



Epidemiological Investigation of Mixed Parasitic Infections Associated with High Mortality in a Goat Herd in Punjab, India

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ABSTRACT

Gastrointestinal (GI) parasitic infestations are common in small ruminants (sheep and goats), causing considerable financial losses due to mortality and reduced production. An epidemiological investigation was initiated to determine the cause of the mortality at a farm in the Faridkot district of Punjab. A total of 50 goats, including 29 young ones and 21 adult goats, were involved in this study. The farm was inspected on 08 April, and data was collected regarding physical examination, clinical signs, and management practices. Symptomatic treatment was started on 08 April with ivermectin 0.2 mg per kg along with iron tonic, liver supplement, as the animals seemed anemic and had no deworming history in the last six months. To find the cause of death, four blood samples and 29 fecal samples were collected, out of which 28 samples were from clinically infected and one sample from a clinically healthy animal as control. The presence of parasite stages was identified based on their morphological characteristics. The data generated from the investigation were processed for further descriptive analyses. Out of the total of 50 animals, 25 (50%) goats were died; maximum mortality was found in goats less than one year of age, 68% (n=17), followed by the 1-2 year age group, 20% (n=5), and 12% (n=3) in adult goats, respectively. The most prevalent parasites were coccidia and strongylus. Even mixed infection of strongyle and coccidia had the highest prevalence (37.93%), followed by strongyle, coccidian, and moniezia (20.68%). The findings emphasized the importance of comprehensive parasite control programs in goat herds, including routine fecal monitoring, strategic deworming, coccidiosis prevention, and good management practices to reduce exposure.

Key Words: Coccidian, Deworming, Ivermectin, Moniezia, Strongylus,

INTRODUCTION

Goat entrepreneurs has a broad economic range, and poor farmers can easily rear goats (Meena *et al*, 2023; Das *et al*, 2024). Due to the low rearing cost, they play an essential role in providing a livelihood to rural families (Tiware *et al*, 2014; Bashir *et al*, 2023). India has seen rapid growth of goat population in the recent years with 148.88 million goats according to the 20th census, showing an increase of 10.1% over the previous census (Animal husbandry statistics, 2023). Out of which 347949 populations were recorded in Punjab (20th Livestock Census, 2019). Punjab is continuously leading in the goat sector. According to the 19th census, the goat population was 327272, which was increased by 6.31% in the 20th census (19th Livestock census, 2012). Endoparasites particularly of the Gastro-intestinal tract are very common among these small ruminants and accounts for huge economic

loss as a result of mortality and decreased production. Most commonly found endoparasites among small ruminants are helminths and coccidia (Waruiru *et al*, 1993; Ozung, 2011). Clinically it is characterised by cachexia, diarrhoea and anaemia, and is thought to be among the most devastating diseases of small ruminants as per economics are concerned (Chhabra and Pandey, 1992). Suspicion is primarily made based on poor animal husbandry management and increased mortality particularly among the young animals during the weaning period (Chartier and Paraud, 2012).

Among all these gastrointestinal parasites, nematodes are of major importance and causes huge economic loss. They remain as a major threat to the small ruminants by causing several effects such as hypoproteinaemia, decreased growth, decreased production, inappetence and indigestion (Gebhardt and Thomas, 2002; Luginbuhl 2015). Among the helminth

