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Research Article

PREVALENCE OF GASTROINTESTINAL PARASITIC INFECTIONS OF SMALL RUMINANTS IN AND AROUND VIZIANAGARAM DISTRICT, ANDHRA PRADESH, INDIA

K. Srinivasarao[1], P. Ramadevi[1*], V. Tejaswani[2], B. Rajeev Kumar[3]

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ABSTRACT: Gastrointestinal parasites cause major economic losses to the small ruminant farming community in terms of morbidity, and mortality. The current study was conducted in and around areas of Vizianagaram District of Andhra Pradesh to determine the prevalence of gastrointestinal parasitic infections and associated risk factors (species, age, management practices, etc.) in small ruminants. A total of 520 fecal samples were collected from sheep (N= 313) and Goats (N= 207) and were subjected to microscopic examination for the identification of eggs/oocysts of helminths and protozoa. Out of 520 samples examined 369 were found to be positive for one or more gastrointestinal parasitic infections with an overall prevalence of 71%, where in Strongyles sp. (23.7%) were predominant followed by Amphistomes (21.5%), *Strongyloides* sp. (6.5%), *Eimeria* sp. (6.2%), *Moniezia* sp. (5%), *Trichuris* sp (1.9%) and *Skrjabinema* sp. (0.4%). The prevalence of GI parasites was found to be higher in sheep (77.6%) than in goats (60.9%). Young animals in this study area had a higher prevalence rate than adult animals. Animals from the farms with regular deworming practices had fewer GI parasites when compared to farms with no regular deworming practices. Animals reared under a free-ranging system had a higher rate of prevalence when compared to semi-intensive farming.

Keywords: Gastrointestinal parasites, Prevalence, Small ruminants, Vizianagaram.

INTRODUCTION

Small ruminant rearing contributes significantly to the economy of India as well as Andhra Pradesh and provides livelihood to the millions of resource-poor rural households. Sheep and goat rearing ensures food and nutrition security to the farmers and thus helps to alleviate poverty and smooth income distribution [1]. Gastrointestinal (GI) parasites remain a major cause of concern for income generation in small ruminant farming communities in terms of morbidity, mortality, reduced weight gain, production losses, and reduced reproductive performance [2]. Prophylaxis against gastrointestinal parasites plays a greater part in economic losses [3]. Common GI parasites in sheep and goats are strongyles, strongyloides, paramphistomes, tapeworms, and coccidia [4]. Reduced weight gain, and wool and milk production are mainly caused by anorexia, reduced feed intake, loss of blood and proteins in the gastrointestinal tract, alterations in protein metabolism, depressed levels of minerals and intestinal enzymes, and diarrhea [5]. Clinical signs in chronic conditions include off-feed, diarrhea, weight loss, anemia, bottle jaw condition, and death whereas acute infections cause mortality without clinical signs [6]. The predisposing factors for GI parasite infections include age, sex, species, immunity, the life cycle of the parasite, agro-climatic conditions (climate, weather, season, type of vegetation, and microclimate), and management practices [7]. Epidemiological studies on gastrointestinal parasitism are a prerequisite for designing effective and economic control measures. The present study aimed to identify the prevalence and associated epidemiological factors in small ruminants.

[1]Assistant Professor, Department of Veterinary Parasitology, [2]Assistant Professor, Department of Animal Genetics and Breeding, [3]Assistant Professor, Department of Veterinary Physiology and Biochemistry, College of Veterinary Science, Garividi, Andhra Pradesh, India.
** Corresponding author. e-mail: rams.vet36@gmail.com*

MATERIALS AND METHODS

Study area

Vizianagaram district is situated in the north coastal area of Andhra Pradesh in the Eastern Ghats (18.1159º N 83.406ºE) with an aerial extent of 6,539 km^2. The district has a tropical savanna climate with a normal annual rainfall of 1131 mm. The mean daily maximum and minimum temperatures are 35ºC and 27ºC respectively, with a mean monthly humidity of 79% [8].

