



Prevalence of gastrointestinal parasites in cattle and buffaloes in the buffer zone of Chitwan National Park, Nepal

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ABSTRACT

Gastrointestinal parasite infestation can affect milk production in dairy cows. The study was conducted in Bharatpur Metropolitan City, Wards 6, 8, 11, and 12, in the Chitwan district buffer zone of Chitwan National Park (CNP), between June and July 2023. We collected and examined 126 fecal samples from cows and buffalo under a microscope using direct smear and sedimentation techniques. Overall, 70.37% of samples tested positive for various gastrointestinal parasites. Among the samples collected, prevalence (80.36%) was higher in cows than in buffaloes (44.29%). The prevalence of *Ascaris* sp. was highest (44%), followed by *Moniezia* sp. (15%). Gastrointestinal parasite infestation can affect milk production in dairy cows. The study was carried out in Bharatpur Metropolitan City, Wards 6, 8, 11, and 12, in the Chitwan district buffer zone of Chitwan National Park (CNP), between June and July 2023. We collected and examined 126 fecal samples from cows and buffalo under a microscope using direct smear and sedimentation techniques. Overall, 70.37% of samples tested positive for various gastrointestinal parasites. Among the samples collected, prevalence (80.36%) was higher in cows than in buffaloes (44.29%). The prevalence of *Ascaris* sp. was highest (44%), followed by *Moniezia* sp. (15%), while *Toxocara* sp. had the lowest prevalence (2.07%). Sex-wise, prevalence was higher in males (70.37% in buffalo, 100% in cow) than in females (27.91% in buffalo, 68.57% in cow). By age, the lowest prevalence of gastrointestinal parasites was found in calves (<12 months) (47.65%), whereas it was higher in adults (83.33% in 12-14 months, 86.67% in >24 months). Future investigations are necessary to evaluate the economic loss due to GI parasites in cows and buffaloes.

Keywords: Buffalo, cattle, gastrointestinal parasites, infection

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INTRODUCTION

The dairy sector contributes in numerous ways to the fight against poverty. It contributes roughly 9% of Nepal's agricultural GDP and nearly 63% of the country's livestock GDP (NDDB 2021). Rural farmers can earn a consistent income year-round from dairy farming (Siddiky 2017). Nepal has 3.8 million households that raise dairy animals and produces 0.247% of the world's milk (Shingh et al 2020). Milk production shows a favorable trend,

with an average annual growth rate of 4.9%, rising from 1.62 million tons in 2011–12 to 2.48 million tons in 2020–21 ([MoALD 2022](#)).

Numerous ecto- and endoparasite species are a primary cause of losses in milk and meat production and eventual economic losses for farmers. Ruminant livestock gastrointestinal parasitic diseases are a global issue for both small- and large-scale farmers. Small ruminants in tropical and subtropical regions suffer far more from internal parasitic diseases than those in temperate regions because parasites are more abundant in nature ([Waller 1997](#)). Nematodes, cestodes, and trematodes are the primary causes of gastrointestinal parasite infections in ruminant livestock ([Ntonifor et al 2013](#)). Helminth infection is thought to be one of the main factors affecting cattle productivity in the subtropics and tropics ([Githiori et al 2004](#)). It decreases productivity and efficiency, leading to significant economic losses ([Sykes 1994](#)) and raises mortality, which affects the livelihood of farming communities.

Helminth parasites negatively affect farm animal breeding by directly or indirectly harming the host. Intestinal parasites can cause economic losses in several ways, including decreased fertility, reduced work capacity, involuntary culling, decreased food intake and weight gain, decreased milk production, increased treatment costs, and mortality in animals with severe parasitism ([Lebbie et al 1994](#)). Grazing practices also significantly influence the frequency and severity of gastrointestinal nematodes ([Keyyu and Kassuku 2005](#)). Despite their economic importance, scholars have paid cattle the least attention. Because of limited veterinary care and farmers' lack of knowledge about diseases, cattle become infected with many endoparasites. Among these endoparasites, gastrointestinal parasites are a serious issue in cattle and cause significant economic losses due to poor meat and milk quality, severe weight loss, and other factors. Developing and successfully implementing gastrointestinal parasite control requires an effective approach. The incidence of gastrointestinal parasitic infections in cattle and their correlation with risk variables that affect parasite transmission must be monitored periodically. The prevalence of gastrointestinal parasites has been estimated to range from 0.72 to 84.1% worldwide ([Bundy et al 1983](#), [Khan et al 2010](#)). An in-depth understanding of the parasite's pathophysiology and epidemiology, in relation to host management and immunity, is necessary for an effective anthelmintic strategy. Therefore, regular monitoring of parasite species in livestock would help manage and treat diseases at the earliest stages of infection in farm management. To ascertain the prevalence of gastrointestinal nematodes in cattle, no thorough surveillance has been carried out in Bharatpur Metropolitan City Wards 6, 8, 11 and 12. As a result, this study assessed the presence of parasites to help formulate management measures and an appropriate deworming plan.

