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 as it offers a handsome share in gross domestic national growth. However, the gastrointestinal parasitic infections are a serious concern for cattle managing organizations and farmers. These effects of gastrointestinal parasites may vary with the age, sex of cattle, nutritional practices, and the severity of contagion. So, there is a need to update knowledge on spatio-temporal differences and regulate practices to improve the health conditions of animals. The present study was conducted to estimate the prevalence of gastrointestinal parasite in bovine, caprine and ovine genera reared in and around Lahore. A total number of 160 fecal samples were collected from all...
different genera. To calculate the prevalence of parasites in different genera, all the samples were subjected to parasitological examination and analyzed through direct smear method. In general, an overall prevalence of 40% was recorded showing 64 samples were positive. The observed parasitic species were *Balantidium coli* (a parasitic protozoan), *Fasciola hepatica* (liver fluke), *Coccidia* (a microscopic protozoan), *Shistosoma bovis* (blood fluke), *Ostertagia ostertagi* (parasitic nematode), *Trichuris globulosa* (intestinal nematode), *Haemonchus contortus* (pathogenic nematode), *Chabertia ovina* (parasitic roundworms) and *Strogyloides papillosus* (parasitic nematode). Overall out of 160 total samples 64 samples were positive and 40% prevalence was recorded in all ruminants. Among bovines, (cows and buffaloes), the multi-parasites prevalence was recorded as 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 caprine species. The study showed a significant difference (P value< 0.05) among adult and young groups of *Balantidium coli* in buffaloes, *Fasicola hepatica* in cows and *Ostertagia ostertagi* in goats. It was concluded that low occurrence of parasites in ovine and caprine species as compared to bovine species was due to proper care and deworming practices being used for these animals. Moreover, there is further need to considered different managerial control practices and awareness programs to control gastrointestinal parasitic infections.

**Key words:** Direct smear method, fecal samples, prevalence, parasites, livestock,

1. **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 the strengthening of 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, mohair etc. and generates a handsome share in national GDP and the agricultural sector globally covers 40% of total GDP [1-5]. The livestock industry offers basic human food of high nutrient content such as meat and dairy products. Leather and hides produced by livestock are valuable products in both local and export markets and are also a good source of income [6-9]. Livestock has been described as a fundamental division of Pakistan’s agricultural industry whose purpose lies beyond food production [10]. However, it was noticed across the world that the parasitic infections pose serious threats in the progress of the livestock industry and gastrointestinal parasitism is one of the key problems that limit livestock productivity [11, 12].

Helminthiasis has a worldwide distribution especially affecting small ruminants, causing severe illness that leads to heavy economic losses and death. Nematode, protozoa, and trematodes are prominent gastrointestinal parasites, particularly infecting young cattle throughout the world and are the cause of 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 more prominent. In small ruminants, Trichostrongylidae spp. is one of the most important parasite as it causes significant death rates in animals around the world [15,16]. However, Haemonchus is considered the most prominent parasitic spp. [17]. Ruminants like cattle, goats, sheep, and wildlife are also widely affected by Fasciolosis. Two species are primarily responsible for 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 that result in reduced meat, milk and wool production, liver condemnation, metabolic diseases and even death [19].

In Pakistan, a large majority of the population are work in livestock farming. Therefore, animal health is a big challenge for the promotion and development of the livestock sectors. There is a significant need to focus on the health problems of animals and to update knowledge on spatio-temporal differences and regulate practices to improve the health conditions of animals. The present study was designed to assess the prevalence of gastrointestinal parasites in different species like bovine, ovine and caprine reared in and around Lahore district. This study reflected the threats and challenges facing animals in 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

Sampling was conducted from the end of January 2018 and completed until the end of May 2018. To collect required samples almost 12 visits were made.

2.3. Sample investigation place

The samples investigation was carried out at 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 find out 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 direct smear method following Dryden et al. [20]. The prevalence of parasitic species was determined by using the following formula:

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

2.5. Statistical analysis of data

Statistical data were performed by using chi-square on SPSS version 25.