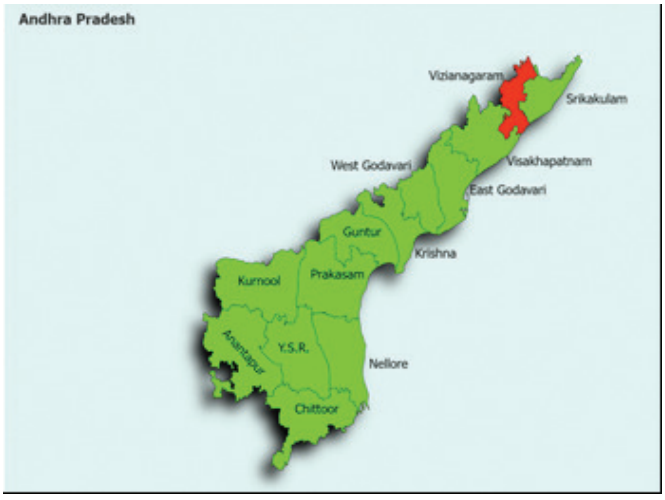

Fig. 1. Location of samples collected for present study.

Collection of fecal samples

A total of 520 fecal samples were collected from sheep (non-descriptive) (313) and goats (including Breeds) (207) in and around areas of Vizianagaram District of Andhra Pradesh from February 2022 to December 2022 (Fig. 1). All the samples are collected directly from the rectum of an individual animal in to clean plastic containers, labeled with an identification number, species, sex, and age and brought to the laboratory at Department of Veterinary Parasitology, College of Veterinary Science, Garividi.

Fecal examination and analysis

A gross examination of all the samples was done to identify any parasitic forms such as segments or worms as well as for the consistency, color, odor, presence of blood and mucous, etc. All the samples were processed and screened microscopically (10x and 40x) by direct smear examination, floatation technique, and sedimentation technique for the presence of ova/cysts/oocysts/larvae of parasites [5]. Based on the morphological features identification of ova/oocysts of the parasites was made [5]. Data was analyzed using the Graphpad fischer's exact test calculator (https://www.graphpad.com/quickcalcs/contingency2/) to determine significant variation among variables. The level of significance is considered when *p≤0.05, **p≤0.01 and ***p≤0.001.

RESULTS AND DISCUSSION

Overall prevalence

In the present study, 369 samples out of 520 samples examined were found to be positive for different gastrointestinal parasite eggs/oocysts with an overall prevalence of 71% (Table 1). Similar findings were reported previously [9, 6]. Higher prevalence rates were reported in the YSR (Kadapa) district [10] whereas lower prevalence rates were reported in the Prakasam and Srikakulam districts of Andhra Pradesh [11, 12]. The similar and dissimilar rates of prevalence might depend upon the location of the area, sample size, breed season, and management practices [6].

Species-wise prevalence

Prevalence of GI parasites was recorded higher in sheep at 77.6% (243/313) when compared to goats at 60.9 % (126/207) (Table 1) which is consistent with the previous reports [6, 11, 12]. Sheep are at higher risk of exposure to parasitic ova as they are traditional grazers compared to browsing ruminants (goats). However,a higher incidence of parasitic infections in goats than in sheep was reported [9, 10] but no significant variation was found between the sheep and goats were noticed by some other workers [13, 14]. The dissimilarity might be attributed to variations in geographical conditions and availability of the susceptible host [9], mixed grazing of sheep and goats on the same pasture which leads to cross-contamination [6].

Parasites present

The GI parasitic infections reported in the present study were Strongyles, Amphstomes, *Strongyloides* sp., *Scrajabinema* sp., *Trichuris* sp., *Monezia* sp. and *Eimeria* sp. (Fig. 2). Comparable parasitic infections have been observed in sheep and goats in various regions of India, such as Andhra Pradesh [10, 11, 12], Maharashtra [13], Punjab [15], and the Telangana region [16]. In the current study, the analysis of gastrointestinal parasitic infections revealed strongyles as the predominant species, accounting for 23.7%, followed by Amphistomes (21.5%), *Strongyloides* sp. (6.5%), *Eimeria* sp. (6.2%), mixed infection (5.8%), *Moniezia* sp. (5%), *Trichuris* sp (1.9%) and *Scrajabinema* sp (0.4%) (Table 1). Notably, a

significant difference in parasitic prevalence was observed between sheep and goats. Amphistomes were more commonly found in sheep, while in goats strongyles exhibited higher prevalence, although the difference was not statistically significant. This aligns with findings from various studies, which consistently reported the predominance of strongyle infections in small ruminants [9, 10, 17]. However, there are regional variations, as Win *et al.* (2020) reported the highest prevalence of *Eimeria* in small ruminants in Myanmar [19], and Hossain *et al.* (2015) identified the highest prevalence of Amphistomes in small ruminants in Bangladesh [20]. The elevated prevalence of strongyles in small ruminants may be attributed to their short generation interval and their ability to capitalize on favorable environmental conditions [12]. Additionally, it's noteworthy that strongyles encompass a diverse group of parasites, including *Trichostronglus*, *Haemonchus*, *Oesophagostomum*, *Ostertagia*, *Cooperia*, *Chabratia*, and *Nematodirus* [17]. Mixed infections were noted in both sheep (7.7%) and goats (2.9%), featuring dual infections such as Amphistome +

