition score and age of sheep except sheep and goat pox that were significantly associated ($p < 0.05$) with age of the animal (Table 5).

Sex, age, body condition, season and management of the animal were taken as risk factors during this study. 62.29% young and 21.98% adult, 30% good body condition, 32.17% medium body condition and 66.67% poor body condition goat were infected with skin diseases. Young and poor body conditioned goat were highly susceptible than adult and good as well as medium body conditioned goat. Age and body condition score were statistically significant ($P < 0.001$ for age and $P < 0.05$ for body condition) with the prevalence of skin disease in goat; while season, sex and management had no significant association ($P < 0.05$) with skin disease prevalence of goat (Table 6).

The identified ectoparasites species were 8.55% lice (*Damalina caprae* and *Linognathus* species), 7.24% tick (*Ambylomma*, *Hyalomma*, *Boophilus* and *Rhipicephalus*) and 3.29% mange mite (*Demodex*, *Sarcoptes* and *Psoroptes*). The other skin diseases observed in goats during this study were 8.55% pox virus disease, 9.21% contagious ecthyma/orf and 1.34% dermatophilosis. Young age and poor body condition goat was highly susceptible to tick than adult, medium and good body conditioned animals. There was significant relation ($P < 0.5$) between body condition and age of goat with prevalence of tick and statistical significance ($p < 0.05$) were present between age and prevalence of lice (Table 7).

Discussion

This study indicates that skin diseases caused by parasites, bacteria and viruses were common in and around Gondar town in ruminants: their overall prevalence were 10.96%, 20.68% and 4.48% in cattle, sheep and goats respectively. These relative high frequencies would be associated with nutritional factor, climatic stress, fly season and favorable condition for diseases agent multiplication. As different flocks of animals came in close contact at available communal watering and grazing sites (contact points) because of the feed scarcity, the establishment and spread of skin diseases infections were encouraged. The prevailing poor veterinary services, improper application of acaricides by non-professionals could also amplified this endemic situation.

Among skin diseases, the prevalence of ectoparasite infestations in my study was important in cattle and sheep (103 (7.95%) and 176 (13.58%) respectively) rarely to goats 29 (2.24%). Sheep ked was statistically significant ($P < 0.001$) with species of ruminants. Higher ectoparasite prevalence was observed in and around Gondar town in small ruminants (26.18%); it was also reported that ectoparasites was significantly more frequent (78.3%) in small ruminants in and around Gondar town [14]. This reduction of small ruminant infestation from the former one may due to proper control of ectoparasites by animal health servants and good management practice of the owner. Furthermore the prevalence of ectoparasite was reported as 55.5% in sheep and 58% in goats and 50.5% in sheep and 56.4% in goats by Mulugeta et al. [15] and Sertese and Wossene [16] in Tgray region and

Skin disease	sex			Age			BCS			
	Male	Female	P	Young	Adult	P	Poor	Medium	Good	P
Tick	18	31	NS	34	15	<.001	19	2	8	<.001
Demodex	2	4	NS	3	3	NS	3	3	0	<.05
Sarcoptes	2	4	NS	4	2	NS	3	3	0	<.05
Psoroptes	3	0	NS	3	0	<.05	3	0	0	<.05
Lice	21	19	NS	26	14	<.05	5	31	4	NS
Sheep ked	32	40	NS	44	28	<.001	7	60	5	NS
Orf	18	13	NS	17	6	NS	6	24	1	NS
Sheep and Goat pox	25	31	NS	32	24	<.05	19	44	1	NS

Table 5: Association of risk factors with major skin diseases of sheep.

