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Research Article

A Study on the Occurrence and Chemotherapy of Trematodes and Cestodes in Equines in Peshawar, Pakistan

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ABSTRACT

The present study was conducted to determine the occurrence and risk factors, as well as the comparative efficacy of different oral drugs, using hematological and serum biochemical markers against gastrointestinal trematodes and cestodes in equines. A total of 150 equines (75 horses and 75 donkeys) were selected from Peshawar, Pakistan. Fecal samples were collected and processed according to standard procedures. Parasite eggs were studied under microscopic examination using the egg flotation and McMaster techniques. Chemotherapy with albendazole, praziquantel, and piperazine was administered against the different parasites observed, based on identification methods. Various blood parameters, such as hemoglobin, red blood cells (RBCs), white blood cells (WBCs), serum potassium (K), and liver enzymes including alanine aminotransferase (ALT) and aspartate aminotransferase (AST), were assessed. The collected data was analyzed using SPSS 16.0 software with an unpaired sample T-test and one-way ANOVA. The results demonstrated that among the various types of cestodes and trematodes present in equines, the highest occurrence was found in *Gastrodiscus* spp. at 50%, compared to *Paranoplocephala* spp. (15%) and *Anoplocephala* spp. (19%). After treatment with albendazole, praziquantel, and piperazine, the levels of hemoglobin, RBCs, and WBCs increased significantly. Similar improvements were observed in serum potassium, AST, and ALT levels. The use of these dewormers remarkably reduced parasitic egg load and improved the hematological and biochemical profiles in horses and donkeys in Peshawar, Pakistan.

Keywords: Trematodes, Cestodes, Chemotherapy, Hemato-biochemical, Equines.

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INTRODUCTION

There are many types of helminthes that can infect digestive tract of horses, however, a few of them are said to cause considerable health issues. Primary class of GIT helminthes that are responsible for affecting health of horses includes large trematodes Cestodes like *Echinococccustaenia* (Walshe et al., 2020).

The general prevalence of gastrointestinal parasites in stallions has been observed to be 59.3%. *Anoplocephala perfoliata*, *A. magna*, and *A. mammillana* are common intestinal cestodes (tapeworms), while *Gastrodiscus* species, including *G. aegyptiacus*, are intestinal trematodes. *Parascaris equorum*, *Strongylus vulgaris*,

Oxyuris equi, *Cyathostomin*, and their multiple species are intestinal nematodes (roundworms) that are considered to be more prevalent in horses (Fesseha et al., 2022; Saeed et al., 2010). Trematodes (flukes) including *Fasciola* species, such as *F. hepatica* and *F. gigantica* in the liver, and *Dicrocoelium* species, such as *D. dendriticum*, *D. suppereri*, and *D. hospes* in the liver, bile duct, and gallbladder, are also common (Sazmand et al., 2020).

Gastrointestinal parasitism in horses leads to anorexia, blood and plasma protein loss in the digestive tract, altered protein metabolism, low enzyme activity, and diarrhea, resulting in weight loss, emaciation, and colic (Jota et al., 2021).

The control of equine parasites remains a complex issue for both owners and veterinary personnel. Conservative effect of these parasites is apparent on many fronts including direct effect on horse wellbeing, poor execution, cost of treatment, cost of anticipation and work (Nielsen, 2016).

The present study was designed to investigate the occurrence and risk factors associated with gastrointestinal helminths, trematodes, and cestodes in fecal samples of equines from different areas of Peshawar, Pakistan. Another objective of the study was to evaluate the comparative efficacy of different oral drugs using hematological and serum biochemical markers against gastrointestinal trematodes and cestodes in equines.

MATERIALS AND METHODS

Animals selection

Total 150 Equines having (Horses =75 and donkey= 75) were selected from Peshawar, Pakistan.

Samples collection

A total of 150 fresh fecal samples from equines were collected randomly from different areas of Peshawar, Pakistan. The samples were stored in a refrigerator at 4°C. Subsequently, slide preparations were made for ovum examination. Each sample was identified and accompanied by information regarding age, sex, body condition, and vaccination A small amount of fecal sample was placed in a bowl, and approximately 12 ml of the flotation solution was added. The suspension was mixed until it was fully blended. It was then strained through a metal tea strainer into a small beaker and later transferred into a test tube. The flotation solution was added, and a concave shape was created in the test tube. A coverslip was placed over the concave shape and allowed to remain for 10-15 minutes. Afterward, the coverslip was carefully removed and placed on a slide, then inspected under the microscope.status.