3. Results and Discussion

Parasitic prevalence was recorded for 160 samples and 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 the prevalence of 47.5% and four parasitic species (Balantidium coli, Fasciola hepatica, Coccidia and Shistosoma bovis) were noticed during the study. It was also noted that parasitic prevalence was high in female as compared to male cows. The recorded prevalence of Balantidium coli was 30% in female cows as compared to male cows at 20%. The prevalence of Fasciola hepatica, Coccidia and Shistosoma bovis in female cows was 15, 10, and 5% respectively while in male 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)
Agewise, parasitic prevalence in fecal samples was also compared and 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). An overall prevalence of parasitic species (gender and age wise) in bovines shown in Fig. 1.

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Positive samples (Prevalence %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>B. coli</em></td>
</tr>
<tr>
<td>Adult cow</td>
<td>8 (40)</td>
</tr>
<tr>
<td>Young cow</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Adult buffalo</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Young buffalo</td>
<td>3 (15)</td>
</tr>
<tr>
<td>Overall prevalence</td>
<td>17 (50)</td>
</tr>
</tbody>
</table>
Fig. 1. An overall prevalence of parasitic species (gender and age wise) in bovines

However, in the case of Buffaloes, out of 40 samples (20 from each male and female), 15 samples were positive with the prevalence of 37.5% and three parasitic species namely, *Balantidium coli*, *Fasciola hepatica* and *Coccidia* were identified. The prevalence of *Balantidium coli* (25%) and *Fasciola hepatica* (20%) in female buffalos was observed. In male buffaloes, it was 10% (2) for each parasitic species, respectively. However, the gender wise prevalence analysis showed high prevalence in female buffalos as compared to males. The prevalence level for *Coccidia* (5%) were similar in both male and female samples of buffaloes (Table: 1). The data was also compared for prevalence in adults and young buffaloes and there was more prevalence of *Balantidium coli* and *Fasciola hepatica* in adults as compared to young except *coccidia spp.* (Table: 2). In this study, fecal examination revealed an overall 40% prevalence of gastrointestinal parasites. The overall prevalence of parasites in buffalos of the current study was noticed 37.5% in line with previously reported data of [21]. On the other hand, the results of [22] and [23] were controversial compared to the present study. Low prevalence was recorded (20.45%) in Karnataka and (13%) in Rajasthan, respectively. However, a higher prevalence was observed
by [24] and [25] who recorded 60% and 61% prevalence of gastrointestinal parasites in Jammu and Bangladesh, respectively. The low and high prevalence of gastrointestinal helminthiasis may differ due to managerial practices that vary according to the area and surrounding environment [21]. The age wise prevalence was also recorded showing higher in adults as compared to young, however, these findings were inconsistent with the study of Sreedevi and Hafeez, [21].

These findings showed the prevalence of fasciolosis 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 those reported previously, [26, 27] where the occurrence of Fasciolosis in buffaloes was higher (30.50, 30.3%) than cattle (20.42 and 28.6%) with reference to age and gender, respectively.

Statistically insignificant but comparatively higher differences were noticed in the prevalence of Fasciolosis in adults of the present study. These results are in line with the findings of previous studies, where adults were significantly more affected than young [28]. Furthermore, statistically insignificant but higher prevalence of Fasciolosis was recorded in females than males. This difference may be due to grazing. It was reported in studies that grazing was found to be associated with the prevalence of Fasciolosis and males that were usually used for the draft purpose and not grazing showed little infection [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 reported findings of *Balantidium coli* [32, 33]. Prevalence of *Coccidia* (10%) in female cattle of the current study was in line with 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*, *Strogyloides 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]. An overall gender wise prevalence of parasitic species in ovines and caprines as shown in Fig. 2.

