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Article: **Prevalence of Parasitic Species in Ruminants Found in the Vicinity of Lahore, Pakistan**

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Prevalence of Parasitic Species in Ruminants Found in the Vicinity of Lahore, Pakistan

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Abstract

*In Pakistan, the livestock industry is one of the most important subsectors of the agricultural industry since it offers a handsome share in gross domestic national growth. However, gastrointestinal parasitic infections are a serious health concern for cattle managing organizations and farmers. For this reason, there is a need to update the knowledge on spatio-temporal differences and regulate practices to improve the health conditions of animals. The current study aimed to estimate the prevalence of gastrointestinal parasites in bovine, caprine and ovine genera reared in and around Lahore. A total number of 160 fecal samples were collected from the selected genera. All samples were subjected to parasitological examination and analyzed using the direct smear method. In general, an overall prevalence of 40% was recorded which showed 64 samples were positive. The observed parasitic species were *Balantidium coli*, *Fasciola hepatica*, *Coccidia*, *Shistosoma bovis*, *Ostertagia ostertagi*, *Trichuris globulosa*, *Haemonchus contortus*, *Chabertia ovina*, and *Stroglyoides papillosus*. Overall, out of 160 total samples, 64 samples were positive, while 40% prevalence was recorded in all ruminants. Among bovines, (cows and buffaloes), the multi-parasites prevalence was recorded to be 47.5 and 37.5%, respectively. However, in ovine (sheep) and caprine (goats), the prevalence was 42.5% and 32.5%, respectively. The parasitic prevalence was observed alike in adults and young. The data showed a higher parasitic prevalence in adult bovine and ovine species as compared to the caprine species. The study revealed that there is a significant difference in prevalence (P value < 0.05) between adult and young buffaloes having *B. coli*, cows having *F. hepatica*, and goats having *O. ostertagi*. Additionally, it was concluded that the low occurrence of parasites in ovine*

and caprine species as compared to bovine species was due to the use of proper care and deworming practices. Moreover, different managerial control practices and awareness programs also need to be implemented to control gastrointestinal parasitic infections.

Keywords: direct smear method, fecal samples, parasites, prevalence, livestock

Introduction

In Pakistan, livestock is one of the most valuable industries, playing an essential role in the socio-economic progress of rural areas. Traditionally, livestock farming was regarded as an additional support instrument for rural families. Nowadays, the livestock sector plays a versatile role in strengthening the rural community. According to one estimate, the agricultural sector contributes between 11-21% of the Gross Domestic Production (GDP) of Pakistan, of which 56% comes from livestock. This industry produces valuable by-products such as bones, hides, skin, wool, manure, and mohair to generate a handsome share in the national GDP. The agricultural sector globally covers 40% of total GDP [1-5]. The livestock industry produces essential food items of high nutrient content, such as meat and dairy products. The leather and hides produced by livestock are valuable products in both local and export markets; they are also a good source of income [6-9]. Additionally, the livestock industry is a source of employment for many people, it also provides raw material to other industries [10]. Parasitic infections pose serious threats to the progress of the livestock industry since gastrointestinal parasitism is one of the key problems that limit livestock productivity [11, 12].

Helminthiasis is known to affect small ruminants worldwide. It causes severe illness among the affected animals, leading to heavy economic losses and death. Nematode, protozoa, and trematodes are the most common gastrointestinal parasites, particularly infecting young cattles around the globe, causing significant economic losses [13, 14].

Many gastrointestinal parasites are present in sheep and goats. Among these parasites, *Coccidia* (protozoa), cestodes (tapeworms), trematodes (flukes), and nematodes (roundworms) are most common. In small ruminants, Trichostrongylidae spp. is one of the most notable parasite since

it results in a high death rate in animals around the world [15, 16]. However, *Haemonchus* is considered the most prominent parasitic spp. [17]. Ruminants, such as cattle, goats, sheep, and wildlife, are also widely affected by Fasciolosis. Two species are primarily responsible for fasciolosis disease, namely *Fasciola hepatica* and *Fasciola gigantica*. *Fasciola gigantica* is common all over Africa and Asia, while *Fasciola hepatica* is cosmopolitan in nature [18]. Around 600 million animals are affected by the diseases, resulting in reduced meat, milk, and wool production as well as liver condemnation, metabolic diseases, and even death [19].

