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Gastrointestinal parasitism: Prevalence and associated determinants in Osmanabadi goats of Chhattisgarh plains

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Abstract

Gastrointestinal (GI) parasitism in animals causing anaemia, emaciation, diarrhoea, oedema, and death is a major constraint to the development of livestock sector. The present study was carried out to ascertain prevalence of GI parasites in Osmanabadi goats of Durg district of Chhattisgarh. A total of 1003 faecal samples of Osmanabadi goats were collected and screened from November, 2021 to October, 2022 for detection of eggs of gastro-intestinal helminths and Oocysts of protozoa using floatation and sedimentation techniques. Out of 1003 samples, 892 (88.93%) were found positive for single or mixed infection of gastro-intestinal parasites. Among various infections, Strongyle was predominant (37.48%) followed by Coccidia (19.94%), amphistomes (10.97%), *Trichostrongylus* (9.97%), *Moniezia* spp. (9.27%) and *Strongyloides* (1.30%). The percentage of goats that suffered from mixed infection was 66.50 in comparison to 22.43 of single infection. The seasonal prevalence of infection was found to be significantly higher ($p < 0.01$) in monsoon (92.44%) and lowest in winter (79.54) season. The infection percentage was significantly higher ($p < 0.05$) in goat kids (93.10%) in comparison to adult goats (87.87%). On Coproculture, *Haemonchus contortus* was observed as the chief Strongyle while *Oesophagostomum* and *Trichostrongylus* followed subsequently. The study indicates that there is a high prevalence of GI parasites in Osmanabadi goats of plain region of Chhattisgarh especially in monsoon season that necessitates development and implementation of suitable control measures.

Keywords: Gastrointestinal parasites, Osmanabadi goats, season, Strongyle, Coccidia, prevalence, age, Chhattisgarh

1. Introduction

The goat population of India numbering 148.88 million accounts for 13.35% of the total meat produced in the country (Livestock census, 2019) [11]. The Durg district, located in the plain region of Chhattisgarh possesses 61,499 goats (Livestock census, 2019) [11]. Goats are of considerable economic importance due to their shorter generation intervals, high rate of prolificacy and easiness in marketing their products. They play a significant role in the food chain and the overall livelihood of rural households (Di Cerbo *et al.*, 2010) [5]. However, there is unequivocal evidence that goats are vulnerable to gastrointestinal (GI) parasitic infections that pose a serious health risk, consequently causing substantial economic losses due to mortality and morbidity in infected animals (Sanyal, 1996) [18]. In goat production, a reduction in the profitability of up to 15% and weight loss of up to 50% due to gastrointestinal parasites has been reported by Bhat *et al.* (2012) [2]. Various factors such as climate changes due to global warming, emerging anthelmintic resistance and poor herd management practices propagate parasite development and cause wide spread prevalence of gastrointestinal parasites (Martinez *et al.*, 2015) [13]. The present work was designed to assess the gastrointestinal parasitic burden in Osmanabadi goats of the plain region of Chhattisgarh to generate epidemiological data for developing efficacious control and management strategies.

2. Materials and Methods

The present study was conducted at the College of Veterinary Science and Animal Husbandry, Durg, Chhattisgarh. Durg district is situated between latitude 21° 11' N and longitude 81° 17' E and is 317 meters above mean sea level. Over the course of the year, the temperature of Durg typically varies from 13.89 °C to 41.11 °C and is rarely below 11.11 °C or above 44.44 °C. The district receives an average annual rainfall of 1052 mm.

Osmanabadi goats of Maharashtra origin are primarily raised for meat purpose. They are hardy and considerably resistant to adverse climatic conditions.

The animals under study were reared in the goat farm of the institute under semi-intensive type of management system which comprised of five-six hours of grazing and stall feeding with green fodder and concentrate mixtures. Deworming in goats was performed twice in a year *viz.*, in the pre-monsoon and post monsoon season. The goat kids were administered anti-coccidial drugs at three weeks of age and then repeated at two months of age.