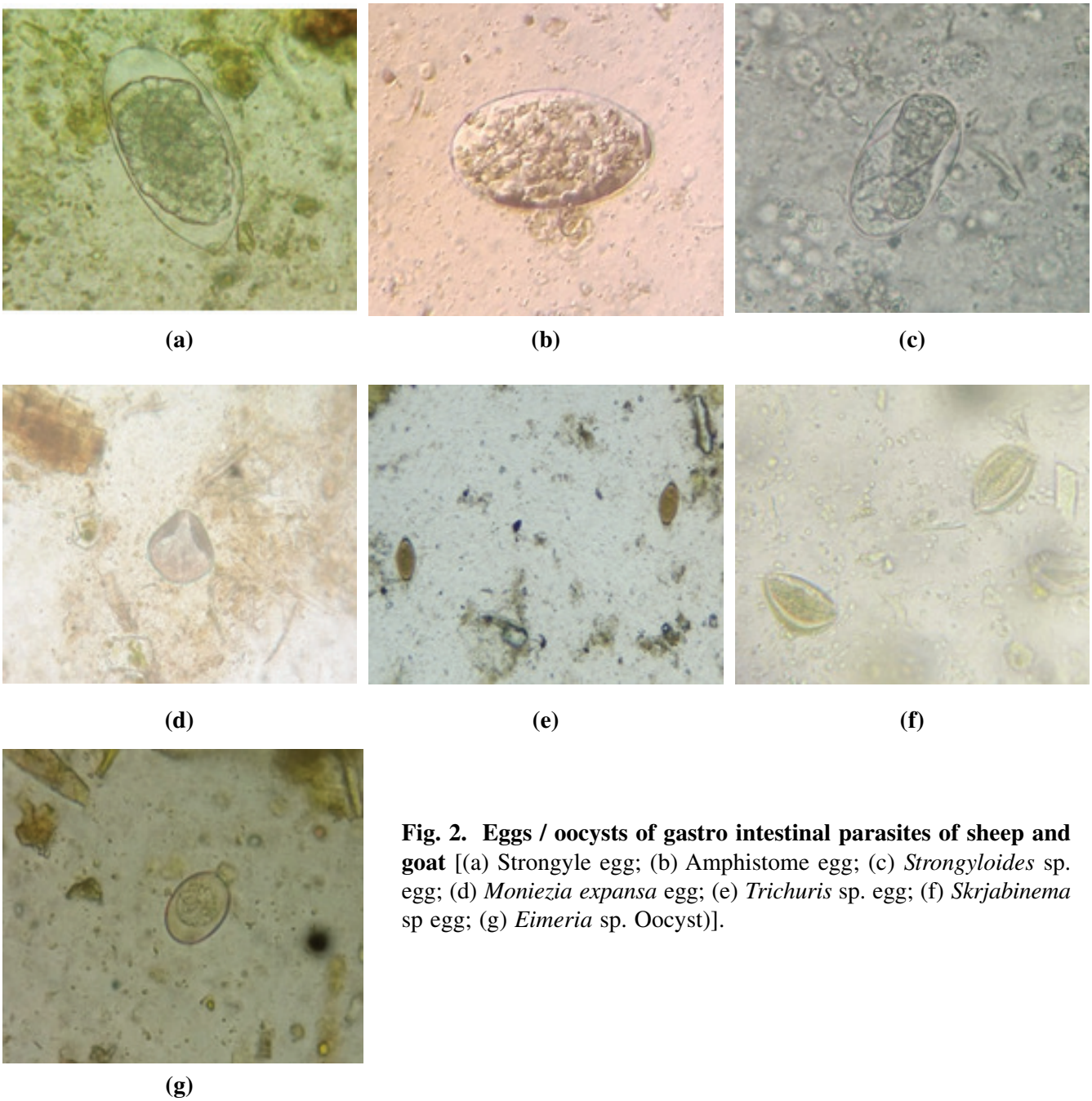

Fig. 2. Eggs / oocysts of gastro intestinal parasites of sheep and goat [(a) Strongyle egg; (b) Amphistome egg; (c) *Strongyloides* sp. egg; (d) *Moniezia expansa* egg; (e) *Trichuris* sp. egg; (f) *Skrjabinema* sp egg; (g) *Eimeria* sp. Oocyst)].

