Identification and Prevalence of Gastrointestinal Parasites in Goats and Sheep of District Lower Dir, Pakistan

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Abstract- An epidemiological study was carried out to investigate the frequency of gastro intestinal parasites in goats and sheep of District Lower Dir, from February 2018 to January 2019. Sedimentation and floatation methods were employed for parasites subjected to microscopic examination with proper prescribed protocols in the parasitology laboratory, department of Zoology, University of Malakand, Chakdara. A total of 1340 fecal samples consisting of 772 goats and 568 sheep, were screened. The total incidence of GI parasites in goats and sheep was found to be 65.37%, in which goat were (63.21%) and sheep were (68.3%) found infected. Six parasites spp; were identified with prevalence rate Haemonchus contortus (23.28%), Strongyloides papillosus (8.95%), Trichuris ovis (10.14%), Dictyocaulus filarial (4.47%), Moniezia spp (6.26%) and Coccidia spp (12.23%) in both animals. Risk factors like gender, health status, condition of farm/household, treatment, socio-economic status of the owners and month wise occurrence were found statistically significant $p<0.05$. Area wise prevalence were found statistically significant and high incidence were occurring in Munda tehsil. It was concluded that sheep of the study area were more infected by nematodes parasites than goats which have considerable economic impact on sheep population in the study area.

Index Terms- Gastrointestinal parasites, Goats and Sheep, Prevalence, Lower Dir.

I. INTRODUCTION

Pakistan is an agricultural country where animals keeping is the important livelihood of poor people which play an important performance in the improvement of economic status of owners and control the poverty (Asif et al., 2008). Goats and sheep need less food as compared to other large animals and can provide useful products (Katoch et al., 1999) but parasitic infestation in goats and sheep is a main health problem (Gadahi et al., 2009) which cause reduction in the milk, wool and meat production. Worldwide, gastrointestinal parasites are a greatest vital restraint to animals, especially in poor resources areas and developing countries (Tariq et al., 2010). Different agro-climatic conditions and infected host are responsible for the different prevalence rate of parasitic infections. In the epidemiology of goats and sheep gastrointestinal parasites, micro and macro climatic condition play important role. Variable factors like temperature, wind, rainfall, humidity etc. make up the macroclimates (Tramboo et al., 2015) linked with occurrence of GI parasites straightly affected on productivity and financial loss with performance reduction of animals (Badran et al., 2012) can lead even death and illness of animals (Pal & Qayyum, 1992). Important classes of parasites are cestodes, nematodes, trematodes and protozoa. Several authors for examples (Farooq et al., 2012; Haleem et al., 2016; Imran et al., 2013; Nabi et al., 2014; Rafiullah et al., 2011; Shah et al., 2015; Sohail et al., 2017; Tramboo et al., 2017 & Ullah et al. 2022) illustrated different character and incidence rate of gastrointestinal parasites in different tehsil of KP, Pakistan. In remote parts of Pakistan, there are still several topographical areas like District Lower Dir where small ruminants need to be analyzed for the incidence of gastrointestinal parasites in light of great commercial rank. On goats and sheep of District Lower Dir, about GI parasites not efficient information is available. The current exploration was consequently planned to examine the incidence of GI parasites in goats and sheep in Lower Dir, Pakistan.

II. MATERIALS AND METHODS

A. Study area

Lower Dir is Located between 34°-37' to 35°-07' North latitude and 71°-31' to 72°-14' East longitude with 1583 squares kilometer area. This area previously known as north west frontier province, which is covered by hilly land and comprise seven tehsils. Lower Dir Bordered attached on East with Swat District, toward West with Afghanistan, Upper Dir and Chitral on its North and north-west similarly, Malakand and Bajaur is on its South. Summer season is hot and moderate while the highly warm months are June and July. Mean minimum and maximum temperature noted as -2.39oC and 11.22oC respectively in January while record of minimum and maximum temperature are 15.67oC and 32.52oC respectively in the month of June, as well as maximum rainfall 242.22 mm has been documented in March (Ullah et al., 2013).