For Coprological examination, faecal samples of 1003 Osmanabadi goats (800 adults and 203 kids) were collected from Durg district of Chhattisgarh from November, 2021 to October, 2022. The study was conducted in the three different seasons *viz.* winter (November–February), summer (March–June) and monsoon (July–October). On the basis of their age, the goats were divided into two groups as kids (<12 months of age) and adults. On collecting the faecal samples directly from the rectum, qualitative investigation was performed using floatation and sedimentation techniques for detection of parasitic eggs and/or oocysts (Zajac and Conboy, 2012) [28]. For obtaining the third stage infective larvae (L₃), coproculture of faecal samples found positive for strongyle group of nematodes was performed. For this, sufficient quantity of activated charcoal was mixed with the pooled faecal samples and then placed in 250 ml cylindrical glass jar covered with a muslin cloth and incubated at 22-25 °C for 7 days as per the procedure described in MAFF (1986) [12]. The mixture was moistened daily by spraying with water and the third stage larvae were subsequently harvested. The strongyle infective larvae (L₃) were identified using morphological keys as mentioned by Knoll *et al.* (2021) [9] and Soulsby (1986) [24]. The data corresponding to the present study was statistically analyzed by Chi-square test.

3. Results and Discussion

The present investigation revealed that gastrointestinal parasitic infections prevailed throughout the year in Osmanabadi goats. On examination of faecal samples of 1003 goats, 892 (88.93%) samples were found positive for single or mixed infection of gastrointestinal parasites *viz.*, Strongyles (37.48%), Coccidia (19.94%), amphistomes (10.97%), *Trichostrongylus* (9.97%), *Moniezia* spp. (9.27%) and *Strongyloides* spp. (1.30%) (Fig.1). The high prevalence of gastro-intestinal parasites observed in these goats is in agreement with the independent studies reported from various parts of India, with prevalence rates of 96% in tarai region of Uttarakhand (Pant *et al.*, 2009) [15], 94.48% in Madhya Pradesh (Singh *et al.*, 2015) [21], 86.11% in Uttar Pradesh (Verma *et al.*, 2018) [25], 83.43% in Tamilnadu (Satish *et al.*, 2018) [19], etc. In goats of Durg district of Chhattisgarh, Pathak and Pal (2008) [16] observed an overall prevalence of gastrointestinal helminths to be 85.22%. In the current study, goats were reared under semi-intensive type of management system which increased their chances of exposure to contaminated feed and water through open grazing and browsing pasture that probably might have lead to high rate of gastrointestinal parasitism. Predominance of strongyle spp. was revealed in our present study which is in concordance with the observations of Das *et al.* (2017) [21]; Olanike *et al.* (2015) [14]. Faecal culture of samples identified the presence of *Haemonchus contortus* (83.65%), *Oesophagostomum* spp. (10.83%), *Trichostrongylus* spp. (3.20%) and *Strongyloides* spp. (2.32%) larvae in all the three seasons of the study period (Table 1). In India, *H. contortus* is the major Strongyle found in goats (Laha *et al.*, 2013) [10] while *Oesophagostomum* spp. and *Trichostrongylus* spp. are also widely reported nematodes (Das *et al.*, 2017) [21].

Table 1: Proportion (%) of Strongyle infective larvae in Coproculture of Osmanabadi goats

Season	<i>H. contortus</i>	<i>Oesophagostomum</i> spp.	<i>Trichostrongylus</i> spp.	<i>Strongyloides</i> spp.
Summer	250	31	9	6
Rainy	268	38	12	8
Winter	239	29	8	7
Total (%)	757 (83.65%)	98 (10.83%)	29 (3.20%)	21 (2.32%)

On comparing the occurrence of mono and mixed infections, the percentage of goats that suffered from mixed infection was 66.50 (667/1003) while those from single infection were 22.43 (225/1003) (Fig.2). The results revealed that 386 (38.48%) Osmanabadi goats harboured mixed infection of helminths and Coccidia (Fig.3) whereas 281 (28.02%) goats had mixed infection of helminths only (Fig.4). Dixit *et al.* (2016) reported mixed infection of gastrointestinal parasites in 87.32% goats of Madhya Pradesh.