For cattle owners, internal parasites can cause considerable productivity losses and major financial impacts. Parasite losses are frequently subclinical and undetectable, but severe infestations can result in disease and even death. Reduced pregnancy rates in mature cows, decreased milk production, decreased weaning weights, delayed puberty and decreased fertility in replacement heifers, decreased fertility in mature cows, and immune suppression in all classes of cattle are just a few of the subclinical production losses brought on by internal parasites. The cattle graze in a nearby marshy forest, which favors parasitic infection. Livestock and wildlife share the habitat temporally and spatially, so parasites can be transmitted between them.

Limited knowledge of intestinal parasites that may infect cattle reduces the availability of dairy products. The study aimed to estimate the prevalence of several internal parasites.

Sufficient work has not been done in Bharatpur Metropolitan City, Chitwan District, on gastrointestinal parasitic infection. The current work may also help future scholars advance their fields of study. The present study clarifies several issues raised by the general public and butchers to raise awareness of the frequency of parasite infection. The next step is to consider the most practical and cost-effective ways to accomplish the aim.

Parasitic infection is a serious issue in livestock. Therefore, the proposed study is focused on intestinal parasite infections. The general objective of this study was to determine the distribution of gastrointestinal parasites in cows and buffalo in wards 6, 8, 11, and 12 of Bharatpur Metropolitan City, Chitwan District. The specific objectives of this study were to identify the presence of different types of gastrointestinal parasites down to the genus level in cows and buffalo from the buffer zone of Chitwan National Park, and to develop recommendations for future planning related to the management of internal parasites in cows and buffalo.

MATERIALS AND METHODS

Study Area

This study was conducted in Wards 6, 8, 11, and 12 of Bharatpur Metropolitan City, Chitwan District, Nepal. Bharatpur Metropolitan has a humid subtropical, dry winter climate. The district's yearly temperature is 29.28°C (84.7°F), 7.28% higher than Nepal's average. Bharatpur typically receives about 252.91 millimeters (9.96 inches) of precipitation and has 182.05 rainy days (49.88% of the time) annually 2023 Weather and Climate. The study sites are situated at a latitude of 27° 40' 60" North and a longitude of 84° 25' 60" East (<https://en.db-city.com/Nepal--Bagmati--Chitwan--Bharatpur>).

Materials Used

The study design is based on laboratory examination. The laboratory materials used included plastic bags, slides, a centrifuge machine, gloves, cover sleeves, pipettes, plastic bottles, beakers, volumetric flasks, a microscope, cotton, a tea strainer, a refrigerator, cello tape, and test tubes. The chemicals used were 10% formalin, 5% potassium dichromate ($K_2Cr_2O_7$), sodium chloride solution, zinc chloride solution, and methylene blue.

Study Design and Methods

Sample Size

A total of 126 dung samples were collected from Bharatpur Metropolitan City Wards 6, 8, 11, and 12 of Chitwan district, Nepal. The weight of each collected sample was 5 grams/sample.

Samples collection

Fecal samples were collected from June to July 2023. Each sample was taken in small glass containers with lids and labeled with the date, age, sex, species and location.

Preservation of samples

Approximately 10% $KMnO_4$ or 2–3% formalin was added to the containers for sample preservation when immediate examination was not possible. Fresh dung samples were collected and placed in airtight containers to prevent desiccation. In the case of fresh samples, 3–4 drops of 10% formalin were added for fixation, whereas 5% formalin was used as a preservative for preserved samples. The samples were thoroughly mixed with the chemicals to minimize fungal growth and were stored in a refrigerator until examination. Sampling was conducted randomly to ensure representative sample.

Laboratory Examination

The samples were examined at the Veterinary Hospital and Livestock Expert Service Center laboratory in Bharatpur, Chitwan, using flotation and sedimentation techniques. The dung samples were collected and brought to the laboratory in preservatives ($K_2Cr_2O_7$) and formalin, and were refrigerated. The sedimentation technique was used to examine the fecal samples.

After collection, samples were taken to the laboratory of the Veterinary Hospital and Livestock Expert Service Center, Bharatpur, Chitwan, where microscopic examination was performed using the direct smear and sedimentation methods to detect and identify gastrointestinal helminth eggs. Following Foreyt (2001), all helminths were identified to the genus level or above using morphological traits. When at least one parasite egg is detected, the results are deemed positive (Lorenzini et al 2007). Using common morphological criteria, recovered parasite stages were identified (Soulsby 1968). Mixed infection refers to helminth parasite infections caused by more than one species (polyparasitism).

Direct smear method

In the direct smear technique, the sample material was dissolved in normal saline, and a drop of the solution was applied to the slide using a dropper before being viewed under a microscope.