B. Collection of fecal samples

A total of 1340 fecal samples consisting of 772 goats and 568 sheep fecal material (150-180 gram) were unswervingly collected from the rectum of animals in clean sterilized bottles containing 10% formalin solution labeling with samples number and put record in the designed questioner from owner of animals and observation of animals. The collected samples were carried

to the parasitology laboratory, department of Zoology, University of Malakand, Pakistan for screening.

C. *Examination of fecal samples*

Direct smear method, sedimentation and floatation methods were applied for the existence of gastrointestinal parasites observing under microscope at 4X and 10X. Different parasites eggs, cyst and larvae were identified on morphological basis using identification key as mentioned by (Soulsby,1986) and available online internet sources.

D. *D. Statistical analysis*

Total incidence of GI parasites was calculated by dividing positive samples on the number of total samples multiplying by hundred. Tables were made using MS-Excel 2010. SPSS software version 22, tests (Chi-Square, one-way NOVA) were used for association of GI parasites with different risk factors.

E. *Ethical statement*

This study was ethically approved by the members of Board of Studies, Hazara University, Mansehra, Pakistan.

III. RESULTS

Overall incidence of GI parasites was found 65.37% in small ruminants of Lower Dir, Pakistan. The identified classes nematodes (Haemonchus contortus, Strongyloides papillosus, Trichuris ovis and Dictyocaulus filarial), cestodes (Moniezia) and protozoa (Coccidia) having different prevalence rate shown in table 1, which is not significant statistically ($p>0.05$). In this respect, high occurrence of Haemonchus contortus in goats were found 24.35% while 21.83% in sheep (Table 1).

Table 1: Overall prevalence of gastrointestinal parasites in goats and sheep in Lower Dir

Parasite species	Goats Samples (772)		Sheep Samples (568)		Total Samples (1340)	
	Positive Samples	%	Positive Samples	%	Total Positive Samples	Total %
Haemonchus contortus	188	24.35	124	21.83	312	23.28
Strongyloides papillosus	52	6.73	68	11.97	120	8.95
Trichuris ovis	92	11.91	44	7.74	136	10.14
Dictyocaulus filarial	36	4.66	24	4.22	60	4.47
Moniezia	44	5.69	40	7.04	84	6.26
Coccidia	76	9.84	88	15.49	164	12.23
Total Parasites	**488**	**63.21**	**388**	**68.3**	**876**	**65.37**

p-value of Goats and Sheep = 0.6609ns, Overall p-value = 0.9920ns, ns: p-value is not significant

Furthermore, other risk factor data like gender, age, area, seasons, grazing system, health status, condition of farm/household, treatment (Table 2), socio-economic status of the owners, source of drinking water, and month were analyzed in regard of variables (Table 3).

Table 2: Prevalence of gastrointestinal parasites in goats and sheep with respect to different risk factors in Lower Dir.

Risk factors	Variables	Goats			Sheep			P-value
		No. examined (772)	Positive samples (488)	Infection (%)	No. examined (568)	Positive samples (388)	Infection (%)	
Gender	Male	344	172	50	188	96	51.06	0.0217*
	Female	428	316	73.83	380	292	76.84	
Age	<2 Years	364	260	71.42	276	208	75.36	0.3247ns
	2-5 Years	228	140	61.4	204	140	68.62	
	>5 Years	180	88	48.88	88	40	45.45	
Area	Adinzai Tehsil	102	64	62.74	80	58	72.5	0.0003*
	Balambat Tehsil	84	51	60.71	72	47	65.27	
	Munda Tehsil	128	96	75	102	81	79.41	
	Timergara Tehsil	72	42	58.33	57	35	61.4	
	Samarbagh Tehsil	134	75	55.97	112	88	86.27	
	Maidan Tehsil	117	67	57.26	98	56	57.14	
	Khall Tehsil	135	93	68.88	92	23	48.93	
Seasons	Winter	235	113	48.08	103	76	73.78	0.7562ns
	Spring	189	130	68.78	167	102	61.07	
	Summer	202	147	72.77	172	129	75	
	Autumn	146	98	67.12	126	81	64.28	
Grazing system	Grazing	332	168	50.6	220	152	69.09	0.1482ns
	Stall Fed	440	320	72.72	348	236	67.81	
Health status	Emaciated	152	76	200	124	76	61.29	0.0000*
	Normal	620	412	66.45	444	312	70.27	
Condition of farm/household	Satisfactory	144	88	61.11	92	48	52.17	0.0000*
	Unsatisfactory	628	400	63.69	476	340	71.42	
Treatment	Treated	188	112	59.57	60	28	46.66	0.0000*
	Untreated	584	376	64.38	508	360	70.86	