Samples processing

Each sample was triturated in a saturated salt solution (specific gravity 1.18–1.2) using a pestle and mortar. Afterward, the suspension was sieved and examined for trematode and cestode eggs using different techniques.

Microscopic examination

Direct microscopy, flotation, and sedimentation techniques were used for examining the fecal samples. Eggs per gram (EPG) were determined using the McMaster technique. Identification of the eggs was based on their morphological features. The positive samples were subjected to the McMaster Egg Counting Technique (Urquhart et al., 1996) to calculate the eggs per gram of feces.

Examination of fecal samples

Direct microscopic examination

A small quantity of feces was placed directly on a clean glass slide, and a few drops of water were added. The feces and water were then blended and mixed until the mixture was fully homogeneous. A cover slip was placed over the smear, and it was observed under the microscope to diagnose trematode and cestode eggs. Each sample was examined one by one using this process.

Simple floatation examination

Egg calculating

The samples positive for trematodes and cestodes were subjected to the McMaster technique to determine the number of eggs per gram.

McMaster technique

Weighed 2 grams of feces and placed them in a beaker, then added 28 ml of flotation solution (saturated NaCl). Mixed the contents of the beaker thoroughly with a spatula for 2-3 minutes to break up the feces and obtain a homogeneous mixture. The mixture was then filtered through a filter with a mesh size of 150 µm. The filtered fluid was left undisturbed for 10 minutes. The filtered liquid was mixed with a pipette, and an adequate amount was transferred into the two chambers of a McMaster slide. The slide was kept undisturbed for 5 minutes. The slide was then observed under a microscope, and the eggs were counted by following the lines running up and down the

columns. The total number of eggs counted was multiplied by 50 to calculate the number of eggs per gram.
Egg per gram (EPG) =N x 50
Where N = number of eggs counted in chamber

Occurrence
The occurrence of gastrointestinal trematodes and cestodes in horses and donkeys was calculated using the formula described by Thru Field (2005), which is given below:

$$\text{Occurrence (\%)} = \frac{\text{Number of positive Equine}}{\text{Total number of Equine}} \times 100$$

Chemotherapy trial:
Twenty equines (n = 10 horses, n = 10 donkeys) positive for trematode and cestode eggs, with an EPG of 750, were selected and divided into four groups: A, B, C, and D. Each group comprised 6 equines. The groups were as follows:

Table 1. Number of treatment groups

Groups	Drug	Dose
A	Albendazole	1ml/10kg
B	Praziquantal	1 mg/kg
C	Piperazine	20-30 g/100kg bw
D	Positive Control	----------
E	Negative Control	----------

Fecal sample were collected from each equine in each group at day 0, day 7, day 14, and day 21.
Anthelmintic efficacy:
Fecal egg count reduction (FECR) were calculated (Coles et al., 1992) according to the following formula:

$$\text{FECR (\%)} = \frac{\text{Pre} - \text{treatment EPG} - \text{Post} - \text{treatment EPG}}{\text{Pretreatment EPG}} \times 100$$

Hematological and serum biochemistry study
Blood samples from each equine in groups A, B, C, D, and E were collected on day 0 (pre-medication) and on days 7, 14, and 21 post-medication. Jugular vein puncture was used to collect the blood. A 5 ml blood sample was taken, stored in an EDTA tube, labeled, and transported to the lab for further examination. Blood samples were analyzed using a hematological analyzer. The blood parameters, including hemoglobin, RBCs, and WBCs, were evaluated.
Statistical analysis
The collected data were entered using SPSS version 16.0 and analyzed using the unpaired sample T-test was used for blood parameters, and one-way ANOVA was used for the treatment trial (Daniel, 2010).

