



Haemato-Biochemical Profile and Prevalence of Gastrointestinal Parasitism in Migratory Gaddi Goats of Himachal Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. Author JS wrote the manuscript and did formal analysis. Authors AS, AK and DS designed the study. Authors NV prepared the original draft. Author DRW reviewed the final manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Gastrointestinal parasitism in goats is a prevalent and significant issue affecting livestock health and productivity in Himachal Pradesh. Goat rearing is a traditional occupation of the nomadic tribes in Himachal Pradesh. Small ruminants especially in hilly areas are often prone to infection with

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parasites. Sampling was done from migratory goats at selected site for further examination and it revealed that migratory goats in mid-hills around Palampur have high prevalence of gastrointestinal parasitism (Strongyle, Trichuris and Moniezia Spp.) with mean Egg Per Gram value of 1656 ± 136.40 in 30 goats out of the total 40 included in this study. Flotation method of faecal examination revealed greater incidence of GIT parasitism. There was significant reduction in Total Erythrocyte count, Haemoglobin, Packed Cell Volume and Mean Corpuscular Volume in infected goats as compared to healthy goats. Mean values of calcium, albumin, globulin, magnesium and iron were also found to be significantly decreased in infected group. Considering the high parasitic load during migration, regular deworming of the migratory goats is advised to keep them healthy and in good body condition.

Conclusion: Present study concluded that prevalence of GIT parasitism in migratory flock of goat was high when assessed at mid-hills altitude with various haematological and biochemical parameters below the normal range as compared to healthy animals. Considering the high parasitic load during migration regular deworming of the migratory goats is advised to keep them healthy and in good body condition.

Keywords: Migratory; gaddi; goats; parasitism; haemato-biochemical.

1. INTRODUCTION

Parasitic gastroenteritis is a significant yet often overlooked factor that hinders the productivity of small ruminants globally. India is predominantly an agricultural country and animal husbandry is an integral part of its economy. Himachal Pradesh too has about 90 per cent population that lives in rural areas (2011 census) and dependency on Agriculture/ Horticulture/ Animal Husbandry provides employment to the rural inhabitants. Goat rearing is a traditional occupation of the nomadic tribes in Himachal Pradesh. Migration is practiced since ancient times by the people living in mountain locked backward and tribal areas to find better fodder for their flocks. The traditional goat rearers are known as "Gaddis" and are semi-nomadic tribal Hindu group who practice long distance herding of sheep and goats from range to range and their flocks are migratory in nature through well-defined routes in Himalaya including alpine pastures [1]. These animals remain confined to the pastures of low plains of Himachal Pradesh during the winter season, but migrate to the alpine pastures during spring and summer seasons meeting the purpose behind small animal farming *i.e.* low investment and good output helping in sustaining the poor farmer's family. Small ruminants especially in hilly areas are often prone to infection with parasites *Trichostrongylus*, *Cooperia*, *Haemonchus*, *Strongyloides* and *Oesophagostomum* [2,3]. Parasitic gastroenteritis is mainly caused by nematode parasite, particularly strongyles which included Parasitic diseases have a special significance as they cause significant morbidity.

The condition is associated with severe diarrhea, anemia, lethargy, weight loss, tachycardia, tachypnea and death. Economic losses occur due to reduced wool, meat and milk output; slowed growth, illness, and mortality. Prevention and control of worms in sheep and goats depend solidly on anthelmintic drugs and chemical dewormers. Effective control of parasitic gastroenteritis in ruminants requires a multidisciplinary approach, combining chemotherapy, biological control, grazing management, worm vaccination, and host genetic resistance. Furthermore, gaining a deeper understanding of parasite epidemiology and its interaction with the host in specific management, production, and climatic conditions enables a more rational and sustainable control of the nematodes causing parasitic gastroenteritis. Therefore, present investigation was planned to study the effect of gastrointestinal (GIT) parasitism on haematological and biochemical profile in migratory goats.

2. MATERIALS AND METHODS

The study was conducted on a total of 40 Gaddi goats, aged above 1.5 years, out of the total 250 goats from the migratory flock belonging to Sh. Gheller Ram of village Chowki Khalet P.O. Thakurdwara Teh. Palampur temporarily stationed at old Vindhavasini location near Palampur (approx. 1350 m above mean sea level) in sub humid mid-hills zone. These goats included 10 goats found apparently healthy on clinical examination. The migratory route practised by the flock is given below:

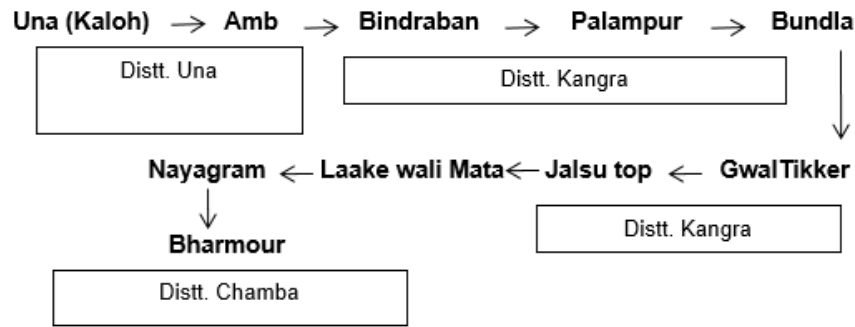


Chart 1. Migratory route practised by the flock

2.1 Collection and Analysis of Faecal and Blood Samples

Faecal samples from migratory goat flock were collected and screened for the presence of eggs of the gastrointestinal parasites. Five grams of faecal sample was collected directly from the rectum of each goat in a clean polythene bag. The faecal samples were analysed by Direct Smear Method and Flootation Technique for detecting eggs of GIT Parasites. The samples found positive for eggs were further subjected to assessment of Eggs per gram (EPG), as per procedure advocated by Gupta and Singla [4].

About 2 mL of blood was collected from the jugular vein in sterile vials containing EDTA for complete blood count (CBC). Another 5 mL blood was collected in heparinized syringe for plasma separation. Plasma was separated by centrifugation at 3000 rpm for 10 minutes and these plasma samples were preserved at -20°C in a deep freezer for further biochemical and mineral estimations.

2.2 Evaluation of Haemato-Biochemical Parameters

The haematological parameters were studied using an Auto-Haematology Analyser BC-2800 Vet (Manufactured by Mindray Medical International Limited, Shenzhen-China; Marketed by Fresenius Medical Care Private Limited, New Delhi). Parameters assessed were Haemoglobin (Hb) (g%), Packed cell volume (PCV) (%), Total erythrocyte count (TEC) ($\times 10^{12}/L$), Total leucocyte count (TLC) ($\times 10^9/L$), Mean corpuscular volume (MCV) (fL), Mean corpuscular haemoglobin (MCH) (pg) and mean corpuscular haemoglobin concentration (MCHC) (%). Biochemical parameters studied were glucose (mg%), total serum protein (TSP) (g/dL), albumin (g/dL), globulin (g/dL), Calcium (mg/dL),

Phosphorus (mg/dL), Iron ($\mu\text{g}/\text{mL}$) and Magnesium (mg/dL) using commercial reagent kits, based on spectrophotometric methods, through semi-automatic biochemical analyser Microlab 300 Clinical Chemistry Analyser (by Merck Limited, Mumbai). The results were compared with values obtained from healthy control. Data collected, was analysed statistically employing "t test" InStat software. Ten apparently healthy goats were selected as healthy group from the same flock. Only those goats were selected as healthy control in which EPG value was less than 500.

3. RESULTS AND DISCUSSION

30 goats were found positive for GIT parasitism and constituted infected group in present study. All of them had EPG above 1200. Prevalence of GIT parasites was found to be 86.6% (26/30) on direct smear examination and 93.33% (28/30) on floatation method (Table 1). Different types of eggs found were Strongyle, Trichuris and Moniezia.

Mean EPG value was found to be 1656 ± 136.40 as compared to 370.82 ± 92.08 of healthy control. There was significant reduction in TEC, Hb, PCV and MCV in infected goats as compared to healthy goats (Table 2).

The reduction in PCV, Hb and total erythrocyte may be due to acute loss of blood by sucking activity and haemorrhages caused by various parasites [5,6]. The decreased level of Hb and PCV during gastro-intestinal nematode infection in goats has also been reported by Pal *et al.* [7], Rajguru *et al.* [8] and Kar *et al.* [9]. The gastro-intestinal nematodes and cestodes infection has been reported to affect the normal digestion and assimilation in small intestine [10]. Mean values of calcium, albumin, globulin, magnesium and iron were found to be significantly decreased statistically in infected group when compared to healthy group (Table 3).

Table 1. Observation on faecal examination in infected group

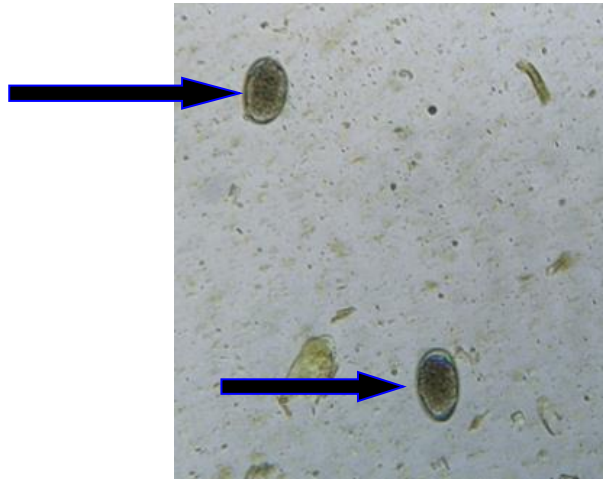
Total Samples in Infected Group	% Incidence On Direct Smear Method	% Incidence On Flotation Method	Types Of Parasites Found	Mean EPG
30	86.6% (26/30)	93.33% (28/30)	Strongyle, Trichuris and Moniezia	1656±136.40