In Pakistan, majority of the population works in livestock farming. Therefore, animal health is a big challenge that needs to be dealt with for the promotion and development of livestock sectors. There is a significant need to focus on the health problems of animals, update knowledge on spatio-temporal differences, and regulate practices to improve the health conditions of animals. The current study assessed the prevalence of gastrointestinal parasites, such as bovine, ovine, and caprine, in different species in and around the Lahore district. This study reflected the threats and challenges faced by the livestock sector.

2. Materials and Methods

2.1. Collection of Fecal Samples from Bovine, Ovine, and Caprine

Forty fecal samples each were collected from cattle, buffaloes, sheep, and goats from the outskirts of Lahore District.

2.2. Sampling Visits and Period

The sampling was conducted from the end of January 2018 until the end of May 2018. To collect the required samples, almost 12 visits were made.

2.3. Sample Investigation Place

The samples investigation was carried out at the University Diagnostic Lab (UDL), University of Veterinary and Animal Sciences (UVAS), Lahore.

2.4. Experimental Protocol

A total of 160 fecal samples were collected and examined for the presence of ova or cysts to determine the prevalence of gastrointestinal parasites. The

samples were collected directly from the rectum of animals and placed in properly labelled sterile polythene bags. The samples were stored at 4 °C until processed and analyzed using the direct smear method as per stated by Dryden *et al.* [20]. The prevalence of parasitic species was determined by using the following formula:

$$\text{Prevalence (\%)} = \frac{\text{Number of infected individuals (n)} \times 100}{\text{Total number of sampled individuals (N)}}$$

2.5. Statistical Analysis of Data

Statistical analysis of the data was performed by using chi-square on SPSS version 25.

3. Results and Discussion

Antitumor activity is reportedly present in polyphenols due to the consequence of pro or antioxidant stimulation in cancer cells, which advance priming of defensive tumour-suppressing immunity. In murine melanoma cells, The role of severe endoplasmic reticulum (ER) stress in apoptosis mediated by a polyphenol-rich extract of *Caesalpinia spinosa* (P2Et) and ICD (immunogenic cancer death of cells) was discovered. When B16-F10 cells of melanoma are examined with P2Et, considerable discrimination in the initiation of particular ER-stress mediators was demonstrated. In cells of melanoma, the initiation of PERK that is driven by P2Et was reported to improve the release of ER calcium and cause disturbance in mitochondrial membrane potential. It also enhances the up-regulation of drivers of ICD, expression of surface calreticulin, and extracellular discharge of HMGB1 and ATP [54].

Parasitic prevalence was recorded for 160 samples. The results showed that only 64 samples showed positive results for gastrointestinal parasites, yielding an overall 40% parasitic prevalence. In cows, out of 40 fecal samples, 19 samples showed positive results with a prevalence of 47.5 %. During the study, four parasitic species (*Balantidium coli*, *Fasciola hepatica*, *Coccidia* and *Shistosoma bovis*) were identified. It was also noted that parasitic prevalence was high in females as compared to male cows. The recorded prevalence of *Balantidium coli* in female cows was 30% and in male cows was 20%. The prevalence of *Fasciola hepatica*, *Coccidia*,

and *Shistosoma bovis* in female cow samples was 15,10, and 5%, respectively, while in male cow samples, it was found to be 10, 5 and 0% respectively (Table 1).

Table 1. Gender based prevalence of different parasites in Bovine (cows and buffaloes)

Category	Positive samples (Prevalence %)			
	<i>B. coli</i>	<i>F. hepatica</i>	<i>Coccidia</i>	<i>S.bovis</i>
Female cow	6 (30)	3 (15)	2 (10)	1 (5)
Male cow	4 (20)	2 (10)	1 (5)	0 (0)
Female buffalo	5 (25)	4 (20)	1 (5)	-
Male buffalo	2 (10)	2 (10)	1 (5)	-
Total prevalence	17 (50)	11 (32)	5 (15)	1 (3)

Agewise, parasitic prevalence in fecal samples was also compared. A higher prevalence of *Balantidium coli* and *Fasciola hepatica* was recorded in adults, while *Coccidia* and *Shistosoma bovis* were the highest prevailing parasitic species in younger cattle (Table 2). The overall prevalence of parasitic species (gender and age-wise) in bovines is shown in Figure 1.