RESULTS

Occurrence of trematodes and cestodes in equines in Peshawar, Pakistan
Overall occurrence of trematodes
A total of 150 equines in Peshawar were examined, out of which 66% of the population (99 animals out of 150) were positive for *Gastrodiscus* spp., 19% (28 animals out of 150) were positive for *Anoplocephala* spp., and 15% (22 animals out of 150) were positive for *Paranoplocephala* spp. Additionally, 75 animals were negative for *Gastrodiscus* spp., 131 animals were negative for *Anoplocephala* spp., and 135 animals were negative for *Paranoplocephala* spp.
Occurrence of trematodes (*Gastrodiscus* species)
The study was designed to determine the occurrence of different trematodes and cestodes in equines. It also aimed to evaluate the chemotherapeutic effects of albendazole, praziquantel, and piperazine against these trematodes and cestodes. The major trematode species found in this study was *Gastrodiscus* spp., which is a significant trematode

in equine species. A total of 150 equines were examined, consisting of 75 horses and 75 donkeys. The occurrence was higher in horses, with 34 horses testing positive, compared to 41 donkeys that were found positive.

Gender wise occurrence of *Gastrodiscus* species

A total of 150 equines were examined, of which 94 were male and 56 were female. The occurrence was higher in males, with 51 males testing positive, compared to 24 females testing positive.

Age wise occurrence of *Gastrodiscus* species

The animals were divided into different age groups: below 2 years, 2-4 years, 4-6 years, 6-8 years, 8-10 years, and above 10 years. The animals below 2 years old numbered 8 and tested positive for *Gastrodiscus* spp. The animals aged 2 to 4 years were 14, all of which were positive for *Gastrodiscus* spp. In the 4-6 year age group, 7 animals tested positive for *Gastrodiscus* spp., while 15 animals in the 6-8 year age group were positive. In the 8-10 year age group, 11 animals tested positive for *Gastrodiscus* spp., and in the above 10 year age group, 20 animals were positive for *Gastrodiscus* spp.

Body condition wise occurence of *Gastrodiscus* species

The animals were randomly divided based on body condition, such as good and weak, for the examination of different internal parasites. Out of 150 animals, 66 animals in good body condition were found positive for *Gastrodiscus* spp., while 9 animals in weak body condition tested positive for *Gastrodiscus* spp.

Gender wise occurrence of *Gastrodiscus* species

The study was designed to determine the occurrence of different trematodes and cestodes in horses. It was also conducted to evaluate the chemotherapeutic effects of albendazole, praziquantel, and piperazine against these trematodes and cestodes. The major trematode species found in this study was *Gastrodiscus* spp., which is a significant trematode in the horse family. A total of 75 horses were examined, of which 53 were male and 22 were female. The occurrence was higher in males, with 24 males testing positive, compared to 10 females testing positive. The occurrence of *Gastrodiscus* spp. in males was 32% of the positive animals, while in females, it was 13% of the positive animals.

Occurrence of cestodes (*Anoplocephala* species)

A total of 150 equines were examined, of which 75 were horses and 75 were donkeys. The occurrence was higher in horses, with 10 horses testing positive, compared to 9 donkeys testing positive.

Gender wise occurrence of *Anoplocephala* species

A total of 150 equines were examined, of which 94 were male and 56 were female. The occurrence was higher in males, with 13 males testing positive, compared to 6 females testing positive. The occurrence of *Anoplocephala* spp. in males was 9% of the positive animals, while in females, it was 4% of the positive animals.

Age wise occurrence of *Anoplocephala* species

The animals were divided into different age groups: below 2 years, 2-4 years, 4-6 years, and 6-8 years. The animals below 2 years old numbered 4 and tested positive for *Anoplocephala* spp. The animals aged 2 to 4 years were 5, all of which tested positive for *Anoplocephala* spp. In the 4-6 year age group, 2 animals tested positive for *Anoplocephala* spp., while 4 animals in the 6-8 year age group tested positive. No animals in the 8-10 year age group tested positive for *Anoplocephala* spp., and 4 animals above 10 years old tested positive for *Anoplocephala* spp.

Body condition wise occurrence of *Anoplocephala* species

The animals were randomly divided based on body condition, such as good and weak, for the examination of different internal parasites. Out of 150 animals, 17 animals in good body condition tested positive for *Anoplocephala* spp., while 2 animals in weak body condition tested positive for *Anoplocephala* spp.

