Seasonal Preponderance of Gastrointestinal Parasites and their impact on Small Ruminants around Gwalior (Madhya Pradesh) India

Ovais Ali Wani (ovaisjiwaji@gmail.com)
Jiwaji University https://orcid.org/0000-0002-5482-6452

Research Article

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Abstract

In India, the Livestock (generally cattle-rearing) is one of the most potential sub-sectors of agriculture which plays a necessary role in endorsing human health and economy and most predominantly in central India, Small ruminants like (sheep and goat) constitute the major portion of livestock. Gwalior is considered as a Semi-Central Zone where different tribes particularly Gujjar's and Bakerwals had made livestock usually cattle-rearing as their proficient business. The production and productivity of small ruminants in Gwalior state are greatly hindered by various diseases which specially include gastro-intestinal parasitic infection mainly caused due to inappropriate care, unhygienic environmental conditions, severe and hot climatic conditions, and close interaction with other infected animals. Gastrointestinal parasitism is a worldwide problem which has affected masses of ruminants throughout the entire world; and Therefore, a one-year-long epizootic survey was accompanied to study the prevalence of gastrointestinal parasites and various species of GI parasites present in small ruminants like (*goats/sheep*) in the Gwalior region of Madhya Pradesh. From January 2019 to January 2020, an aggregate of 338 faecal samples of (goats and sheep) from different locations in Gwalior were examined to confirm the presence of parasites and gastrointestinal parasitic infections. Majority of the samples were found positive for endoparasites and goats were also detected positive for gastrointestinal parasites too. In Goat, the inclusive incidence of *Haemonchus, Coccidia, Trichuris, Nematodirus, and Fasciola* were *47.6, 36.5, 39.6%* respectively. While, In Sheep the incidence of *Haemonchus, Coccidia, Trichuris were found to be as 58.1, 37.2, 23.2%* respectively. More prominently, the occurrence of *Nematodirus* and *Fasciola (20.9, 2.32%)* were detected individually in sheep alone. The current analysis could assist as a reference line study for additional extensive experiments to evaluate specific region risk factors.

Introduction

Parasitic gastro-inflammation or gastroenteritis, constitutes to pose a severe health threat and a drawback to the efficiency of small ruminants like goat and sheep due to the allied morbidity, mortality, cost of treatment and control measures. As, livestock exclusively cattle rearing is one of the most potential subsectors of agriculture which plays a key role in assisting human health and economy of the India [1–3]. Livestock not only aid to upgrade the financial condition but also makes a substantial benefaction to mankind. However, livestock is a fundamental and elementary part of agricultural system especially Gwalior region which has eventually a better contribution in enhancing the economy of Madhya Pradesh. Habitually, Small ruminants like (sheep and goat) constitute the major part of livestock as mentioned above. Therefore, the total contribution of livestock subsector to *Gross Domestic Product* (GDP) in India is approximately 4.23% [4–6]. In Gwalior, 80% rural people are involved and associated with the cattle rearing and farming. Most of the animals are nurtured in small houses under the traditional husbandry performs where lesser number of ruminants especially goat and sheep are mainly reared for various reasons including milk, meat, wool and skin production. The losses caused due to the parasitic infections are in the form of slight health conditions, retarded growth rate, decline in the working proficiency. Decrease in milk and meat production cost associated with preventive measures and reduces

the disease defiance capability, which could eventually lead to higher mortality rate. GI parasitic infections especially *Fascioliasis, Haemonchosis, Trichostrongylosis, Oesophagostomiasis*, and *Monieziosis* lessened the growth and productivity of small ruminants. It has been observed that 30% adult ruminants die due to the gastrointestinal parasitic contaminations underneath both rural and farm condition [7–8] The commonness of gastrointestinal helminths is related to the agro-climatic surroundings like quantity and quality of pasture, temperature, humidity and grazing behaviour of the host [9–11]. *Haemonchus contortus*, found in the abomasum of sheep and goats, causes excess blood wastage. It has been documented that each worm sucks about 0.05 to 0.08 ml of blood per day or responsible for continuous outflow of blood from feeding spot resulting severe anaemia [12–15] A decrease in effectiveness up to 15% and weight loss up to 50% due to gastrointestinal parasites have also been reported [16]. Major Infections caused due to GI Parasites also affect milk production in cattle, which is reduced by about 3kg per day [17]. Natural changes in season, prevalence and relative encumbrance are the key factors to control the parasitic diseases efficiently [18]. However, in most areas of India especially in the marginalised areas of Gwalior like Dabra, Morar, Kampoo, Pahadia; no study has been accompanied regarding the prevalence/preponderance of different gastrointestinal parasites in small ruminants. Numerous epidemiological studies have been directed on gastrointestinal parasites of small ruminants in different regions of the country but, a limited investigation was ingeniously done on gastrointestinal parasites of small ruminants of Gwalior India. Moreover, the current study comprises two veterinary hospitals of two different areas of Gwalior namely *'Vyas animal care & cure (VACC) pet hospital' and 'Pashu Chikitsalay animal hospital'* and they were selected due to their earthly location as well as excessive patient load.