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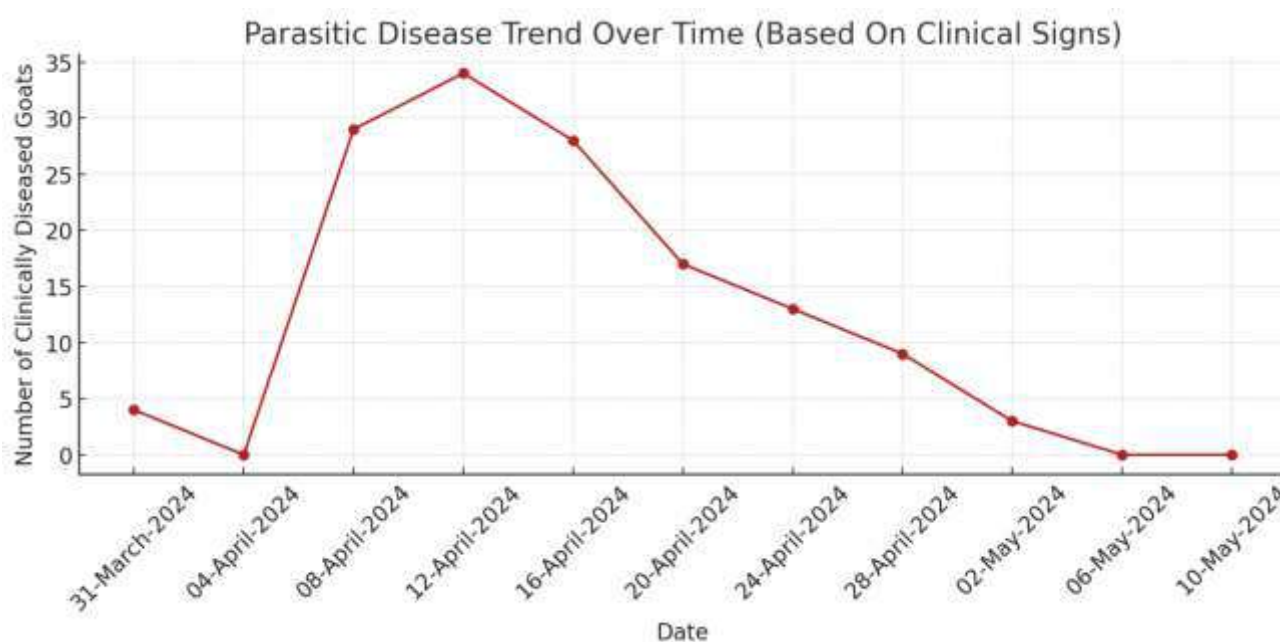


Fig. 1: Parasitic Disease Trend over Time (Based on Clinical signs)

parasites of small ruminants, *Moniezia expansa* is one of the most widely distributed cestodes found in every part of the world (Nama, 1990). Monieziasis is mostly associated with moderate infection, but occasionally severe infection can also occur and is associated with pot-belly, inability to gain weight, diarrhoea, anaemia, decreased production even mortality among the animals (Fagbemi and Dipeolu, 1983; Zhao *et al*, 2009; Yan *et al*, 2013). Kaur and Kaur (2008) reported that the overall prevalence of GI helminths among these small ruminants was 82% from Patiala and its nearby area, and the recorded parasites were *Trichostrongylus* sp. (78.57%), *Haemonchus* sp. (64.29%), *Strongyloides* sp. (57.14%), and *Oesophagostomum* sp. (42.86%). In the adjoining country, Pakistan, Gadahi *et al* (2009) reported the prevalence of *Haemonchus* (64.19%), *Trichuris* (35.48%), *Nematodirus* (13.00%), *Trichostrongylus* (4.51%), and *Strongyloides* (3.22%) in goat from Rawalpindi and Islamabad. As we know very well, parasites are an important factor in producing economic loss in goat rearing. An overview of the present work was designed to investigate the main parasitism and co-factors involved in a high infestation and high mortality rate due to mixed parasitic infection reported in a Goat Herd in Punjab.

MATERIALS AND METHODS

The area under study falls in the Faridkot district (Latitude 30.657256, Longitude 74.771290), the Southwest area of Punjab state. A gastrointestinal

infection and death rate in a goat farm was reported by a farmer on 08 April at the veterinary polyclinic, Faridkot, Punjab. The farm was rearing 50 goats mainly for milk and breeding purposes. A total of 50 goats, including 29 young ones and 21 adult goats, were involved in this study. Most of the animals were female, 78% (39), and 22% (11) were male. According to the history provided by the farmer, four goats died from 31 March to 04 April 2024. The farm was inspected on 08 April, and it was found that 12 animals were affected. Data was collected regarding physical examination, clinical signs, management practices, history of recent purchase or sale, vaccination, deworming, feeding practices, mortality, and quarantine history. To combat clinical signs, a symptomatic treatment was started on 08 April with ivermectin 0.2 mg per kg along with iron tonic, liver supplement, as animals seemed anaemic, inappetent, and had no deworming history in the last six months. To find the cause of death, four blood samples and five faecal samples were collected on 10 April, and 24 faecal samples were collected on 16 April. Twenty-nine faecal samples were collected, out of which 28 samples from animals having clinical signs and one sample from a clinically healthy animal were collected as controls. Faecal samples were collected per-rectally and were placed in a faecal container. All the containers were properly marked for sampling date, age of the animal, identification number or mark if any and sex. The samples were transported on the same day to the polyclinic in Faridkot for examination. Findings at the