Occurrence of cestodes (*Paranoplocephala* species)

The major cestode species found in this study were *Paranoplocephala* spp. and *Anoplocephala* spp., which are common cestodes in equine species. A total of 150 equines were examined, consisting of 75 horses and 75 donkeys. The occurrence was higher in donkeys, with 8 donkeys testing positive, compared to 7 horses testing positive.

Gender wise occurrence of *Paranoplocephala* species

A total of 150 equines were examined, of which 94 were male and 56 were female. The occurrence was higher in males, with 10 males testing positive, compared to 5 females testing positive. The occurrence of *Paranoplocephala* spp. in males was 7% of the positive animals, while in females, it was 3% of the positive animals.

Age wise occurrence of *Paranoplocephala* species

The animals were divided into different age groups: below 2 years, 2-4 years, 4-6 years, and 6-8 years. The animals below 2 years old numbered 3 and tested positive for *Paranoplocephala* spp. The animals aged 2 to 4 years were 2, both of which tested positive for *Paranoplocephala* spp. In the 4-6 year age group, no animals tested positive for *Paranoplocephala* spp., while 4 animals in the 6-8 year age group tested positive. In the 8-10 year age group, 3 animals tested positive for *Paranoplocephala* spp., and in the above 10 year age group, 3 animals tested positive for *Paranoplocephala* spp.

Body condition wise occurrence of *Paranoplocephala* species

The animals were randomly divided based on body condition, such as good and weak, for the examination of different internal parasites. Out of 150 animals, 14 animals in good body condition tested positive for *Paranoplocephala* spp., while 1 animal in weak body condition tested positive for *Paranoplocephala* spp.

Chemotherapy trail

A total of 20 equines (horses and donkeys) positive for trematodes and cestodes, with an egg count of less than 750 eggs/gram, were selected and divided into five groups: A, B, C, D, and E. Group A animals were treated with albendazole, Group B animals were treated with praziquantel, and Group C animals were treated with piperazine. Group D was kept as the positive control, and Group E was kept as the negative control. All drugs were administered orally.

Overall eggs per gram (EPG) on Day 0, 7, 14 and 21

The eggs per gram (EPG) value of each group was calculated on days 0, 7, 14, and 21. The EPG value of Group A was 750 on day 0, 365 on day 7, 220 on day 14, and 140 on day 21. Group B had 630, 270, 180, and 110 eggs per gram on days 0, 7, 14, and 21, respectively. The EPG values of Group C were 720 on day 0, 410 on day 7, 270 on day 14, and 130 on day 21. Group D, which was the positive control and not treated with albendazole, praziquantel, or piperazine, had 700, 800, 900, and 1000 eggs per gram on days 0, 7, 14, and 21, respectively. Group E, which was the negative control and also not treated with albendazole, praziquantel, or piperazine, had 500, 600, 700, and 800 eggs per gram on days 0, 7, 14, and 21, respectively.

Percent efficacy of drugs post treatment

The efficacy of the albendazole drug was 51.3% on day 7, 70.66% on day 14, and 82.20% on day 21. The praziquantel drug had an efficacy of 57.4% on day 7, 71.4% on day 14, and 83.31% on day 21. The piperazine drug showed 43.05% efficacy on day 7, 62.25% on day 14, and 78.42% on day 21. Group D, which was the positive control and not treated with albendazole, praziquantel, or piperazine, had 0%, 0%, and 0% efficacy on days 7, 14, and 21, respectively. Group E, which was the negative control and also not treated with albendazole, praziquantel, or piperazine, had 0%, 0%, and 0% efficacy on days 7, 14, and 21, respectively.

EPG of *Gastrodiscus* species on Day 0, 7, 14, and 21

The eggs per gram (EPG) value of each group were calculated on days 0, 7, 14, and 21. The EPG value of Group A was 670 on day 0, 370 on day 7, 210 on day 14, and 170 on day 21. Group B had 720, 410, 250, and 190 eggs per gram on days 0, 7, 14, and 21, respectively. The EPG values of Group C were 750 on day 0, 480 on day 7, 260 on day 14, and 180 on day 21. Group D, which was not treated with albendazole, praziquantel, or piperazine, had 600, 700, 700, and 600 eggs per gram on days 0, 7, 14, and 21, respectively.