The seasonal influence on percent prevalence of various gastrointestinal parasites is depicted in Table 2. Prevalence of gastrointestinal parasitic infection in Osmanabadi goats was significantly higher ($p < 0.01$) in monsoon (92.44%) followed by summer (89.01%) and winter (79.54%) season and is in accordance with the reports of Sorathiya *et al.* (2017) [23] and Dhara *et al.* (2015) [4]. On the contrary, highest occurrence of GI parasites in goats of West Bengal was observed during winters by Sahay *et al.* (1996) [17] which may be ascribed to

different climatic conditions eastwards of India. Strongyle infections were found to be significantly higher ($p < 0.01$) in monsoon (44.70%) than winter (34.09%) and summer (29.94%). The most probable reason is that in rainy season there is increased pasture larval burden which is either due to humid tropical environment that are conducive for the survival and development of pre-parasitic stages or due to reduced pre-patent period of the strongyle worms in monsoon (Pathak and Pal, 2008) [16]. Coccidia infections were least during the dry spell of the year i.e. summer (17.03%) and winter (20.45%) while maximum in monsoon season (22.03%); similar trend of prevalence was mentioned by Kantzoura *et al.* (2012) [7] and Sharma *et al.* (2009) [20]. Due to high humidity and ambient temperature, monsoon season is more favourable for the sporulation of Oocysts of Coccidia so the clinical disease is mostly evident in kids just after rains (Singh and Swarnkar, 2010) [22].

Table 2: Seasonal prevalence of gastro-intestinal parasites in Osmanabadi goats in Durg

Prevalence (%) of gastro-intestinal parasites								
Season	Total samples	Infected (%)	Strongyle	Coccidia	Amphistome	Trichuris	Moniezia	Strongyloides
Winter	176	140 (79.54)	60 (34.09)	36 (20.45)	16 (9.09)	16 (9.09)	10 (5.68)	2 (1.14)
Summer	364	324 (89.01)	109 (29.94)	62 (17.03)	60 (16.48)	30 (8.24)	59 (16.21)	4 (1.09)
Rainy	463	428 (92.44)	207 (44.70)	102 (22.03)	34 (7.34)	54 (11.66)	24 (5.18)	7 (1.51)
X ² value (df= 2)		21.549**	20.004**	3.22	18.20**	2.84	32.71**	0.31

s** - Highly significant ($p < 0.01$)

The percent prevalence of amphistomes was observed to be significantly high ($p < 0.01$) in summer (16.48%) in comparison to winter (9.09%) or rainy (7.34%) season and the results are in concurrence with the findings of Bansal *et al.* (2015) [1]. In summer season, due to availability of palatable grass around small areas of collected water bodies, there is concentration of goats, snails and metacercariae (Soulsby, 1986) [24] which is possibly a major reason for increased incidence of amphistomosis during this time of the year. Infection rates of *Moniezia* spp. in Osmanabadi goats was

observed to be significantly high ($p < 0.01$) in summer (16.21%) as opposed to winter (5.68%) or monsoon (5.18%) season and the results are consistent with that described by Khajuria *et al.* (2013) [8]. Wehner *et al.* (2018) [27] reported that at higher air temperatures there is increased dispersal ability of adult Oribatid mites, thus the fact may justify for high prevalence of monieziosis in summer. Seasonal prevalence of *Trichuris* spp. was revealed to be highest in rainy (11.66%) followed by winter (9.09%) and summer (8.24%).

Table 3: Age-wise prevalence of gastro-intestinal parasites in Osmanabadi goats of Durg

Prevalence (%) of gastro-intestinal parasites								
Age	No. of samples	Infected (%)	Strongyle	Coccidia	Amphistome	Trichuris	Moniezia	Strongyloides
Kid (<1year)	203	189 (93.10)	71 (34.97)	52 (25.62)	12 (5.91)	15 (7.39)	35 (17.24)	4 (1.97)
Adult (>1year)	800	703 (87.87)	305 (38.12)	148 (18.5)	98 (12.25)	85 (10.63)	58 (7.25)	9 (1.13)
X ² value (df= 1)		4.497*	0.685	5.13*	6.66**	1.89	19.21**	0.90

* - Significant ($p < 0.05$), ** - Highly significant ($p < 0.01$)

Age wise prevalence study exhibited that overall gastrointestinal parasitic infection was significantly higher ($p < 0.05$) in kids (93.10%) in comparison with adult goats (87.87%) (Table 3) and the result is in agreement with the observations of Singh *et al.* (2015) [21] from Madhya Pradesh. Goat kids are more prone to infection whereas adult goats develop acquired immunity due to frequent exposure to the parasites (Vieira *et al.*, 2014) [26]. The incidence of coccidiosis was significantly higher ($p < 0.05$) in kids (25.62%) than adults (18.5%). In kids, an exposure to initial infection leads to

maximum output of Oocysts and on repeated exposure immunity supervenes, so Oocyst number is considerably reduced. Similarly, prevalence of Monieziosis was significantly higher ($p < 0.01$) in kids (17.24%) in comparison to adult goats (7.25%). However, the infection percentage of Amphistome was significantly higher ($p < 0.01$) in adults (12.25) as opposed to kids (5.91). This could be ascribed to the lesser exposure of kids to the contaminated grazing pasture as compared to adults and thus accounts for the discrepancy of the results observed in the present study.