ns: p-value is not significant; *: p-value is significant.

Table 3: Prevalence of gastrointestinal parasites in goats and sheep with respect to related risk factors in District Lower Dir

Risk factors	Variables	Goats			Sheep			P-value
		No. examined (772)	Positive samples (488)	Infection (%)	No. examined (568)	Positive samples (388)	Infection (%)	
Socio-economic status of the owners	Good	204	136	66.66	88	64	72.72	0.0000*
	Poor	568	352	61.97	480	324	67.5	
Source of drinking water	Open Water	268	192	71.64	212	160	75.47	0.0525ns
	Bore Water	128	60	46.87	64	32	50	
	Tape Water	172	88	51.16	128	84	65.62	
	Stream Water	204	148	72.54	164	112	68.29	

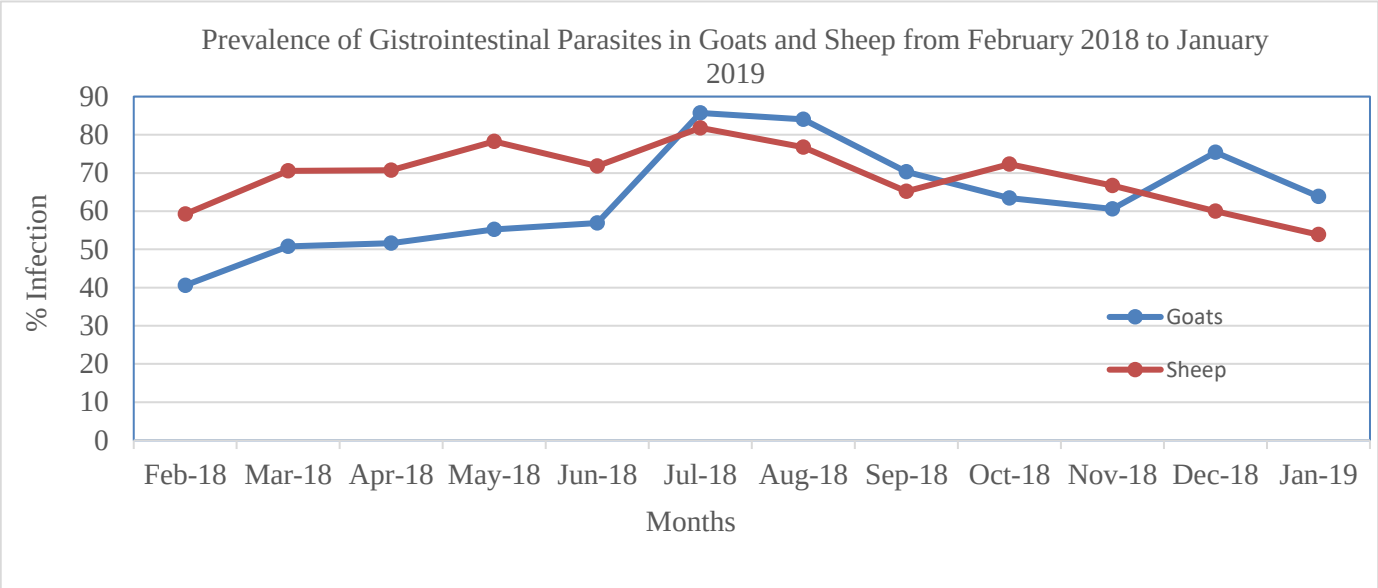

Figure 1. Month wise prevalence of Gastrointestinal parasites in Goats and sheep

gender wise occurrence of GI parasites was higher in male sheep (51.06%) and female sheep (76.84%) compared to male goats (50%) and female goats (73.83%), which was ($p<0.05$) (Table 2). In all categories of age, high occurrence was found in young age goats and sheep, no significant difference ($p>0.05$) was observed (Table 2).