Table 2. Age based prevalence of different parasites in Bovine (cows and buffaloes)

Category	Positive samples (Prevalence %)			
	<i>B. coli</i>	<i>F. hepatica</i>	<i>Coccidia</i>	<i>S. bovis</i>
Adult cow	8 (40)	4 (20)	1 (5)	0 (0)
Young cow	2 (10)	1 (5)	2 (10)	1 (5)
Adult buffalo	4 (20)	3 (15)	0 (0)	-
Young buffalo	3 (15)	3 (15)	2 (10)	-
Overall prevalence	17 (50)	11 (32)	5 (15)	1 (3)

However, in the case of buffaloes, out of 40 samples (20 from each male and female), 15 samples were positive and had a prevalence of 37.5%. In these samples, three parasitic species, namely *Balantidium coli*, *Fasciola hepatica*, and *Coccidia* were identified. The prevalence of *Balantidium coli* (25%) and *Fasciola hepatica* (20%) in female buffaloes

was observed. In male buffaloes, it was 10% (2) for each parasitic species. However, the gender wise prevalence analysis showed a high prevalence in female buffaloes as compared to males. The prevalence level for *Coccidia* (5%) was similar in both male and female samples of buffaloes (Table 1). The data was also compared to determine the prevalence in adults and young buffaloes. There was more prevalence of *Balantidium coli* and *Fasciola hepatica* in adult buffaloes as compared to younger ones, except *Coccidia* spp. (Table 2). In this study, fecal examination revealed an overall 40% prevalence of gastrointestinal parasites. In the current study, it was determined that the overall prevalence of parasites in buffaloes was noticed at 37.5%, which is in line with previously reported data [21]. Conversely, the results of [22] and [23] were controversial as compared to the current study. Low prevalence was recorded (20.45%) in Karnataka and (13%) in Rajasthan. However, a higher prevalence was observed by [24, 25], who recorded 60% and 61% prevalence of gastrointestinal parasites in Jammu and Bangladesh, respectively. It was determined that the low and high prevalence of gastrointestinal helminthiasis may differ due to managerial practices that vary according to the area and surrounding environment [21]. This study also recorded the age wise prevalence, which was higher in adults as compared to young. However, these findings were inconsistent with the study of Sreedevi and Hafeez [21].

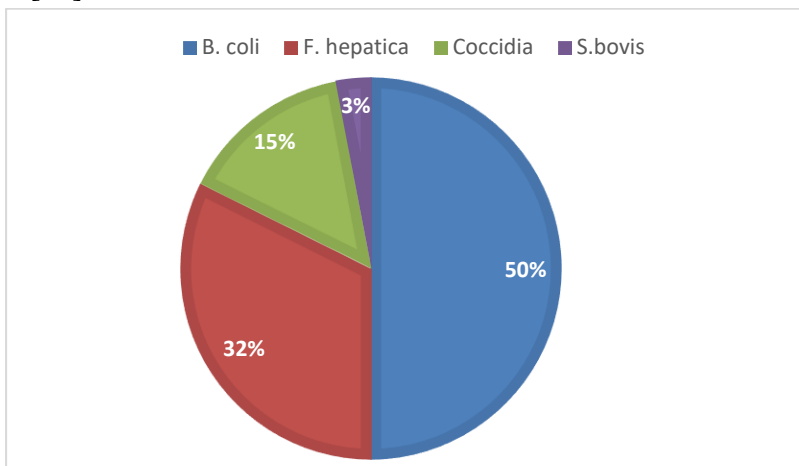


Figure 1. An overall prevalence of parasitic species (gender and age wise) in bovines

According to the findings, the prevalence of fasciolosis seems to be higher in buffaloes (15%) as compared to cattle (12.5%). Furthermore, there were no statistically significant results found in age and gender of bovines. These results were similar to those reported previously by [26, 27], where the occurrence of Fasciolosis in buffaloes was higher (30.50 and 30.3%) than cattle (20.42 and 28.6%) with reference to age and gender, respectively.