Methods And Materials

A total of 338 faecal samples were scrutinized for the research work; 86 samples of these were from sheep and 252 from goats respectively. The faecal samples were collected from various farms and small stock holders (*Dabra, Morar*, *Kampoo, Pahadia*) of Gwalior region. The faecal samples were professionally carried to the Endocrinology Laboratory, School of studies in Zoology; Jiwaji University Gwalior, for the identification of endoparasitic infection by using direct qualitative microscopic examination, centrifugation, floatation and basic sedimentation techniques. Identification of the eggs or cysts was made on the basis of their morphological features and Volume of eggs. The whole data was critically and statistically analysed by means of Pearson Chi-Square test. The period of study was alienated into four main seasons viz; monsoon(July–September), post-monsoon(October–November), winter(December–February) and pre-mon-soon/summer (March–June).

STATISTICAL SURVEY

Questionnaire figures were instituted into the Microsoft excel spreadsheet [19]. The descriptive examination was performed by employing the frequency (N, %) of positive and negative sample test outcomes overall and stratified by various demonstrative variables. Invariable analysis was accompanied by using the Chi-square test and t-test for the designated explanatory variables and those having a P-

value ≤of 0.05 were inspected as noteworthy. Statistical data management and rest of the analysis were performed by using MS Excel, STATA, and SPSS version-12 [20-21]

MATERIALS USED DURING ANALYSIS

Distilled water, applicator stick, universal bottle, polythene bags, labelling sheets, glass slides, hand gloves, masking tape, saturated salt solution, beaker, universal bottles, spatula sieve, light microscope, faecal samples, freezer, xylene.

QUESTIONNAIRE SURVEY

During sample collection, the facts concerning the animal husbandry practices such as feeding schedule, farm supervision, veterinary maintenance, and anthelmintic treatment were asked to the farm proprietors.

FAECAL EXAMINATION

Faecal flotation and sedimentation procedures were carried out during the investigation [22]. For faecal flotation, 10 g of the faecal sample was mixed with 50 ml of distilled water in a beaker and sieved through a sieve into an another beaker. The solute in the second beaker was put in a 20 ml centrifuge tube and then centrifuged at 1500 rpm for about 15 minutes. Then, the supernatant fluid was completely cast-off. In the next step, the saturated sugar solution was commingled into the tube and centrifuged again at 1500 rpm for 15 minutes. Subsequently, the tube was stuffed with a sugar solution; a coverslip was placed on the tube and placed on a glass slide for microscopic examination after 30 minutes of waiting. For the sedimentation method, 5 g of faeces was intermixed with 200 ml of water in a beaker and poured the mixture into a fresh beaker through a sieve. After 10 minutes, 75% of the supernatant fluid in the beaker was discarded and refilled the beaker with pure water. This phase was repeated 4-5 times until the supernatant fluid was crystal clear. 95% of the supernatant fluid was discarded. Lastly, one drop of the sediment was placed on the glass slide, and a coverslip was placed on the glass slide and examined under a high resolution microscope.

Results And Discussion

Out of the total faecal (338) inspected during the research analysis, 68.09 % were found to be positive for infections. Therefore, overall prevalence of endoparasites in both sheep and goats was found to be 68.9%. However, the prevalence of endoparasites tended to be higher ($p = 0.06$) in sheep (72%) as compared to goats (63.69%). The uniformity of occurrence of different species identified in small ruminants like sheep and goats are as presented in *Table 1* and *Table 2* respectively. A substantial variance ($p < 0.001$) was noted vis-à-vis to the prevalence of various species of parasites in sheep, Similar outcomes were also witnessed for goats as well. The pervasiveness of Haemonchus was higher ($p = 0.05$) in sheep as compared to goats. Correspondingly, Trichuris were more repeatedly ($p< 0.01$) found in the faecal samples of goats as compared to sheep. However, the prevalence of Coccidia was alike ($p > 0.05$) in both types of ruminant animals. On the other hand, *Nematodirus* and *Fasciola* were only spotted