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Table 1: Results of fecal flotation method technique of 29 samples

Sr. No.	Gender	Age	Result
	M= Male F= Female		Qualitative (ova/oocyst)
1	M	2.5 years	Coccidia
2	F	04 months	Strongyle, Coccidia
3	F	02.5 years	Strongyle, Coccidia
4	F	05 months	Strongyle
5	F	03 months	Coccidia
6	F	05 months	Strongyle
7	F	06 months	Strongyle, Monezia
8	F	07 Months	Strongyle, Coccidia, Monezia
9	F	1.5 years	Strongyle, Coccidia
10	F	1.5 years	Strongyle, Coccidia, Monezia
11	F	02 years	Strongyle, Coccidia, Monezia
12	F	06 months	Strongyle, Coccidia
13	F	06 months	Strongyle, Monezia
14	F	03 years	Strongyle, Monezia, Strongyloides
15	M	06 months	Strongyle, Coccidia, Monezia
16	F	1.5 years	Strongyle, Strongyloides
17	F	05 months	Strongyle, Coccidia
18	M	04 years	Strongyle, Coccidia
19	F	2.5 years	Negative
20	F	08 months	Strongyle, Coccidia, Monezia
21	F	02.5 years	Strongyle, Coccidia
22	F	04 months	Strongyle
23	F	01 year	Coccidia
24	F	2.5 years	Strongyle, Coccidia, Monezia
25	F	06 months	Strongyle, Coccidia
26	F	06 months	Coccidia
27	F	02 months	Strongyle, Coccidia
28	F	06 months	Strongyle, Coccidia
29	F	06 months	Strongyle, Coccidia

investigation site was such that the farm condition was unhygienic, goats were reared on an intensive farming system, and deworming was not done in the past six months. Goats had poor body condition, a sign of poor nutrition and animal husbandry practice.

Examination of samples

About 3 g of faecal sample from each animal was mixed with 45 mL of flotation fluid, sodium chloride (1.2 specific gravity) (Dryden *et al*, 2005). Parasite stages (eggs or larvae of helminths, oocysts of coccidia) were identified based on their morphological characteristics (Urquhart *et al*, 1996; Van Hautert *et al*, 1996) using 10× and 40× magnification. Blood samples were examined through a private laboratory.

Statistical analysis

The data generated from the investigation were entered in a Microsoft Excel (2007) worksheet,

and was processed for further analyses. For each parasite species, prevalence was calculated as the number of goats infected with that parasite divided by the herd total, expressed as a percentage. Mixed infection prevalence was calculated as the proportion of goats harbouring more than one parasite species. Descriptive statistics (frequencies, percentages) were compiled for clinical signs and outcomes (e.g., mortality rate). The parasitic disease trend was analyzed using R statistical software.

RESULT AND DISCUSSION

In the present investigation a total of 50 goats were analyzed. Among these majority of the goats were female n=39 (78%), and n=11 (22%) was male. 58% (n=29) goats were less than one year old, 18% (n=09) were between 1 and 2 years of old, and 24% (n=12) goats were more than 2 years of old. Out of a total of 50 animals, 44 were got infected, out of which 19 (43%)

goats recovered successfully from the infection. Out of the total population (n=50) total mortality was 50% (n=25); maximum mortality was found in goats less than one year of age, 58.6% (n=17/29), followed by the 1–2-year age group, 55.5% (n=05/09), and 25% (n=3/12) in adult goats, respectively. Gender, female, showed a high mortality rate that was 51.2% (n=20/39) as compared to male 45.45% (n=5/11) in this study. The possible reason for higher infection in young animals might be due to a lower immune status as compared to the adult goats, which have acquired natural resistance due to repeated infection. These findings were similar to Talukdar, 1996 and Pundlikrao, 2009 (The prevalence of helminths was 78.13%, 60.87%, 41.87% and 57.14% respectively among goats below 1 year, between 1 to 2 years, between 2 to 4 years and above 4 years). In the present study higher infection rate were observed among the female goats as compared to the male goats, which is similar to many other researchers (Prevalence of Gastrointestinal parasites was 85.97% in females and 69.23% in males) and possible reason might be due to different physiological factors like gestation, lactation which leads to decrease in the immune potential of the animal (Singh *et al*, 2017).