Percent efficacy of drugs post treatment against *Gastrodiscus*

The efficacy of the albendazole drug was 47.77% on day 7, 68.66% on day 14, and 74.34% on day 21. The praziquantel drug had 43.05%, 65%, and 69% efficacy on days 7, 14, and 21, respectively. The piperazine drug showed 36% efficacy on day 7, 52% on day 14, and 58% on day 21. Group D, which was not treated with albendazole, praziquantel, or piperazine, had 14.28%, 14.28%, and 14.28% efficacy on days 7, 14, and 21, respectively.

EPG of *Paranoplocephala* species on Day 0, 7, 14 and 21

The eggs per gram (EPG) value of each group were calculated on days 0, 7, 14, and 21. The EPG value of Group A was 730 on day 0, 435 on day 7, 230 on day 14, and 210 on day 21. Group B had 750, 370, 170, and 140 eggs per gram on days 0, 7, 14, and 21, respectively. The EPG values of Group C were 700 on day 0, 300 on day 7, 150 on day 14, and 130 on day 21. Group D, which was not treated with albendazole, praziquantel, or piperazine, had 700, 800, 900, and 1000 eggs per gram on days 0, 7, 14, and 21, respectively.

Percent efficacy of drugs post treatment against *Paranoplocephala* species

The efficacy of the albendazole drug was 40.41% on day 7, 68.49% on day 14, and 72.3% on day 21. The

praziquantel drug had 50.66%, 77.33%, and 79.82% efficacy on days 7, 14, and 21, respectively. The piperazine drug showed 57.14% efficacy on day 7, 78.71% on day 14, and 83% on day 21. Group D, which was not treated with albendazole, praziquantel, or piperazine, had 12.5% and 28.57% efficacy on days 7 and 14, respectively.

Table 2. Total hemoglobin rate in experimental horses and donkeys.

Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D (Positive control)	Group E (Negaitive control)
Horses	Day 0	9.1±.11	9.9±.26	11.7±.40 g/dl	10.8±.19g/dl	10.8±.19
Hemoglobin	Day 7	9.3±.15	10.2±.35	12.2±.56	10.6±.21	10.8±.21
(means ± S.D)	Day 14	9.4±.41	10.4±.41	12.7±.75	10.4±.31	10.8±.31
	Day 21	9.7±.43	10.6±.22	12.9±.76	10.2±.33	10.9±.33
Donkeys	Day 0	9.1±.11	10.4±.26	10.7±.40	9.8 ±.21g/dl	9.8 ±.21
Hemoglobin	Day 7	9.2±.15	10.6±.35	11±.56	9.7 ±.21g	9.8 ±.21
(means ± S.D)	Day 14	9.3±.41	10.9±.41	11.7±.75	9.5 ±.21g/dl	9.9 ±.21
	Day 21	9.5±.42	11±.43	11.8±.76	9.3 ±.21g/dl	9.9 ±.21

EPG of *Anoplocephala* species on Day 0, 7, 14 and 21

The egg per gram value of each group was calculated on days 0, 7, 14, and 21. The egg per gram value of Group A was 800 on day 0, 600 on day 7, 500 on day 14, and 400 on day 21. Group B had 750 on day 0, 400 on day 7, 200 on day 14, and 100 on day 21. The egg per gram values of Group C were 700 on day 0, 350 on day 7, 200 on day 14, and 100 on day 21. Group D was not treated with albendazole, praziquantel, or piperazine and had 700 on day 0, 800 on day 7, 900 on day 14, and 1000 on day 21.

Percent efficacy of drugs post treatment against *Anoplocephala* species

The efficacy of the Albendazole drug was 25% on day 7, 37.5% on day 14, and 46.21% on day 21. The Praziquantel drug had 46.66%, 73.33%, and 78.35% efficacy on days 7, 14, and 21, respectively. The Piperazine drug had 50% efficacy on day 7, 71.42% on day 14, and 79.63% on day 21. Group D, which was not treated with Albendazole, Praziquantel, or Piperazine, had 14.28%, 28.57%, and 42.12% efficacy on days 7, 14, and 21, respectively.