in the faecal samples of sheep alone and were absent in the goats as unmistakably mentioned in the (Table 1). The higher prevalence of haemonchosis in sheep than goats may be attributed to a variability of aspects like ground grazing habit of sheep, relatively less cleanliness and extensive pasture grazing as compared with goats [23]. Haemonchus is a vigorous and joint nematode parasite and requires a special attention for its control [24]. It has been suggested that Haemonchus can attain higher resistance quicker than other gastrointestinal nematodes, like Trichostrongylus, because of its high biotic potential [25]. The outcomes of the current study show that Haemonchus, Trichuris and Nematodirus, Coccidia are completely prevalent in the Gwalior area and its nearby marginalised zones like *Pahadia* and *Kampoo* as mentioned above. It has also been described that Coccidia and other gastrointestinal nematodes as mixed or single infections are the major parasitic diseases of sheep and goats in tropical and temperate climates [26]. Oocytes of the endoparasites of sheep and goat are mentioned in the (figure 1 and figure 2) respectively. Meanwhile, Deceases due to the *Eimeria* species may also occur though lowered productivity due to poor growth is usually unnoticed by farmers.

Table 1*: Species-wise prevalence of gastrointestinal endoparasites in sheep.*

Name of Parasites	No. of samples positive	Relative Prevalence* (%)	Overall prevalence (%)
Haemonchus	50	80.7	58.1
Coccidia	30	51.6	37.2
Trichuris	20	32.3	23.2
Fasciola	02	4.4	2.32
Nematodirus	18	29.0	20.9

Table 2*: Species-wise prevalence of gastrointestinal endoparasites in Goat.*

Name of Parasites	No. of samples positive	Relative Prevalence* (%)	Overall prevalence (%)
Haemonchus	120	75.5	47.6
Coccidia	92	57.5	36.5
Trichuris	100	62.5	39.6
Fasciola	ND	ND	ND
Nematodirus	ND	ND	ND

INCLUSIVE PREVALENCE OF GASTROINTESTINAL PARASITIC INFECTIONS

The general preponderance of gastrointestinal parasitic infections in small ruminants like sheep and goat showed uniformity with the observation of *Hassan and Gadahi* [27] who recorded 61.4% in small ruminants in Ethiopia, 63.41% in Black Bengal goat in Chittagong district, Bangladesh and 63.50% in

small ruminants in and around Rawalpindi and Islamabad, Pakistan respectively. The previous observation was partially consistent with the reports of Khajuria et al, Dagnachew et al, Biu et al, and Asif et al [28-30] who reported 67.24 % in Jammu province, 47.67% in Ethiopia, 58.0% in the University of Maiduguri research farm in Nigeria and 65.7% in Pakistan, respectively. On the other hand, reflection of this study was greatly wide-ranging from Islam et al and Lima et al [31] who recorded 74.55% in different regions of Bangladesh and 82% in Brazil respectively. change in the occurrence of gastrointestinal parasites infection might be due to geo-climatic conditions, sample size, breed, age, mode of nutrition, behaviour, availability of host, foliage, grazing pattern, nurturing and husbandry dealings, deworming, gene resistance etc.

SEASON INTERRELATED PREVALENCE OF GI-PARASITES IN SMALL RUMINANTS

The cyclical upshot on gastrointestinal parasitism in small ruminants was found significant ($p<0.05$) throughout the year in Gwalior region of Madhya Pradesh. In all seasons (winter, summer, and rainy season), small ruminants like sheep and goat were infested with the Gastrointestinal parasites. Seasonal prevalence and concentration were highest in the rainy (72.4%) followed by the summer (61.8%) and winter season (56.7%) as stated in below mentioned figures (*Fig. 3 and Fig. 4*) respectively. The present outcome is approximately similar to the previous reports and results of Yadav et al [32] who reported that the higher prevalence was in the rainy season (88.5%), but contradictory to the reports of Biswas et al [33] who reported that the higher prevalence was in summer (84.6%), surveyed by rainy season (83.6%) and in the winter season (81.2%) in Bhola district, Bangladesh. The present result varied with the reports of Azhar et al [34] who described a greater incidence in spring (20.0%) followed by winter (13.0%), while the lower (9.0%) was recorded during summer in Pakistan. This might be due to the fact of change in the geographical zone of the study zones, the season of survey, and also the basics of methodology of the study [35].