All cases in this analysis occurred in early summer (31 March to 10 May, 2024), which is typically a peak season for parasites given warm weather (Maximum temperature 31–37 °C in March and April) (Anonymous, 2024). In this study, seasonal variation was not compared as the epidemiological study was only evaluated during the summer season. Many other previous studies were in the agreement of the finding that highest incidence of the disease was noticed during peak summer with humid conditions (Talukdar, 1996) which is due to the sustainability and reproduction of the parasites (The rate of infection was highest (35.34%) in summer and lowest (13.95%) in winter). Based on clinical history, the first four cases of parasitism were reported between 31 March to 04 April, then surge of 29 cases was reported till 04–08 April 2024, which further increased up to 34 cases till 12 April then a down fall of cases started as symptomatic treatment was initiated using Ivermectin and Fenbendazole combination, hematinic and liver tonics as per body weight from 08 April, after diagnosis of parasitic infection. Amprolium was further added in treatment for the control of coccidiosis @ 50mg/kg from 11 April, which led to recovery in the flock, as Amprolium was a line of treatment for the control of coccidiosis (Fig. 1).

Fecal examinations confirmed GI parasitic infections in all goats (n=28), those having clinical symptoms, except one sample (control) out of the total 29 samples. The identified parasite species is summarized in Table 1. The most prevalent parasites were coccidia and strongylus. Strongyle and coccidia mixed infection had the highest prevalence 37.93% (n=11), followed by strongyle, coccidian and moniezia 20.68% (n=06), coccidian 13.79% (n=04), strongyle 10.34% (n=03), strongyle and moniezia 6.89% (n=2), other mixed parasite (strongyle, moniezia and strongyloides), and (strongyle and strongyloides) were 3.44% (n=1 each) respectively. As shown above, coccidial infection was detected in the majority of goats, n=21 (72%). This is expected, as coccidia are ubiquitous in goats.

Nearly all infected goats (n=44) were presented with weight loss or poor body condition, lethargy. Out of 44 infected goats 77.27% of goats showed emaciation, 65.9% showed pale mucous membranes (a sign of anemia). Approximately 56.81 % of the goats exhibited inappetence and diarrhea. Submandibular edema (“bottle jaw”), indicating severe hypoproteinemia and anemia in 6.81% of goats that were infected in this study. Those with the heaviest parasite burdens and severe clinical signs (severe anemia, hypoproteinemia, etc.) did not survive, despite treatment. The present study showed a high prevalence of strongyle and coccidia infection in the herd, which might be due to the large number of species in the genus and coccidiosis due to poor hygienic practices followed in the shed. The presence of diarrhea, weight loss, anemia and bottle jaw in the animals were similar to the previous reports.

The prevalence of coccidia and other gastrointestinal nematodes may be due to no prior administration of dewormers and coccidiostat drug by the farmer. This proves that the climatic conditions were favoring development of parasites and its propagation. Apart from this constant exposure to infections, continuous deposit of infections material on the pasture land by the adult ruminants and poor management practices as discussed earlier.

CONCLUSION

The present investigation revealed that unhygienic animal husbandry conditions and improper deworming status were the major factors for the prevalence of helminths and coccidia, that could lead to a high mortality. The findings emphasize the importance of comprehensive parasite control

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programs in goat herds, including routine fecal monitoring, strategic deworming, coccidiosis prevention, and good management practices to reduce exposure. Moreover, the seasonal pattern of parasitic infection needs to be investigated, which will help in the preparation of suitable control strategies, ultimately helpful for goat rearing in Punjab.

Ethics statement: As this was a disease investigation, data collection and treatment were involved in this study; no laboratory animal was used or sacrificed in this study. So, ethical permission was not required in this study.

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