Table 3. Red blood cells value in horses and donkeys.

Red Blood Cells Value in Horses						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D	Group E
Horse RBCs	Day 0	6.56±0.1	7.73±0.2	8.16±0.1	9.11±0.4	10.3±0.4
(means ± S.D)	Day 7	6.8±0.2	8.13±0.2	9.26±0.2	9.2±0.6	10.3±0.4
	Day 14	6.9±0.4	8.23±0.2	9.72±0.2	9.1±0.7	10.3±0.6
	Day 21`	7±0.4	8.33±0.2	9.82±0.2	9.1±0.6	10.3±0.6
Red Blood Cells Value in Donkeys						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D	Group E
Donkey RBCs	Day 0	5.9±0.1	6.70±0.2	7.9±0.1	9.1±0.1	11.56±0.9
(means ± S.D)	Day 7	6.2±0.3	7.53±0.5	8.56±0.8	9.0±0.2	11.66±0.9
	Day 14	6.4 ±0.5	8.73±0.6	9.56±0.9	8.8±0.7	11.66±0.9

Hematology and serum biochemistry

Blood samples were collected to measure various parameters such as hemoglobin (Hb), red blood cells (RBCs), and white blood cells (WBCs). Serum samples were analyzed for liver enzymes, including alanine aminotransferase (ALT), aspartate aminotransferase (AST), and potassium (K). After treatment with albendazole, praziquantel, and piperazine, the levels of Hb, RBCs, and WBCs successfully increased. Similar improvements were observed in serum potassium, AST, and ALT levels. There was no significant difference between or within the groups. All values were within the reference range. The results are shown in Tables 2-7.

Table 4. White blood cells in horses and donkeys.

White Blood Cells in Horses						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D	Group E
Horse WBCs (means ± S.D)	Day 0	8.03±0.4	10.73±0.1	8.70±0.2	9.8±0.3	10.8±0.3
	Day 7	8.4±0.3	10.79±0.6	9.83±0.7	9.4±0.5	10.8±0.6
	Day 14	8.46±0.2	10.82±0.7	10.56±0.2	9.33±0.7	10.8±0.8
	Day 21	9.46±0.2	11.82±0.7	10.58±0.2	9.10±0.7	10.8±0.8
White Blood Cells in Donkeys						
Donkey WBCs (means ± S.D)	Day 0	9.36±0.2	10.1±0.1	9.0±0.5	9.7±0.2	10.7±0.2
	Day 7	9.53±0.2	10.6±0.1	9.66±0.3	9.5±0.4	10.76±0.7
	Day 14	9.57±0.7	10.9±0.3	9.7±0.6	9.1±0.8	10.76±0.9
	Day 21	9.57±0.9	10.9±0.8	9.7±0.6	9.1±0.8	10.76±0.9

Table 5. Serum potassium level in horses and donkeys

Serum Potassium Level in Horses						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D (Positive control)	Group E (Negative control)
Horses Potassium (means ± S.D)	Day 0	2.5±.11	3.5±.26	2.7±.40g/dl	2.5±.32	4.0 ±.40
	Day 7	2.7±.15	3.7±.41	2.7±.56	2.3±.32	4.0 ±.40
	Day 14	2.9±.41	3.7±35	2.8±.75	2.2±.30	4.2 ±.41
	Day 21	2.4 ±.40	3.6 ±.37	3.0 ±20	2 .1 ±.28	4.2 ±.41
Serum Potassium Level in Donkeys						
Donkeys Potassium (means ± S.D)	Day 0	3.5±.11	3.5±.26	2.7±.40	3.2±.32	4 ± 40
	Day 7	3.7±.15	3.7±.41	2.2±.56	2.8±.32	4 ± .40
	Day 14	3.9± .41	3.7±.35	2.7±.75	2.5 ±.30	4.2 ± .44
	Day 21	3.9 ± .40	3.7 ±.38	2.3 ±.82	2.3 ± .28	4.2 ± .47

Table 6. Serum AST level in horses and donkeys.