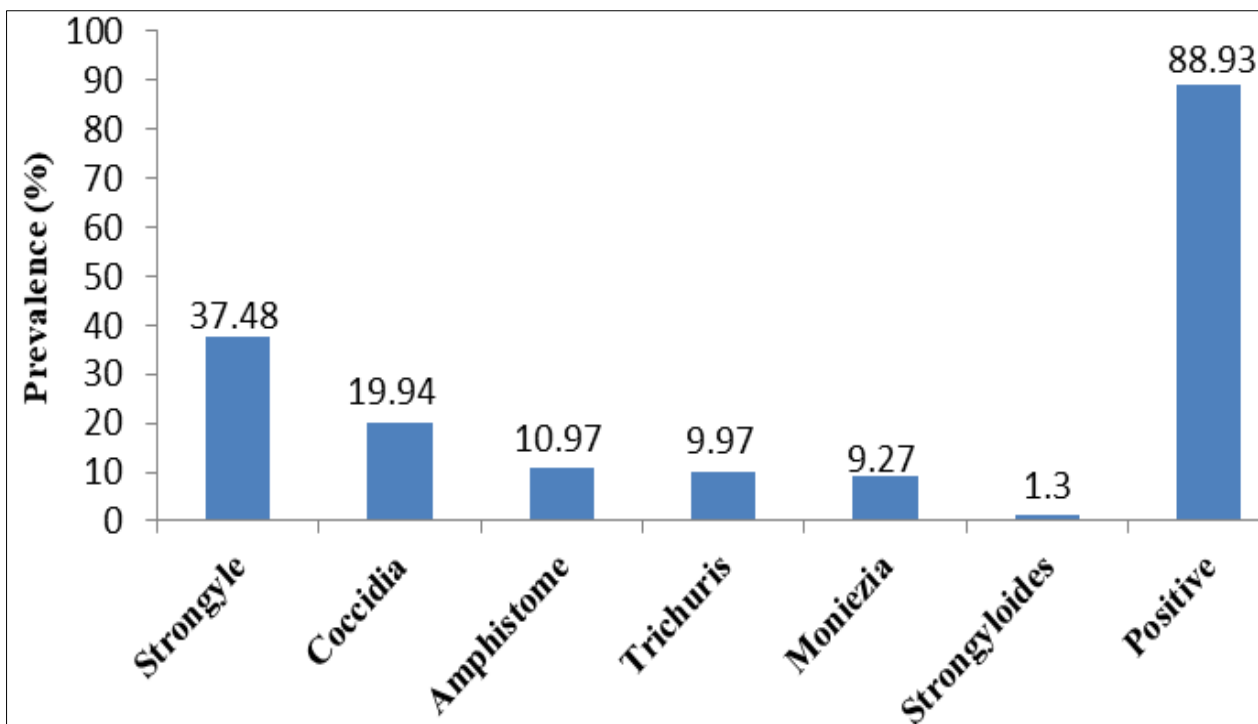


Fig 1: Prevalence of gastro-intestinal parasites in Osmanabadi goats

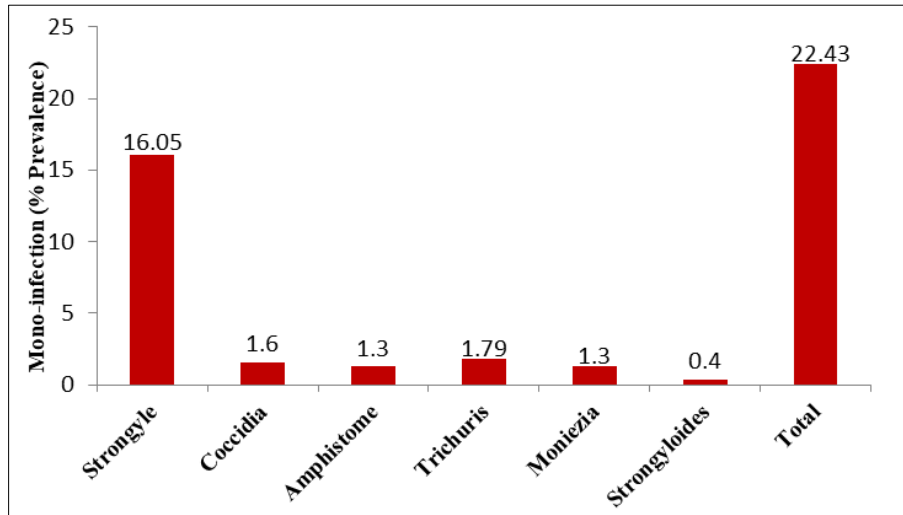


Fig 2: Mono infection of gastrointestinal parasites in Osmanabadi goats

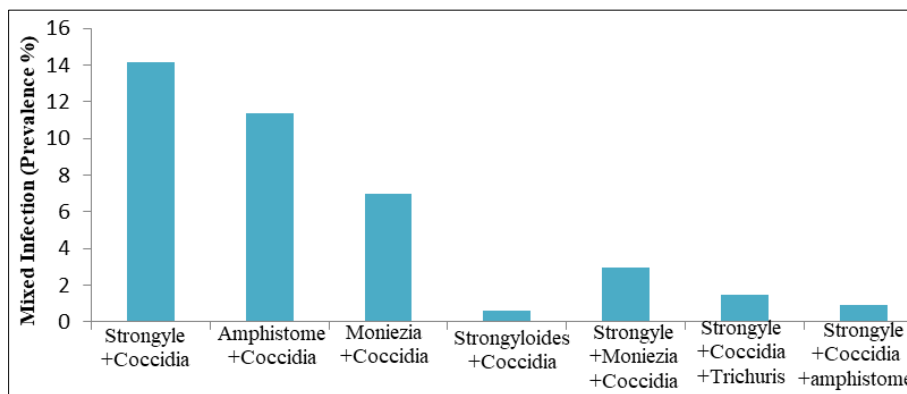


Fig 3: Mixed infection of GI helminths and Coccidia in Osmanabadi goats

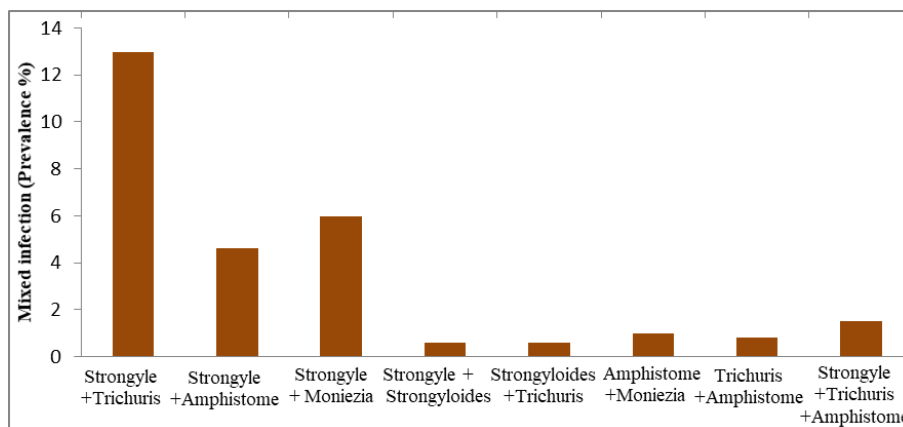


Fig 4: Mixed infection of GI helminths in Osmanabadi goats

4. Conclusion

The current study concludes that gastro intestinal parasites are highly prevalent (particularly *Haemonchus* and *Coccidia*) in Osmanabadi goats of Durg district of Chhattisgarh. The climate of this region is exhibited to be conducive for the development and propagation of GI parasites throughout the year. However, other possible determinants include constant exposure to infections, frequent and inappropriate use of anthelmintics and poor animal husbandry practices. Present investigation revelations on season wise and age wise pattern of the prevalence of these parasitic infections will certainly help in development and implementation of appropriate control and management strategies, to meet out profitable goals in goat industry.

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