strongyle and Strongyle + coccidia, along with triple infections of Amphistome + Strongyle + coccidia (Table 2). The identification of two or more parasitic infections aligns with the observations made by various authors, highlighting their significance as a potential cause of morbidity and production loss [15, 18].

Table 1. Prevalence of gastro intestinal parasites in sheep and goats.

Parasites	Prevalence (%)			
	Sheep (N=313)	Goat (N=207)	p value	Total (N= 520)
Strongyles	23.3	24.2	0.4535	23.7
Amphistomes	26.8	13.5	0.0002***	21.5
Strongyloides sp.	7.3	5.3	0.2322	6.5
Trichuris sp.	1.3	2.9	0.1608	1.9
Moniezia sp.	4.8	5.3	0.4704	5.0
Eimeria sp.	6.4	5.8	0.4691	6.2
Skrjabinema sp.	0.0	1.0	0.3479	0.4
Mixed infection	7.7	2.9	0.0156*	5.8
Overall prevalence	77.6	60.9	0.0001*	71.0

[N= total number of animal: level of significance *p≤0.05, **p≤0.01, ***p≤0.001].

Table 2. Mixed infections observed in sheep and goats.

Type of mixed infection	No of positive samples	
	Sheep	Goat
Amphistome + strongyle	10	2
Strongyle + *Eimeria* sp.	8	4
Amphistome + Strongyle + *Eimeria* sp.	6	0

Age-wise analysis

Analysis based on age categories revealed a higher prevalence of GI parasites in lambs and kids (<6 months of age) compared to adult animals (>6 months of age). In sheep, a significant disparity in overall prevalence was noted between lambs and adult animals (p=0.0029), and this distinction was particularly noteworthy in goats (p=0.001). Among lambs, strongyles (p=0.0001) were identified as the predominant species, followed by *Eimeria* sp., while in adult sheep, Amphistomes (p=0.0004) were the predominant species. In goats, strongyles were the dominant parasites (p=0.008) in both age groups (Table 3). This observation aligns with the findings of Chiranjeevi *et al.* (2021) and Win *et al.* (2020) [11, 19]. In contrast, Rahman *et al.* (2017) and Singh *et al.* (2017) reported a higher prevalence of GI parasites in adult animals than in young ones [14, 15]. Emiru *et al.* (2013) and Dapawar *et al.* (2020) found no significant difference in prevalence rates among different age groups [13, 21]. The higher incidence of Amphistomes in adult sheep may be attributed to their grazing habits, making them more susceptible to amphistomes, and due to their complex lifecycle and prolonged prepatent period, resulting in the visibility of eggs in animals over 6 months of age [22]. The increased vulnerability of lambs and kids (< 6 months of age) to GI parasites in the present study may be linked to lower levels of immunity in young animals. In contrast, adult animals may develop immunity through repeated infections [19].

Deworming status

The overall prevalence of parasitic infections based on deworming status revealed that sheep with no deworming history showed a significantly higher incidence of parasitic infections (88.0%) compared to sheep with regular deworming history (29.1%) (Table 3). Simultaneously in goats also non-dewormed ones (72.6%) were found to be at higher risk of being infected with GI parasites than dewormed animals (24.0%). This study revealed that, in the case of sheep, concerning strongyles, amphistomes, and *Moniezia* spp. a significant difference is seen between dewormed and non-dewormed sheep whereas in the case of goats significant difference is observed concerning strongyles and *Strongyloides* sp. between dewormed and non-dewormed animals (Table 4). The findings are in agreement with the previous reports [6].

The study of deworming status on a regional and/ or farm basis is important in consideration of the development of resistance among the ecto and endo parasites [23].

Table 3. Prevalence of gastro intestinal parasites in different age groups in sheep and goat.