With respect to area wise prevalence, high infestation rate was found in Munda tehsil as compared to others tehsil which have ($p<0.0003$) (Table 2). Moreover, analyzed data of three seasons i.e. winter, spring and summer, in this regard, highest prevalence of GI parasites in goats and sheep was observed in spring and summer season as compared to winter season which was ($p>0.05$) (Table 2). Similarly, in grazing system wise prevalence, more infestation rate noted in stall fed goats (72.72%) and grazing sheep (69.09%) as compared to grazing goats (50.6%) and stall-fed sheep (67.81%) which is statistically not significant ($p>0.05$) (Table 2). Furthermore, in health status wise prevalence, high incidence of GI parasites was observed in normal goats (66.45%) and sheep (70.27%) as compared to emaciated goats (50%) and sheep (61.29%), showing high statistically significant variation ($p<0.0000$) (Table 2). Moreover, condition of farm/household wise prevalence, high rate of GI parasites was found in unsatisfactory condition of farm/household goats (63.69%) and sheep (71.42%) as compared to satisfactory condition of farm/household goats (61.11%) and sheep (52.17%) showing significant difference ($p<0.0000$) (Table 2). Additionally, in treatment wise prevalence, more infestation found in untreated goats and sheep, which is statistically significant ($p<0.0000$) (Table 2). Consistently, in Socio-economic status of the owner wise prevalence, high infestation of GI parasites noted in good socio-economic status of the owner sheep and goats (72.72% and 66.66%) respectively, as compared to poor which is statistically significant ($p<0.0000$) (Table 3). Furthermore, in source of drinking water wise prevalence, high degree of GI parasites infestation was observed in open water drinking sheep (75.47%) and goat (71.64%), while in stream water sources drinking goats (72.54%) and sheep (68.29%) as compared to other water sources like bore and tape water, showing no statistically significant variation ($p>0.05$) (Table 3). The incidence of GI parasites infestation in small ruminants was further analyzed in different months. High prevalence in the months of June and July as compared to other months was found. For example, the prevalence of GIT helminthes infestation increased gradually from May to August but the incidence was found higher in month of July. The prevalence of GI parasites shown significant difference ($p<0.0000$) across month-wise data (Figure 1).

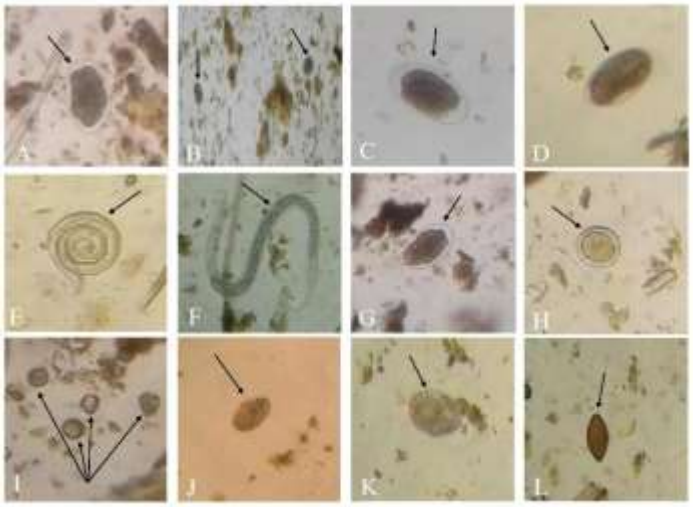

Figure 2. Identified eggs, cyst, oocytes and larvae of GI parasites in Goats and sheep, (**A**= *Haemonchus contortus egg*, **B**= *Haemonchus contortus eggs*, **C**= *Haemonchus contortus egg*, **D**= *Strongyloides papillosus oocytes*, **E**= *Haemonchus contortus larva*, **F**= *Strongyloides larva*, **G**= *Strongyloides egg*, **H**= *Coccidian egg*, **I**= *Moniezia specie cyst*, **J**= Nematode parasite egg, **K**= *Dictyocaulus filaria egg*, **L**= *Trichuris ovis egg*)**.**