Factor	Categories	No Examined	No Examined	Prevalence (%)	Chi-square	p-value
Positive						
Sex	Male	75	27	35.06	.633	.426
	Female	75	31	41.33		
	Total	152	58	38.16		
Age	Young	61	38	62.29	25.16	.000
	Adult	91	20	21.98		
	Total	152	58	38.16		
Body condition	Good	10	3	30	11.33	.003
	Medium	115	37	32.17		
	Poor	27	18	66.67		
	Total	152	58	38.16		
Management	Extensive	147	54	36.73	4.4	.111
	Semi intensive	3	2	66.67		
	Intensive	2	2	100		
	Total	152	58	38.16		
Season 31 15 58	Spring			34.29	.323	.851
	Ottoman		80	38.75		
	Winter		37	40.54		
	Total		152	38.16		

Table 6: Association of risk factors with prevalence of skin diseases in goat.

Skin disease	Sex		Age			BCS			
	Male	Female	Young	Adult	P	Poor	Medium	Good	
Tick	6	5	9	2	<0.5	6	5	–	<0.5
Mange mite	3	2	1	4	NS	3	2	0	NS
Lice	7	6	9	4	<0.5	2	10	1	NS
Orf NS	5	9	7	7	NS	3	10	1	NS
Sheep and NS	6	7	8	5	NS	3	8	2	NS

P = p – value, NS = non significance, BCS = body condition score

Table 7: Association of risk factors with major skin diseases of Goat.

in different agro ecological zone of eastern Amhara respectively. This prevalence of species variation is suggested as a result of disproportion of sample size of the two species in different studying area.

The main ectoparasites were ticks (*Ambylomma*, *Hyalomma*, *Boophilus* and *Rhipicephalus* species), mange mite (*Demodex*, *Sarcoptes* and *Psoroptes*) and lice (*Damalina ovis*, *Damalina bovis*, *Damalina caprae* and *Linognathus* species). Tewodros et al. [14] reported the presence of these ectoparasites (*Boophilus*, *Hyalomma*, *Ambylomma*, *Demodex*, *Sarcoptes*, *Psoroptes*, *Damalina ovis*, *Damalina caprae* and *Linognathus* species) in small ruminants of in and around Gondar town.

The prevalence of tick among species was 10.52%, 7.77% and 7.24% during my study. The main tick attachment sites were ventral abdomen, sternum, under the tail, scrotum in males and udder in females and the tick infestation prevalence was not significantly influenced ($P > 0.05$) by sex, and season. The same tick species have been identified in the previous study conducted in the Wolaita Soddo region [7] including that *Rhipicephalus* genus in small ruminants. Tick infestation had been highly significant association ($p < 0.001$) with age, body condition and breed of ruminants, which is related with Nibret et al. [17] in Lay-Armacheho Woreda North West of Ethiopia, in which 18.22% in cattle, 23% in sheep and 7.3% in goat with high proportion of *Rhipicephalus* was found and other finding that reported by Teshome [18], (16% in goats and 23.8% in sheep) in Sidama zone. The relatively low prevalence rate of tick infestation in my study as compared to the above finding might be due to the dry season period during which the study was conducted whereas humidity and prolonged sunlight promote the survival and reproduction of ticks in low land areas [19].

A high prevalence of pediculosis: was noticed in ruminants (6.34%, 7.21% and 8.55%) for sheep, cattle and goat respectively. The study is associated with findings by Yacob et al. [20], conducted in and around Adama town 6.63% and 6.10% in sheep and goats respectively. The risk for this skin disease was significantly increased in cross breed cattle and in young and poor body condition ruminants ($p < 0.001$). By contrast, no significant ($P > 0.05$) sexual predisposition was evidenced as previously reported by Regasa [21]. Sheep ked was the most abundant parasite of sheep during my study and similar report was done by Ermiyas [22], in Sebeta, which was high significant association ($P < 0.001$) with species of animal.

Mange mite infection was registered at prevalence rates of 2.34% in cattle, 2.38% in sheep and 3.29% in goats. The demodicosis prevalences previously reported in cattle ranged from 0.42% in Nekemte region Regasa [21] to 1.63% in the Wolaita Soddo region Chalachew [23]. In my study 2.47% mange positive animal population including sheep was admitted to Gondar university veterinary clinic. The difference in the prevalence of mange in sheep may as a result the difference in management practice in the two study area. However, frequencies of mange in sheep and goats were 0.80% and 1.37% respectively in

the central Ethiopia Haffize [24] which is less than the prevalence in Gondar town.

