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Helminthiasis in Small Ruminants of different Eco-climatic zones of Nepal

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Abstract

Livestock farming is one of the important agriculture sectors in Nepal. Small ruminant production especially goat and sheep have become an additional source of income for most Nepalese people. However, the production of these livestock has been decreasing due to the occurrence of gastrointestinal helminth infection. This study was performed to determine the overall prevalence of specific GI helminth parasites from the collected fecal sample of small ruminants from four different eco-climatic zones of Nepal i.e. Rasuwa, Rupandehi, Syangja, and Kavre. A total of 274 fresh fecal samples were collected and were placed in a zip-lock poly bag to which few drops of 10% formalin soaked in cotton was added to safeguard the sample. The qualitative fecal examination was carried out by different methods i.e. using differential flotation methods for nematodes, cestodes, and using sedimentation methods for trematodes. Examination of the fecal sample revealed that among 274 samples, 72 (26%) was found to be infected with various gastrointestinal helminth parasites. Altogether six different types of helminth parasites were found. Infection of Trichuris sp was found highest i.e. 12.04% and infection of Strongylus sp was least i.e. 1.09%. The prevalence of mixed infection was 0.72%. The comparison between the prevalence of helminth parasites among four different areas of Nepal showed the highest occurrence of GI helminth in Kavre (33.86%) followed by Rasuwa (26.60%), Syangja (21.87%), and Rupandehi (19.98%). The presence of various species of gastrointestinal helminths within small ruminants is an important cause of morbidity and loss of production. From the study we can conclude the need of effective and quantitative parasitic examination on more farms in large scale for betterment of health and increase productivity of the animal.

Keywords: Eco-climatic zone • Fecal sample • Helminth parasites • Prevalence • Ruminant

Introduction

Nepal is an agricultural country where 66 percent of the population is directly engaged in farming. Farming is subsistent in nature and crop is mostly integrated with livestock. Livestock contributes about 31% to the total GDP of the country and plays an important role to rescue farmers from adverse shocks like drought, discontinued work/employment, illness, death, etc. Livestock farming is one of the sustainable employment options and contributes about 20% to total HH (Household) income. Cattle, buffalo, goat, and sheep are the major components of livestock farming systems in Nepal. Having said that the resource-poor farmers who cannot invest a large sum of money on cattle and buffalo prefer goat and sheep which play an important role in improving the welfare of poor families in this country.

However, one of the encumbrances to their production worldwide is gastrointestinal helminthiasis. The insufficient investigation on parasitic infection and lack of pertinent control strategies are the major factors behind a large number of small ruminant harboring parasitic infestation. The nutritional requirement of animals is not satisfactory in a developing country where such infection is proliferating haphazardly. Furthermore, no adequate facilities of veterinary care and the favorable environment of tropics have enhanced their growth and transmission. Hence it has become a serious veterinary health concern in Nepal. The loss due to the death of animals and the decrease in population is high in the Nepalese context as a consequence farmer suffers huge losses.. Parasitic infection of small ruminants and other livestock have major economic impacts worldwide and a huge amount of money is invested annually worldwide to combat helminth parasites in livestock [1]. As the gastrointestinal helminth parasites depend upon their host, they are found in the gut, body cavity, liver, lungs, gall bladder, and blood or within the internal cavities, tissues or cell of the host. Fasciola sp, Ascaris sp, Trichuris sp, is examples of typical endoparasites. Different helminth parasite of different classes such as Trematoda, Cestoda, and Nematoda with different genera is infecting sheep and goats in different seasons. Fasciola sp, Trichostrongylus sp, Schistosoma sp, etc are the most common helminths which are responsible for the loss of goats and sheep farming. They are acquired by eating

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contaminated food and water through the ingestion of infective eggs or larvae or by skin penetration which is found to be largely affecting the ruminants. Hostile immunity and unfavorable environmental conditions such as dry or very cold periods of weather, arrest the development of larvae that are deposited in the feces. When environmental conditions improve, development continues and the life cycle is completed.