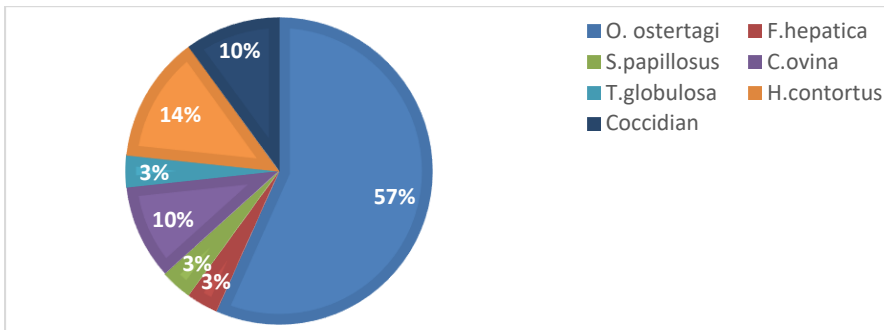
In the current study, statistically insignificant but comparatively higher differences were noticed in the prevalence of Fasciolosis in adults. These results are in line with the findings of previous studies, where adults were significantly more affected than young [28]. Furthermore, a statistically insignificant but higher prevalence of Fasciolosis was recorded in females as compared to males. This difference may be attributed to different grazing habits. It was reported in previous studies that grazing was found to be associated with the prevalence of Fasciolosis. However, male cattles, that were usually used for draft purposes and not grazing, showed low infection rates [26, 29]. Similarly, [30, 31] reported that the prevalence and intensity of infection were significantly higher in females than males, indicating the difference in susceptibility of both sexes for Fasciolosis.

The prevalence of *Balantidium coli* in buffaloes was found to be 17.5%, while in cows, it was 25%. These results were in line with the reported findings of *Balantidium coli* [32, 33]. The prevalence of *Coccidia* (10%) in female cattle as determined in the current study was in line with the findings reported by Sreedevi and Hafeez [21], who reported coccidial infection (15.42%) in buffaloes. The prevalence of *Shistosoma bovis* in cattle was observed as 2.5% which is in line with the previous results [34].

Parasitic prevalence was also checked for a total of 40 samples each for ovine and caprine species. A parasitic prevalence of 42.5% in sheep and 32.5 % in goats was recorded. The parasitic species found in sheep were *Ostertagia ostertagi*, *Fasciola hepatica*, *Stroglyoides papillosus*, *Chabertia ovina*, *Trichuris globulosa*, and *Haemonchus contortus*. The gender-wise prevalence was high in females as compared to males (Table 3). A very low prevalence of 17.2% was reported by [35]. The overall gender wise prevalence of parasitic species in ovines and caprines is shown in Figure 2.

Table 3. Gender based prevalence of different parasites in Ovine and Caprine genera

Category	Positive samples (Prevalence %)						
	<i>O. ostertagi</i>	<i>F.hepatica</i>	<i>S.papillosus</i>	<i>C.ovina</i>	<i>T.globulosa</i>	<i>H.contortus</i>	Coccidian
Female sheep	6 (30)	0 (0)	0 (0)	1(5)	1 (5)	1 (5)	-
Male sheep	4 (20)	1(5)	1(5)	2 (10)	0 (0)	0 (0)	-
Female goat	3 (15)	-	-	-	-	2(10)	1 (5)
Male goat	4 (20)	-	-	-	-	1(5)	2 (10)
Overall prevalence	17 (58)	1 (3)	1 (3)	3 (10)	1 (3)	4 (13)	3 (10)

**Figure 2.** An overall genderwise prevalence of parasitic species in ovines and caprines

According to age, there was more prevalence of all parasitic species in adult sheep as compared to young, except *Chabertia ovina* (Table 4).