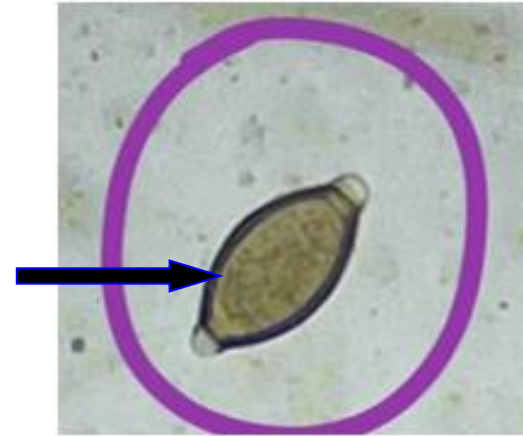
Fig. 1. Site of Sampling



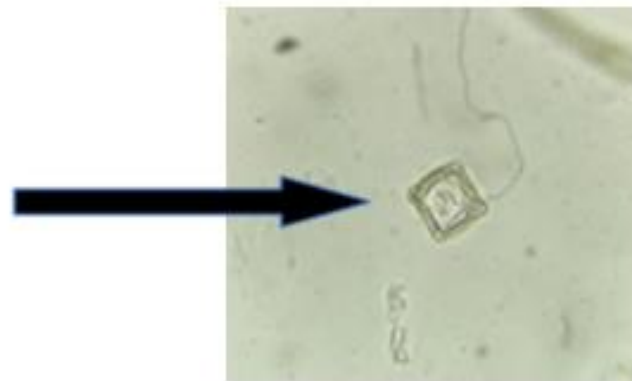
Fig. 2. Collection of Samples



Strongyle egg



Trichuris egg



Moniezia Egg

Fig. 3. Eggs of different endoparasite found

Table 2. Haematological Profile of Goats Infected with Gastrointestinal Parasitism and Apparently Healthy Goats

Sr. No	Parameters	Infected Goats (N=30)	Healthy Goats (N=10)
		Mean ±Se	Mean ±Se
1	TLC (10 ⁹ /L)	12.98±0.89	12.11± 1.030
2	TEC (10 ¹² /L)	14.77±0.46**	16.63± 0.25**
3	Hb (g/dl)	6.40±0.22***	9.18 ±0.25***
4	PCV (%)	24.40±0.91***	32.72 ±0.88***
5	Mean Corpuscular Volume (fl)	16.55±0.27***	21.19 ±0.45***
6	Mean Corpuscular Haemoglobin (pg)	4.78±0.16	4.93 ± 0.04
7	Mean Corpuscular Haemoglobin Concentration (g/dl)	28.49±1.06	29.90± 0.28

*Significant At 5% Level (P<0.05) **Significant At 1% Level (P<0.01) ***Significant At 0.1% Level (P<0.001)

Table 3. Biochemical Profile of Goats Infected with Gastrointestinal Parasitism and Apparently Healthy Goats

Sr. No	Parameters	Infected Goats(N=30)	Healthy Goats(N=10)
		Mean ±SE	Mean ±SE
1	Calcium (mg/dl)	7.86±0.26*	8.92 ± 0.41*
2	Phosphorus (mg/dl)	3.43±0.26	4.13±0.28
3	Albumin (g/dl)	3.28±0.15**	4.15 ± 0.23**
4	Globulin(g/dl)	2.98±0.16***	3.75±0.20***
5	Total Protein (g%)	6.26±0.31	7.90± 0.43
6	Iron (µg/ml)	1.45±0.41*	2.63 ± 0.23*
7	Magnesium (mg/dl)	2.6±0.06***	3.25 ± 0.04***
8	Glucose (mg%)	52.20±1.67	53.31 ± 1.90

*Significant at 5% level (p<0.05) **significant at 1% level (p<0.01) ***significant at 0.1% level (p<0.001)

The hypoproteinaemia and hypoalbuminemia in the affected animals could be attributed to protein losing gastroenteropathy in nematodiasis [11] and malabsorption of proteins from damaged intestinal mucosa in concurrent gastrointestinal infections [12]. The phosphorus and glucose level did not differ significantly [13].

4. CONCLUSION

Present study concluded that prevalence of GIT parasitism in migratory flock of goat was high when assessed at mid-hills altitude with various haematological and biochemical parameters below the normal range as compared to healthy animals. Considering the high parasitic load during migration, regular deworming of the migratory goats is advised to keep them healthy and in good body condition.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image

generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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