Conclusion

The current study was performed in aiming to determine the seasonal prevalence of Gastrointestinal parasites and gastrointestinal parasitic infections of small ruminants like sheep and goat around Gwalior region of Madhya Pradesh, India. Small ruminants were infected by a variety of Gastrointestinal parasites, the majority of which were coinfections. An overall 68.9% infection was detected in small ruminants like (*sheep and goats*) in this study. Although the Incidence of Gastrointestinal parasites was relatively high. As the parasite amount was comparatively high in the study area, therefore appropriate handling and control measures should be provided as well. Further, molecular studies should be performed to know the genetic modifications in GI parasites between Gwalior and the rest of the other states in India. Prevalent agro-climatic conditions like excessive and overstocking of the animals, grazing of young and fully-grown animals together with unwell drained land provide ideal situations for spread of the endoparasites to build up a medical infestation of the host. The overall higher incidence of nematode infestation in the areas surveyed could be accredited to the lower immunity of hosts as a result of malnourishment. As the cattle rearing in that area under investigation largely depended on grazing in

worsened rangelands. It was also observed that farms in these areas were deficient in covering fences, sheep and goats used the same meadowland for grazing. Gastrointestinal parasitism and infection have been found mutually in sheep and goats which is now becoming a severe threat in the entire Gwalior zone. Therefore, Consistent control methods should be accomplished to reduce the parasitic burdens in the affected areas.

Limitation Of The Study

This study was conceded out to conclude the prevalence of GI parasites seasonally but the study doesn't disclose why some parasites were more predominant and others were not. This study is limited to definite parameters and some of the parts of the study were left untouched due to time and corona virus outbreak. Future researchers can elaborate this study by forthcoming to the untouched portion.

Recommendation

- More studies on gastrointestinal parasites in Gwalior city of Madhya Pradesh, India should be carried out.
- Precautionary control measures should be considered in the research study area to reduce the difficulty of gastrointestinal parasites by undertaking on a proper strategic dehelmintization program and good management practices.
- Awareness and enlightenment program to educate villagers as well as farmers should be instituted by the local government authority.

Declarations

CONTRIBUTIONS

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CONFLICTS OF INTEREST

The author affirms that there are no conflicts of interest.

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Figures

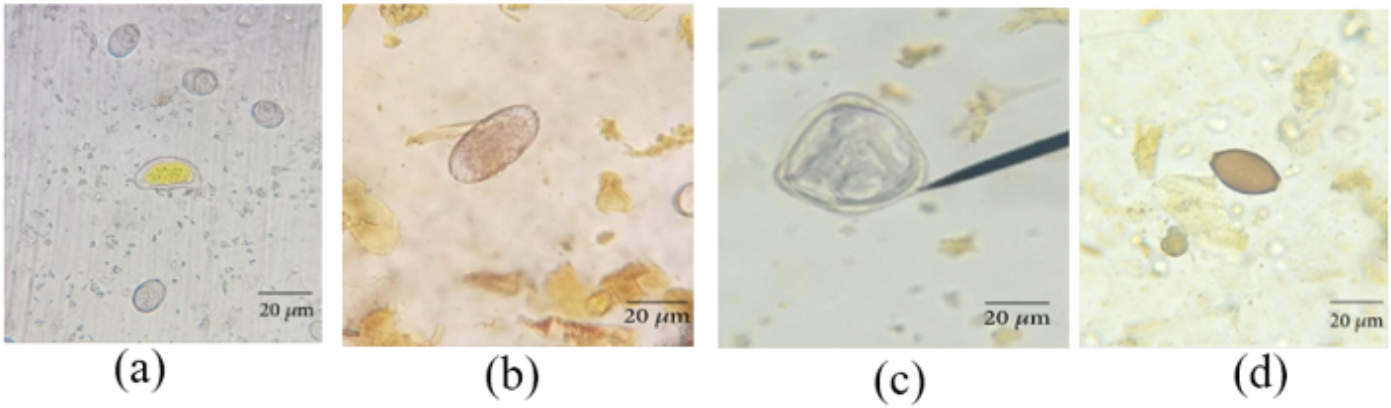

Figure 1

Oocyst/eggs of sheep: (a) Eimeria spp. (×400), (b) Trichostrongyles (×100), (c) Moniezia expansa (×400), and (d) Trichuris spp. (×400).