The ordinary method for suppressing such gastrointestinal parasites is to use synthetic anthelmintic drugs. But the excess use of these chemical anthelmintic drugs has provoked the problem of anthelmintic resistance among the small ruminant livestock producers. Moreover, the excessive use of chemical drugs leads to the water bodies, groundwater and soil contamination which affect humans and other animal's health due to the release of chemical residues by the treated animals in their active form. Thus, the development of non-chemical approaches or biological control appears to be a suitable and efficacious alternative toward anthelmintic drugs.

This study was performed to determine the overall prevalence of specific GI helminth parasites from the collected fecal sample of small ruminants of four different eco-climatic zones i.e. Rasuwa, Rupandehi, Syangja, and Kavre, Nepal [2].

Materials and Methods

Study area

The study was conducted between October 2018 and April 2019 in Rasuwa, Rupandehi, Syangja, and Kavre district in Nepal.

Sample collection

A total of 274 fresh fecal samples were collected from different eco-climatic zones and were placed in a zip-lock poly bag to which few drops of 10% formalin soaked in cotton was added as a preservative. The samples were then stored in a cool and dark area after which it was brought to a laboratory for further analysis.

Fecal examination

The qualitative fecal examination was carried out by different methods i.e. using differential floatation methods for nematodes, cestodes, and using sedimentation methods for trematodes.

Sedimentation method: About 3 grams of ground fecal sample was placed in 100 ml beaker and water was added. The mixture was poured through a tea strainer and the material left in the strainer was discarded. The filtrate was centrifuged at 2000 rpm for 15 minutes. After, centrifugation supernatant was discarded and refilled with fresh water then again centrifuged until the supernatant was cleared. Then sediment left in the bottom was taken on a clean glass slide and examined under a microscope [3].

Differential flotation method: About 3 grams of ground fecal sample was placed in 100 ml beaker and water was added. The mixture was poured into a beaker containing clean water through a tea strainer and was centrifuged at 2000 rpm for 15 minutes. After 15 minutes, the supernatant was discarded and refilled with fresh water for 2-3 times until the supernatant was cleared. Then, the sediment content was mixed with 10-20 times (42ml) of its volume of saturated common salt solution (380 grams of NaCl/L of water having a specific gravity of 1.2). A glass slide is carefully laid on the top of the container and stand for 20-30 minutes. After which the glass slide was quickly lifted, turned over smoothly and examined under a microscope (40X).

Results

The prevalence rate of helminth parasites

Among 274 fecal samples of small ruminants of the different eco-climatic zone that was collected and examined, 72 (26%) were found to be infected with various gastrointestinal helminth parasites (Figure 1).

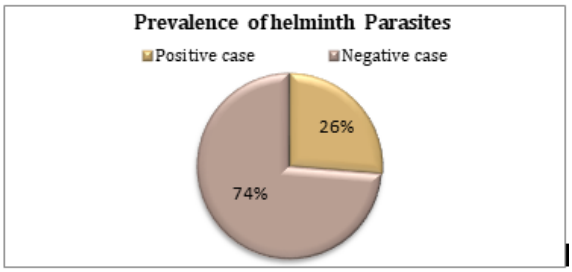

Figure 1. Prevalence of helminth parasites in small ruminants.

The prevalence rate of specific helminth parasites

Among the helminth parasite infection, nematode infection was highest i.e. 24.77% followed by trematode i.e. 1.45%. Altogether six types of helminth parasites were found. Infection of Trichuris sp was found highest i.e. 12.04% and infection of Strongyloides sp was least i.e. 1.09%. The prevalence of mixed infection was 0.72% (Figure 2, Figure 3) [4].

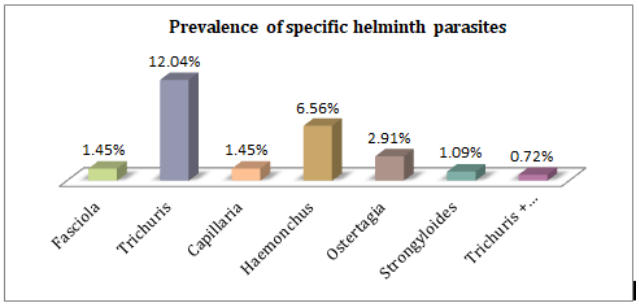

Figure 2. Prevalence of specific helminth parasites among small ruminants.