The main skin diseases caused by bacteria were Dermatophilosis in the 3 species studied (the prevalence were 1.36%, 1.32% and 0% in cattle, goats and sheep respectively). The diseases prevalence is less than the prevalence of dermatophilosis in Ambo town with the total prevalence of 5.21% by Dejene et al. [25]. The occurrence of dermatophilosis was mainly in at the beginning of winter during the rainy season. The prevalence of dermatophilosis was significantly associated with season of disease occurrence ($P < 0.001$), sex of ($p < 0.05$) in which female cattle were more susceptible than male one. This is accordance with the previous study by Dejene et al. [25] in Ambo town; in which dermatophilosis occurs in rainy season and affect female than male. This is suggested as females are always in contact with water for udder washing and they are stressed during milking.

Lumpy skin disease only found in cattle, which accounts 5.65% prevalence at Gondar university veterinary clinic; which is higher than the previous study 0.68% conducted by Yacob et al. [7] at Adama veterinary clinic and lower than the study conducted Wolliso (South west Oromia) which shows a prevalence rate of 27.91% by Bishawired [26]. This is assumed to be as a result of study period, in which multiplication of flies which act as mechanical vector for the virus is common during spring in Ethiopian context and availability of flies for mechanical vector aggravates the infection rate of lumpy skin disease. There was no significant association ($P > 0.05$) between risk factors and prevalence of Lumpy skin disease except season of disease occurrence which was significantly associated ($P < 0.05$) with disease prevalence.

The contagious ecthyma/orf (4.91% in sheep and 9.21% in goats) and the pox virus disease (8.55% in goat and 8.87% in sheep) were seen in small ruminants. The study conducted in Adama veterinary clinic Yacob et al. [7], (1.79 % orf and 11.46% sheep and goat pox) shows less prevalence than the prevalence here in Gondar; this is suggested that due to difference in the drought level of the area; because contagious ecthyma and sheep and goat pox occurs mostly in drought period. Significant associations between the prevalence of skin diseases induced by orf and small ruminant pox and season of disease occurrence were evidenced in ruminants ($p < 0.05$) [27].

Conclusion and Recommendations

This study was conducted to identify the prevalence of major skin diseases and their associated risk factors on ruminants. The most important skin diseases identified were tick, lice, mange mite, sheep ked, dermatophilosis, lumpy skin disease, sheep and goat pox and contagious ecthyma. Tick was the most abundant ectoparasites in the study area followed by lice, sheep and goat pox, sheep ked, orf, lumpy skin disease and Dermatophilosis. The infestations of skin diseases are important affecting the health and productivity of ruminants in and around Gondar town. Lack of awareness about the significance of the problems among owners for control schemes have contributed to the wide spread nature of skin disease in the area. In view of the significance of skin and hide production as main source of foreign currency to the country and the ever increasing demands of livestock market, the high prevalence of skin diseases prevailing in cattle, sheep and goat in the area requires serious attention to minimize the effect of the problem.

Based on the above conclusion the following Recommendations are forwarded:

- (1) Strategic treatment of ruminants with insecticides and acaricides should be practiced in the study area to minimize the impact of ectoparasites on the health of animals.

- (2) Awareness creation for the local farmers about the control of skin diseases is essential.
- (3) Vaccination should be applied for viral disease before its occurrence season.
- (4) Newly introduced animals should be treated before they are introduced in the herd or in to the farm.
- (5) Better ruminant animal management practices should be implemented to minimize transmission of the disease and increase the productivity of the animals.
- (6) Further detail study should be done to assess the seasonal dynamicity and major ectoparasites borne disease in the study area.

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