IV. Discussion

In Pakistan, goats and sheep grow fast in all ruminants as compared to other animals which provide milk, wool, and meat as by-products (Hasnain & Usmani 2006). But gastrointestinal parasites in small ruminants cause poor weight gain, stunted growth and poor feed consumption which reason vast illness and death (Lashari & Tasawar, 2011). In Pakistan, several earlier studies conducted by many authors, reported the prevalence rate of GI parasites from 25% to 92% (Farooq et al., 2012; Ijaz et al., 2009 & Raza et al., 2007). So, the current investigation was directed in Lower Dir to explore the occurrence of GI parasites infestation in small ruminants. The overall occurrence of GI parasites in small ruminants was 65.37% which in line with 65.7% of Asif et al. (2008) but lower from 63.50% by Gadahi et al. (2009) in Rawalpindi and Islamabad. Similar results of GI parasites occurrence in District Lower Dir and Rawalpindi and Islamabad may be due to temperature similarities in thesis regions. Different risk factors like gender, age and grazing system etc., are associated with the occurrence of GI parasites but variance in agro-climatic conditions shown effects on parasitic infestation in goats and sheep (Bhat et al., 2012; Demissie et al., 2013; Komoin et al., 1999; Ouattara, & Dorchies, 2001 & Sajid, et al., 1999).

In other risk factors, gender-wise data show that female animals in both species of small ruminants highly affected which are previously reported by Mazid et al. (2006) in Bangladesh, which may be due to pregnancy stress, hormonal differences and due to stall feeding. Age wise prevalence was found high in 71.42% in young goats and 75.36% in young sheep as compared to adult and old small ruminants. Similar results were also reported by Rashid et al. (2016) and Zeryehun, (2012). May be due to weak immune system in young animals and lake of immunological reaction to GI parasite can led high infestation. In risk factor area, high prevalence was noted in sheep of Munda tehsil 72.91%, Adienzai tehsil 72.5%, and Balambat tehsil 71.87% but high rate of GI parasites was recorded in goats of Munda tehsil 75% as compared to other tehsils. While lower rate of GI parasites was found in sheep of Timergara tehsil 45.45%. Present results of all tehsils reveal high infection of GI parasites in sheep as compared to goats. Its reason may be variances in caring by owner, grazing system, feeding habits and different management system. But occurrence of GI parasites was high in goats of Timergara than sheep, it may be due to small samples size or due to ecological variations found in tehsil.

In season wise prevalence, high rate of GI parasites in sheep was found 78.57% in spring and 77.41% summer while in goats, 78.26% summer and 64.86% in spring season as compared to occurrence rate in winter season. Our result is in line with the report of (Jan et al., 2015 & Vlassoff & McKenna, 1994). It may be due to heavy monsoon rain fall, vegetation thickness and consistent temperature change which may be the reason for the high incidence of GI parasites in goats and sheep in spring and summer seasons. In risk factor grazing system, high infection rate found in stall fed goats 72.72% and 69.09% in grazing sheep while 67.81% in stall fed sheep and 50.6% goats. Existing analyses are supportive with the results of Nabi et al. (2014) & Rashid et al. 2016. Differences in the prevalence rate of both animals may be due to variance in feeding system and habits. Stall feeding behavior of goats and sheep may transmit parasitism in other animals, but less GI parasites infestation was found in grazing goats and sheep, which may be due to free range area for grazing of goats and sheep and also dispersed grazing behavior which cause less infection of GI parasites than stall fed.