Parasite	Sheep			Goat		
	<6 m % (N= 75)	>6 m % (N=238)	p Value	<6 m % (N= 53)	>6 m % (N=154)	p Value
Strongyles	40.0	18.1	0.0001***	37.7	19.5	0.008**
Amphistomes	12.0	31.5	0.0004***	9.4	14.9	0.22
*Strongyloides*sp.	10.7	6.3	0.16	9.4	3.9	0.12
Trichuris sp.	0.00	1.7	0.33	1.9	3.2	0.52
Monezia sp.	1.3	5.9	0.09	3.8	5.8	0.43
Eimeria sp.	17.3	2.9	0.54	11.3	3.9	0.06
Skrajabinema sp.	0.00	0.00	1.00	3.8	0.00	0.07
Mixed infection	8.0	7.6	0.54	1.9	3.2	0.52
Overall	89.3	73.9	0.0029**	79.2	54.5	0.001***

[N= total no. of animal; level of significance *p≤0.05 , **p≤0.01 and ***p≤0.001].

Table 4.Prevalance of gastro intestinal parasites in sheep and goats based on their deworming status.

Parasite	Sheep			Goat		
	Dewormed % (N= 55)	Nondewormed % (N=258)	p Value	Dewormed % (N= 50)	Nondewormed % (N=157)	p Value
Strongyles	7.3	26.7	0.0008***	12.0	28.0	0.014*
Amphistomes	10.9	30.2	0.0017**	6.0	15.9	0.054
*Strongyloides*sp.	0.00	8.9	0.0098**	0.0	7.0	0.044*
Trichuris sp.	0.00	1.6	0.46	0.0	3.8	0.186
Monezia sp.	1.8	5.4	0.0001***	2.0	6.4	0.57
Eimeria sp.	5.5	6.6	0.52	4.0	6.4	0.207
Skrajabinema sp.	0.00	0.00	1.00	0.0	1.3	0.412
Mixed infection	3.6	8.5	0.17	0.0	3.8	0.186
Overall	29.1	88.0	0.0001***	24.0	72.6	0.0001***

[N= total no. of animal; level of significance *p≤0.05 , **p≤0.01 and ***p≤0.001].

Table 5. Prevalence of gastro intestinal parasitic infection sheep and goat based on type of rearing system.

Parasite	Sheep			Goat		
	Semi intensive % (N= 73)	Extensive % N=240)	p Value	Semi intensive % (N= 61)	Extensive % (N=146)	p Value
Strongyles	24.7	22.9	0.435	24.6	24.0	0.528
Amphistomes	5.5	33.3	0.0001***	3.3	17.8	0.0027**
*Strongyloides*sp.	6.8	7.5	0.54	3.3	6.2	0.32
Trichuris sp.	0.0	1.7	0.34	3.3	2.7	0.57
Monezia sp.	6.8	4.2	0.25	8.2	4.1	0.19
Eimeria sp.	15.1	3.8	0.0037**	6.6	5.5	0.49
Skrajabinema sp.	0.0	0.0	1.00	0.0	1.4	0.496
Mixed infection	5.5	8.3	0.30	0.0	4.1	0.12
Overall	64.4	81.7	0.0022**	49.2	65.8	0.0196*

[N= total no. of animal; level of significance *p≤0.05 , **p≤0.01 and ***p≤0.001].

Rearing system

Based on rearing systems, it is seen that the animals under free-ranging were more prone to parasitic infections compared to animals reared under semi-intensive rearing in both sheep and goats. In the case of sheep, a significant difference was observed with regards to amphistomes (p=0.0001) and *Eimeria* sp. (p=0.0037) between animals reared in semi-intensive and extensive systems. Whereas in the case of goats, the prevalence of amphistomes (p=0.0027) significantly differed between animals reared in semi-intensive and extensive systems (Table 5). It was reported that a higher incidence of parasitic infections in sheep under the semi-intensive method than in free-ranging sheep but the difference is statistically insignificant [24].

CONCLUSION

The present study revealed that gastrointestinal parasites are prevalent in small ruminants in and around areas of Vizianagaram district of Andhra Pradesh. Age, sex, grazing, and management practices were found to be predetermining factors for the occurrence of gastrointestinal parasitic infections in small ruminants. This is the first kind of study in this area. The data generated in the present study provides the pilot data to the researchers regarding the prevalence of different gastrointestinal parasites in the present study area and is useful for designing effective therapeutic and prophylactic measures against gastrointestinal parasitism in small ruminants that found to be an area of concern need to be explored in future research.

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