Table 4. Age-based prevalence of different parasites in Ovine and Caprine genera

Category	Positive samples (Prevalence %)						
	<i>O. ostertagi</i>	<i>F.hepatica</i>	<i>S.papillosus</i>	<i>C.ovina</i>	<i>T.globulosa</i>	<i>H.contortus</i>	<i>Coccidia</i>
Adult sheep	7 (35)	1(5)	1(5)	1 (5)	1 (5)	1 (5)	-
Young sheep	3 (15)	0 (0)	0 (0)	2 (10)	-	0 (0)	-
Adult goat	1 (5)	-	-	-	-	1(5)	3 (15)
Young goat	6 (30)	-	-	-	-	2(10)	0 (0)

In goats, the prevailing parasites were *O. ostertagi*, *H. contortus*, and *Coccidia*. Gender wise prevalence was higher in males as compared to the females of the caprine genus (with the exception of *H. contortus*) (Table 3). The age-wise prevalence was found to be higher in young goats as compared to adults, except for *Coccidian* (Table 4). Overall, the prevalence of parasites in sheep was higher as compared to goats; however, the mild prevalence of parasites, such as *F. hepatica*, *S. bovis*, *O. ostertagi*, *T. globulosa*, *H. contortus*, *C. ovina* and *S. papillosus*, were also noticed in sheep. The results also revealed that only *O. ostertagi* was highly prevalent in sheep. The higher prevalence of *H. contortus* and *O. ostertagi* were also reported in sheep [36]. Moreover, the presence of *H. contortus* and *C. ovina* were also reported in sheep [37]. The occurrence of almost all parasites was also seen in lamb by Makovcová *et al.* [38]. In sheep, the prevalence of *Fasciola hepatica* was 5%, which is lower than that reported by Mushtaq *et al.* [39]. Low prevalence of *H. contortus* was also found in the current study when compared with the results reported previously by [40, 41]. The results may be variable due to effective deworming strategies and good management practices adopted by the farmers.

Similar to the findings of the study conducted by Asif *et al.*, more parasitic species were found in sheep as compared to goats [42]. The prevalence of *H. contortus* in goats was 7.5%, which was close to findings for *H. contortus* (9 %) reported previously by [34]. It has been reported that *Coccidia* and other gastrointestinal nematodes as mixed or single infections are major parasitic diseases of sheep and goats in tropical and temperate climates [43]. The presence of different parasites such as *Haemonchus*, *Coccidia*, *Trichuris*, *Nematodirus*, *Trichostrongylus*, *strongyloides* and *Fasciola* was reported in goats with a higher prevalence of 64.2, 43.9, 35.5, 13.0, 4.5, 3.2, and 0.7%, respectively [41]. It is important to point out that in the case of goats, the prevalence levels were higher in young animals as compared to adults as described by [44]. However, in another study, older goats were found to be more susceptible to endoparasitic infections as compared to younger ones and higher parasitic prevalence was noticed unlike our findings [45, 46]. The findings of the current study showed a low prevalence of different parasites in economically important farm animals. Ntonifor *et al.* [47] reported controversial results when compared to our findings by stating the highest prevalence of parasitic species in goats

followed by sheep and cattle. Conversely, a recent study carried out in Egypt determined the prevalence of parasites in cattle, buffaloes, goats and sheep showed findings similar to our results [48]. A study conducted on goats in Shendam town of Plateau State, Nigeria also determined higher prevalence in goats as compared to sheep [49]. The study also suggested that controversial results in studies might be due to the difference in climate and area. In this regard, Alcalá-Canto et al. [50] stated that macroenvironment variables, such as temperature, humidity, and rainfall, produced a pronounced effect on parasitic prevalence.

4. Conclusion

The current study examined the low prevalence of different parasites in economically important farm animals. It was determined that *Balantidium coli* in buffaloes, *Fasciola hepatica* in cows, and *Ostertagia ostertagi* in goats were significantly different for adult and young groups. The main reason behind the low occurrence of parasites in ovine and caprine species as compared to bovine species was the use of proper care and deworming practices. It is recommended that different managerial control practices and awareness programs should be considered to control gastrointestinal parasitic infections. These findings would help to develop and implement future preventive measures to control the spread of these parasites and improve the health of these animals.

Conflict of Interest

The authors declare no conflict of interest.

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