The health status of study animals during samples collections was considered an important parameter for incidence of GI parasites. Categorizing goats and sheep in emaciated or good health condition wise observation represent infestation in 50% emaciated goats and 66.45% in normal, whereas in emaciated sheep 61.29% and normal sheep 70.27% covered GI parasites. Existing results revel high infection rate in normal and healthy goats and sheep than emaciated. The current result is in line with the result of Dabasa et al. (2017) who reported the high occurrence rate in normal health condition animals, it may be due to not viewing the clinical signs of disease and during collection the animals shown as normal. Condition of farm/household wise prevalence, in both animal high prevalence of GI parasites was found in sheep and goats living in unsatisfactory condition of farm/household, 71.42% and 63.69% respectively, as compared to goats and sheep living in satisfactory condition. The present investigation is supportive with the result of Asif et al. (2008) who illustrated the high incidence of GI parasite in unsatisfactory farm/household than satisfactory. During collection mostly animal farms were unhygienic, overcrowding herd and unsatisfactory. Overloading is one of the key factors for distribution of GI parasites in small ruminants (Lone et al., 2012). In treatment wise prevalence, high infection rate occurred in untreated goats and sheep (64.38% and 70.86% respectively) as compared to treated goats and sheep. The existing consequences are agreeing with the result of Katoch et al. (1999), Ijaz et al. (2009) & Raza et al. (2007) who reported less infestation in treated animals due to use of anthelmintic drugs than untreated. High prevalence of GI parasites in the animals of study area may be due to untreatment and careless attitude.

In socio-economic status of the owner wise prevalence, high infection rate was found in good socio-economic status of the owner sheep and goats (72.72% and 66.66% respectively) as compared to poor socio-economic status of the owner goats and sheep. Results of this risk factor were more interesting. The cause of the present result may be the fecal samples collection from the farm or household which are good in view. As the owner of animals having agricultural land, concreted house and all needed services of life were recorded as a good socio-economic status while less incidence of GI parasites in poor socio-economic status of the owner might be due to the well care of animals because goats and sheep are safe source of profits for landless and poor people of study area. Yet no author reported the incidence of GI parasites in small ruminants on the base of socio-economic status of the owner. In source of drinking water wise prevalence, high infection rate was found in drinking from open water sheep and goats (75.47% and 71.64% respectively) and stream water goats and sheep (72.54% and 68.29% respectively) as compared to bore and tape water drinking goats and sheep.

In district Lower Dir open water and stream water are generally used by animals as compared to bore water and tap water which may cause the GI parasites in goats and sheep. In Lower Dir goats and sheep typically drink open water and stream water

which are highly contaminated by different parasites. In some areas, due to no availability of open water and stream water sources, only bore and tap water sources are widely used. Bore and tap water are safe and able for drinking but due to living of huge flock of animals in same places can spread GI parasites. The high rate of GI parasites in open and stream water consuming animals may be due to contamination and pollution of water sources in the study area. The present investigation highest prevalence of GI parasites was reported in sheep and goats in June (83.33% and 80.76%, respectively) and in July in goats and sheep (81.81% and 75%, respectively) as compared to either February, March, April and May respectively. high occurrence of GI parasites in goat and sheep during June and July may be due to the heavy rainfall in monsoon, bushy vegetation, increased moisture and high temperature which highly favorable for the growth of free larval stages of helminthes parasites. Our results are in line and nearly similar with the earlier results which revealed higher infection rate of gastrointestinal parasites in small ruminants during June and July as compared to February (Katoch et al., 1999). Among the several parasites species detected in the current area, Haemonchus contortus was noted highly prevalent while Dictyocaulus filarial as the least common parasite.

V. CONCLUSIONS:

On the basis of present study, it was concluded that goats and sheep of Lower Dir are extremely affected by gastrointestinal parasites. Instead of sheep of the study area, goats were more infected by parasites like, Haemonchus contortus, Strongyloides papillosus, Trichuris ovis, Dictyocaulus filarial are widely occurred as compared to Moniezia and Coccidia in both animals. Goats and sheep are highly prevalent by Haemonchus contortus and Coccidia. Male and female animals in tehsil Adenzai and tehsil Munda are highly affected by GI parasites as compared to other tehsil. For alleviation and control of these parasites, small ruminants need care, use of anti-helminthic drugs and use of ethnobotanical remedies.

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CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.