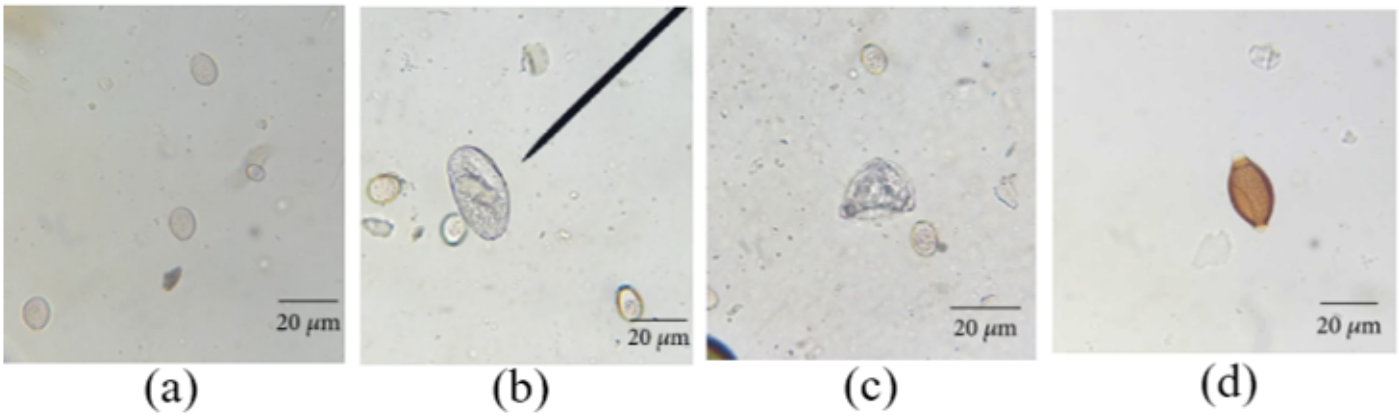

Figure 2

Oocyst/eggs of goat: (a) Eimeria spp. (×400), (b) Trichostrongyles spp. (×400), (c) Moniezia expansa (×100), and (d) Trichuris spp. (×400)

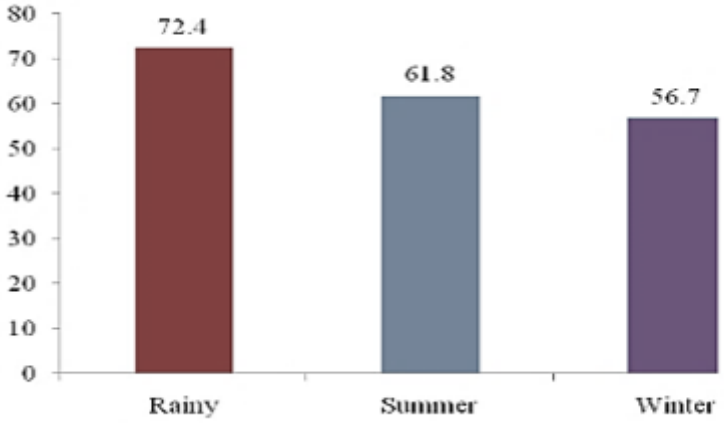

Figure 3

Cyclic incidence of Gastrointestinal parasites in sheep and Goat

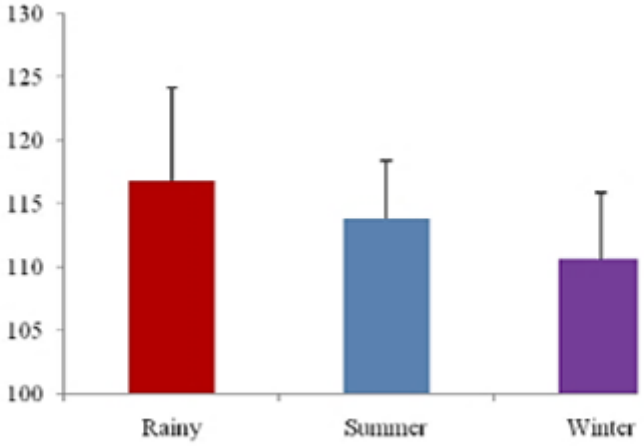

Figure 4

Cyclic incidence of (Faecal EPG) Gastrointestinal parasites in sheep and Goat.