Serum AST Level in Horses						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D (Positive control)	Group E (Negative control)
Horse AST (means ± S.D)	Day 0	295±.11	310±.26	245±.40	281±.32	414 ± .40
	Day 7	297±.15	317±.41	268±.56	287±.30	414 ± .40
	Day 14	309±.41	321±.35	286±.75	293±.28	414 ± .41
	Day 21	314 ± .40	327±.43	301 ±.84	298 ± .26	414±. 41
Serum AST Level in Donkeys						
Donkeys AST (means ± S.D)	Day 0	365±.11	312±.26	219±.40	367±.32	414 ± 40
	Day 7	376±.15	341±.41	225±.56	362 ±.32	414 ± 40
	Day 14	381± 41	352 ±35	2437±.75	353 ± 30	414 ± 41
	Day 21	392 ± 40	357 ±	254 ±	348 ± 28	414 ± 41

DISCUSSION

In the current experiment, out of a total of 150 equine samples (75 horses and 75 donkeys), the samples positive for *Gastrodiscus spp.* were 75%. The previously reported occurrences were 53.33% (Ememe et al., 2024), 75% (Maitland-Stuart, 2022), 58.5% (Saeed et al., 2010), and 45.1% (Tahir et al., 2016). The difference in occurrence may be due to the method of sampling; active sampling may result in higher occurrences compared to passive sampling, or factors such as the history of anthelmintic use, season, and target species (Khanum et al., 2021). *Gastrodiscus spp.* was the most prevalent endoparasite (75%). Our study results contrast with earlier findings

reported by Alsahli et al. (2024), who reported a lower occurrence of *Gastrodiscus spp.*

Table 7. Serum ALT level in horses and donkeys.

Serum ALT Level in Horses						
Group	Days	Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D (Positive control)	Group E (Negative control)
Horses ALT (means ± S.D)	Day 0	10.5±.11	10.5±.26	11.7±.40	12.8±.32	17 ± .40
	Day 7	10.7±.15	10.7±.41	12.2±.56	12.5±.32	18 ± .40
	Day 14	10.9±.41	13 ±.35	12.7±.75	11.5 ±.30	18.2± .41
	Day 21	11.4 ±.40	13.6 ±	13 ±.81	11.3 ± .28	18.5±.41
Serum ALT Level in Donkeys						
Group		Group A (Albendazole)	Group B (Praziquantal)	Group C (Piperazine)	Group D (Positive control)	Group E (Negative control)
Donkeys ALT (means ± S.D)	Day 0	9.5±.11	10.5±.26	11.7±.40g/dl	12±.32	18 ±.40
	Day 7	9.7±.15	10.7±.41	12.2±.56	12 ±.32	18 ±.40
	Day 14	10.9±.41	13 ±.35	12.7±.75	11.5 ±.30	18.2 ±.41

In the present study, *Paranoplocephala spp.* (15%) cestodes were found, which is consistent with earlier studies (Li et al. 2022). However, a contradictory result was observed in previous studies, where *P. equorum* was reported as the most frequently detected parasite (Phetkarl et al., 2024). In the current experiment, the results for *Anoplocephala spp.* (19%) of cestodes were similar to earlier reports (Burcáková et al., 2023). However, the present results disagree with earlier studies where *P. equorum* was reported as the most frequently detected parasite (Matinpour et al., 2025).

In the present study, the occurrence of *Gastrodiscus spp.* in male animals was 45.2%, while in females, it was 45.4%. A total of 75 horses were examined, out of which 53 were male and 22 were female. The occurrence was higher in males, with 24 positive cases, compared to 10 positive females. Other helminths such as *Paranoplocephala spp.* (5%) were found in over 50% of necropsies of Thoroughbreds in Kentucky in recent years (Carminatti et al., 2023).

The occurrence of *Paranoplocephala spp.* was also higher in males, with 6 positive cases, while only 1 female was found positive. These findings are consistent with those of Rehbein et al. (2013). In this experiment, the occurrence of *Paranoplocephala spp.* in males was 15.09%, while in females, it was 13.63% (P value 0.591). The occurrence was more in males, with 8 positive cases, and 3 females found positive.