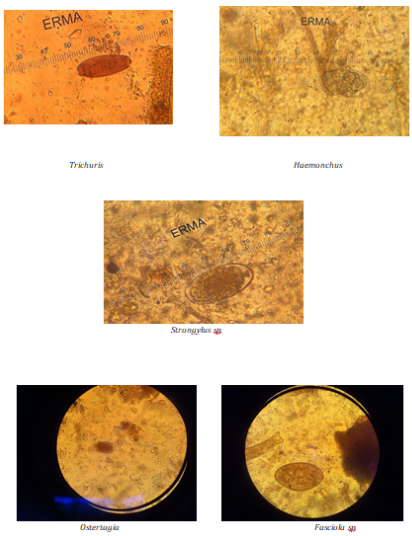

Figure 3. Eggs of helminth parasites observed under 40x microscope.

Regional prevalence of helminth parasites

Altogether 125 samples were collected from Rasuwa, 55 from Rupandehi, 32 from Syangja and 62 samples were collected from Kavre [5]. Out of 125 samples collected from Rasuwa, 33 (26.60%) were found positive and out of 55, 32, 62 samples collected from Rupandehi, Syangja and Kavre, 11 (19.98%), 7 (21.87%) and 21 (33.86%) samples were found positive for helminth parasites respectively (Figure 3).

S.N	Class	Genera	Eco-climatic zone							
			Rasuwa		Kavre		Syangja		Rupandehi	
			Total Positive	Prevalence %	Total Positive	Prevalence %	Total Positive	Prevalence %	Total Positive	Prevalence %
1	Trematode	*Fasciola*	1	0.80%	1	1.61%	2	6.25%	0	0%
2	**Nematode**	***Trichuris***	**11**	**8.80%**	**11**	**17.74%**	**5**	**15.62%**	**6**	**10.90%**
		Capillaria	4	3.20%	0	0%	0	0%	0	0%
		Haemonchus	**9**	**7.20%**	**9**	**14.51%**	**0**	**0%**	**0**	**0%**
		Ostertagia	6	5%	0	0%	0	0%	2	3.63%
		Strongylides	**0**	**0%**	**0**	**0%**	**0**	**0%**	**3**	**5.45%**
		Trichuris + Haemonchus	2	1.60%	0	0%	0	0%	0	0%
			TP=33	TPP=26.60%	TP=21	TPP=33.86%	TP=7	TPP=21.87%	TP=11	TPP=19.98%

Figure 3. Prevalence rate of helminth parasites in different eco-climatic zone of Nepal.

Discussion

Small ruminants under natural environmental conditions commonly harbor more than one species of helminth parasites. However, the worm burdens are not evenly distributed within the animal population. The degree of parasitic infection acquired by the animals is determined by natural and management factors, seasonal and environmental conditions, grazing behavior, previous exposure to parasites, physiological state of the animal, stocking rate, nutrition, age of the animal, and previous anthelmintic treatment. Each species of helminth parasite confers deleterious effects and collectively lead to illness or decreased performance in the host animal. These parasites cannot be eradicated but they can be limited in their ability to cause economic loss to the producer [6].

A qualitative study was carried out to determine the general rate of prevalence of gastrointestinal helminth parasites in small ruminants of 4 different eco-climatic zones of Nepal. The present study revealed the overall prevalence of GI helminth parasites to be 26%. It is relatively lower than the report on the prevalence of parasitic infection on goats in Nigeria (80.85%) and higher than the report on the prevalence of goats Sukupayo and kunwar in Salley (12.36%). The difference in prevalence in different study areas might have resulted from differences in topography, climatic condition, and management system that favor the survival of the infective stage of the parasites and intermediate hosts [7].