<table>
<thead>
<tr>
<th>Category</th>
<th>O. ostertagi</th>
<th>F. hepatica</th>
<th>S. papillosus</th>
<th>C. ovina</th>
<th>T. globulosa</th>
<th>H. contortus</th>
<th>Coccidian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sheep</td>
<td>6 (30)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (5)</td>
<td>1 (5)</td>
<td>1 (5)</td>
<td>-</td>
</tr>
<tr>
<td>Male sheep</td>
<td>4 (20)</td>
<td>1 (5)</td>
<td>1 (5)</td>
<td>2 (10)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Female goat</td>
<td>3 (15)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 (10)</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Male goat</td>
<td>4 (20)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 (5)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Overall prevalence</td>
<td>17 (58)</td>
<td>1 (3)</td>
<td>1 (3)</td>
<td>3 (10)</td>
<td>1 (3)</td>
<td>4 (13)</td>
<td>3 (10)</td>
</tr>
</tbody>
</table>
Fig. 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 sheeps as compared to young, except *Chabertia ovina* (Table: 4).

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Positive samples (Prevalence %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O. ostertagi</td>
</tr>
<tr>
<td>Adult sheep</td>
<td>7 (35)</td>
</tr>
<tr>
<td>Young sheep</td>
<td>3 (15)</td>
</tr>
<tr>
<td>Adult goat</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Young goat</td>
<td>6 (30)</td>
</tr>
</tbody>
</table>

In goats, the prevailing parasites were *Ostertagia ostertagi, Haemonchus contortus*, and *coccidia*.

Gender wise prevalence was higher in males as compared to the females of the caprine genus (with the exception of *Haemonchus contortus*) (Table: 3). The age-wise prevalence was found higher in
young goats as compared to adults except for coccidian (Table: 4). Overall, the prevalence of parasites in sheep was higher when compared to goats, however, mild prevalence of parasites such as Fasciola hepatica, Shistosoma bovis, Ostertagia ostertagi, Trichuris globulosa, Haemonchus contortus, Chabertia ovina and Strogyloides papillosus were noticed in sheep. However, only Ostertagia ostertagi was highly prevalent in sheep in the present study. The higher prevalence of Haemonchus contortus, and Ostertagia ostertagi were also reported in sheep [36]. Moreover, the presence of Haemonchus contortus and Chabertia ovina in sheep were also reported [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]. However, a low prevalence of Haemonchus contortus was found in the present study when compared to results reported previously [40,41]. The results may be variable due to effective deworming strategies and good management practices adopted by the farmers.

More parasitic species were found in sheep as compared to goats and in line with findings of the study conducted by Asif et al. [42]. Prevalence of Haemonchus contortus in goat was 7.5% which was close to findings for Haemonchus contortus (9 %) reported previously [34]. It has been reported that Coccidia and other gastrointestinal nematodes as mixed or single infections are the 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 compared to
our current 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 a controversial results to our with the highest prevalence of parasitic species in goats followed by sheeps and cattles. However, a recent study carried out in Egypt for the prevalence of parasites in cattle, buffaloes, goats and sheep which showed similar findings like our results [48]. While, another study did in Shendam town of Plateau State, Nigeria only on goats and sheeps also reports higher prevalence in goats as compared to sheep [49]. The study also suggested that controversial results in various studies might be due to difference in climate and area. As Alcala-Canto et al. [50] described the effect of macroenvironment variables such as temperature, humidity and rainfall also produced pronounced effect on the parasitic prevalence.

4. Conclusion

The present study generally showed the low prevalence of different parasites in economically important farm animals. It was noticed that Balantidium coli in buffaloes, Fasicola hepatica in cows and Ostertagia ostertagi in goats were significantly different for adult and young groups. The main reason for this low occurrence of parasites in ovine and caprine species as compared to bovine species was due to proper care and deworming practices being used for these animals. The different managerial control practices and awareness programs should be considered to control gastrointestinal parasitic infections. These findings would be helpful for the future preventive measures planned to control these parasites to improve the health of these animals.

Conflict of Interest

The authors declare no conflict of interest.

References