In this study, the occurrence of *Gastrodiscus spp.* in horses was 44.28%, while in donkeys, it was 60% (P value 0.441). The occurrence was higher in horses, with 31 positive cases, compared to 3 positive donkeys. The current experiment confirmed the occurrence of *Gastrodiscus spp.* in Peshawar, where 75 donkeys were examined, and 41 were found positive. The occurrence of *Gastrodiscus spp.* in Peshawar was 54.6%. The prevalence of parasites in equids was found to be more than 90%, with mules having the highest fecal egg count at 875 eggs per gram, followed by donkeys and horses with 400 eggs per gram. No relationship was found between EPG (eggs per gram) and body condition score (BCS) ($p > 0.05$). The results suggest that the high prevalence and parasite load in equids are not significantly influenced by BCS (Valdéz-Cruz et al., 2013).

In this experiment, the occurrence of *Paranoplocephala spp.* in donkeys in Peshawar was found to be 10.6%. A total of 75 donkeys were examined, and 8 were found positive. The occurrence of *Anoplocephala spp.* in Peshawar was also 10.6%. The results confirmed its occurrence in Peshawar, where 75 donkeys were examined and 8 were found positive. In the present study, the occurrence was higher in males, with 27 positive cases, compared to 14 positive females. The occurrence of *Gastrodiscus spp.* in males was 65.85% in positive animals, while in females, it was 41.17%. The P value was 0.028. In the present experiment, the occurrence of *Paranoplocephala spp.* was higher in males, with 4 positive cases, and 4 positive females were found. The occurrence of *Paranoplocephala spp.* in males was 9.75%, while in females; it was 11.76%, with a P value of 0.534.The overall occurrence of *Gastrodiscus spp.* and *Paranoplocephala spp.* was found to be 13%. Females had a 15.2% occurrence, while animals younger than six months had a 15.4% occurrence. Pasture-dependent animals showed an occurrence of 15.58%, and this was found

to be a significant variable (Roncoroni et al., 2016).

The findings of the present study indicated that the occurrence was higher in males, with 5 positive cases, compared to 3 positive females. The occurrence of *Anoplocephala spp.* in males was 12.19% in positive animals, while in females, it was 8.82%, with a P value of 0.466.

The present study observed that the animals aged below 2 years had 8 positive cases for *Gastrodiscus spp.*, while 14 animals in the 2 to 4 years age group were positive for *Gastrodiscus spp.*. Seven animals in the 4 to 6 years age group were positive for *Gastrodiscus spp.*, and 15 animals in the 6 to 8 years age group were positive. Eleven animals in the 8 to 10 years age group were positive for *Gastrodiscus spp.*, and 20 animals above 10 years of age were positive.

Out of 150 animals, 66 animals were found positive for *Gastrodiscus spp.*, which were placed in good body condition scoring, while 9 animals in weak body condition were found positive. The burden of tapeworms increases as they are facilitated by a reduction in competition with other gastrointestinal parasites, due to the decreased number of parasites following medication (Emeto et al., 2022).

The findings of the present study indicated that 3 animals below 2 years of age were positive for *Paranoplocephala spp.*, 2 animals in the 2 to 4 years age group were positive, and no animals in the 4 to 6 years age group were positive for *Paranoplocephala spp.*. Additionally, 4 animals in the 6 to 8 years age group were positive, 3 animals in the 8 to 10 years age group were positive, and 3 animals above 10 years of age were positive for *Paranoplocephala* spp.

In the present experiment, out of 150 animals, 17 animals in good body condition were found positive for *Anoplocephala spp.*, while 2 animals in weak body condition were found positive for *Anoplocephala* spp.

CONCLUSION

The results demonstrated that among the various types of cestodes and trematodes present in equines, the highest occurrence was found in *Gastrodiscus spp.*, followed by *Paranoplocephala spp.*, *Anoplocephala spp.*, and donkey. The use of albendazole, praziquantel, and piperazine as anthelmintics against cestodes reduces the parasitic egg load and improves the hematobiochemical profile in horses and donkeys.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this research.

COMPETING OF INTEREST

The authors declare no competing interests.

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