One genera of Trematode (Fasciola sp.) and five genera of Nematodes (Capillaria sp, Ostertagia sp, Strongylus sp., Trichuris sp., and Haemonchus sp.) were observed. The prevalence rate of Trichuris sp. was found more in studied animals and the least prevalence was shown by Strongylus sp. The result of the current study indicates the prevalence of helminths egg with respect to their genera were Fasciola sp (1.45%), Trichuris sp (12.04%), Capillaria sp (1.45%), Ostertagia sp (2.91%), Strongylus sp (1.09%), Haemonchus sp (6.56%) whereas the mix infection i.e. Trichuris sp + Haemonchus sp was 0.72%. In this result, the Trichuris sp. were highly prevalent than other genera. The comparison of the present study with the study carried out by Sukupayo and kunwar showed a similar kind of result where the prevalence rate of Fasciola sp and

Trichuris sp were found high i.e. 2.94%. A research work by Yusof and Isa on goats from three selected farms in Terengganu, Malaysia showed a high prevalence of Strongylus sp (45.6%) and the least prevalence of Trichuris sp (8.7%). The result of this study contradicts our findings. Similarly, the study carried out by Acharya et al and Zvinorova et al revealed similar kind of result where the prevalence of Strongylus sp was found to be high.

The comparison between the prevalence of helminth parasites among four different areas of Nepal showed the highest occurrence of GI helminth in Kavre (33.86%) followed by Rasuwa (26.60%), Syangja (21.87%), and Rupandehi (19.98%). It is relatively lower than the report on the prevalence of parasites on domestic yaks Acharya et al in Mustang (85.42%). Tripathi and Subedi also reported a higher prevalence in Kapilvastu i.e. (67.92%). Likewise, in the study carried out by Sukupayo and kunwar revealed the overall prevalence of GI helminth parasites to be 12.36% in Salley, Panauti Municipality, Nepal. Byanju et al also reported the prevalence of 81.82% of gastrointestinal parasites in domestic yaks of Lehe VDC, Manaslu Conservation Area and Sukupayo and Rayamajhee demonstrated the overall prevalence of 17.34% GI helminth parasites in Roshi rural Muncipality-11, Nepal.

According to our study, the higher prevalence of different types of helminth parasites was found to be in Rasuwa i.e. Fasciola sp (0.80%), Capillariasp (3.20%), Ostertagia sp (5%), Strongylus sp (0%), Trichuris sp (8.80%), Haemonchus sp (7.20%), and Trichuris + Haemonchus (1.60%). This variation might be due to the difference in the geographical distribution of the area, habit and habitat of the animals, climatic condition, and inefficient selection of de-wormers, poor husbandry practices or the development of anthelmintic resistance feeding. The low prevalence rate observed in our study could be due to the difference in the management system of the animals and more importantly the environmental conditions prevalent in the area.

Infection with various species of gastrointestinal helminths within small ruminants is an important additional cause of morbidity and loss of production. The interaction between the gastrointestinal helminths species will cause impairment in the host immune system which further increases goat susceptibility to other diseases or parasites. Besides that, the infection worsens when each of the gastrointestinal helminth species has a different level of resistance causing a reduction in response towards treatment given due to heritable changes in genetic. These conditions are somehow becoming a threat to the agricultural sector in Nepal.

Conclusion

The present study shows the prevalence of GI helminth parasites in small ruminants of different eco-zones of Nepal. The parasitic load possess a significant impact upon the health of animals, thus interfering with their growth and has a great economic impact and constraint to livestock farming in Nepal in achieving better and sustainable productions. The finding suggests that prevention measures and usage of anthelmintic should be implemented properly by consulting with veterinary professionals for correct dosing to reduce the parasitic burden on the goats and to prevent anthelmintic resistance. At the same time, education on animal farming should be provided to the farm owner from time to time. The fecal examination must be done periodically to assess the effect of anthelmintic used. It is very important to control the infection since infected goats might result in production losses through mortality that leads to economic loss. Moreover, proper pasture and animal management could improve animal health thus increases production, reduce treatment costs, and indirectly increase farmer's profit. Further studies and investigations on the helminths load in goat farms in and other areas should be carried out which can further help farmers and veterinary professionals for treatment to limit parasitic burdens and consequently increase its production.

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