Sedimentation Technique

For sedimentation, we crushed the sample with a mortar and pestle. The sample was crushed and then dissolved in a sterile saline solution. The sample was then filtered in the beaker using a tea filter. Then, 1 mL of the filtered sample and 14 mL of the NaCl solution were placed in a 15-milliliter centrifuge tube and spun at 1000 rpm for 5 minutes. The tube was removed, and the solution was left undisturbed for approximately 15 minutes. After 15 minutes, a pipette was used to extract the supernatant without disturbing the sediment.

Statistical analysis

The information was gathered, tabulated for frequency, and then converted to percentages for drawing inferences. The difference was determined to be statistically significant. Comparative prevalence of various gastrointestinal (GI) parasites by group or species was calculated by following the formula.

Prevalence (%) = (Number of positive samples / Total number of samples examined) $\times$ 100

RESULTS

Gender-Wise Prevalence of Gastrointestinal Parasites

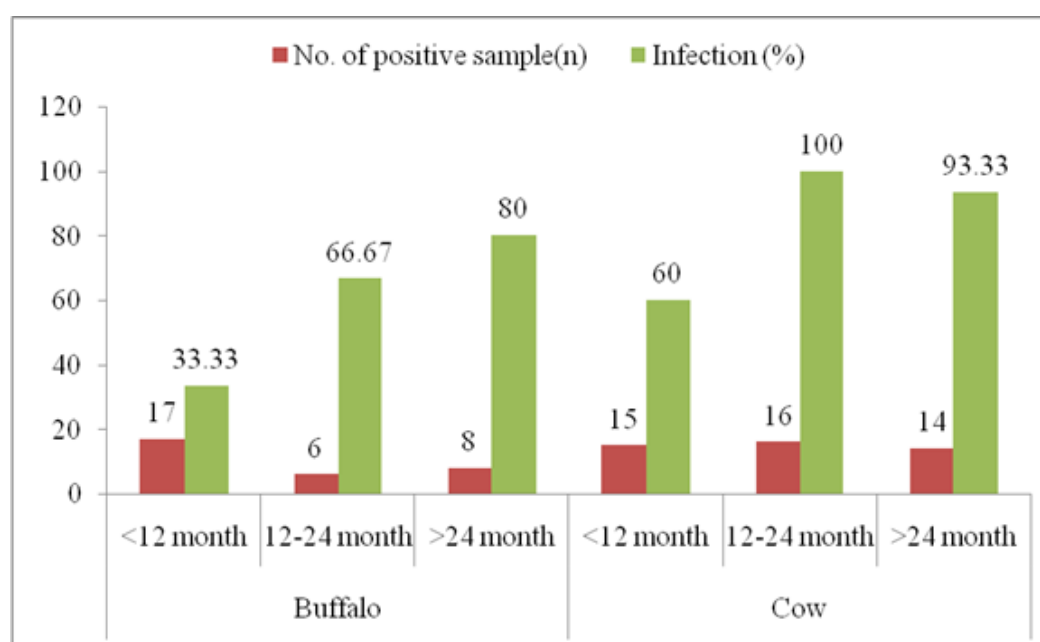
Table 1 shows the infection rates for internal parasites in cows and buffaloes by gender. The overall infection rate for buffaloes is 44.28%, with male buffaloes having a higher infection rate of 70.37% compared to female buffaloes with an infection rate of 27.91%. Overall, the infection rate for cows is 80.36%, with male cows at 100% and female cows at 68.57%. Combining the data for both cows and buffaloes, the overall infection rate for internal parasites in both species is 60.32%.

Table 1: Gender-wise prevalence of internal parasites in cow and buffalo

Animal category	Variables	No. of examined sample (n)	No. of positive sample (n)	Infection (%)
Buffalo	Male	27	19	70.37
	Female	43	12	27.91
Overall	Total	70	31	44.28
Cow	Male	21	21	100.00
	Female	35	24	68.57
Overall	Total	56	45	80.36
Overall animals	Total gender	126	76	60.32

Age-Wise Prevalence of Gastrointestinal Parasites

Figure 1 shows that in buffalo, those older than 24 months had the highest infection rate (80%), with 8 out of 10 samples testing positive. Buffaloes younger than 12 months had the lowest infection rate (33.33%), with 17 of 51 samples testing positive. Similarly, in cows, the 12-24 month age group had a 100% infection rate, with 25 out of 25 samples testing positive. Calves younger than 12 months had a 60% infection rate, with 15 of 25 samples testing positive.

**Figure 1:** Age-wise prevalence (%) of internal parasites in cows and buffaloes

Overall Prevalence of Gastrointestinal Parasites

Figure 2 shows infection rates ranging from 16.7% to 100%. The infection rates of *Paramphistomum* sp., Tapeworm, *Taenia* sp., *Moniezia* sp., *Strongylus* sp., and *B. coli* are higher in cows compared to buffaloes. In contrast, *Toxocara* sp. shows a higher infection rate in buffaloes than in cows. This suggests that cows are more susceptible to *Paramphistomum* sp., Tapeworm, *Taenia* sp., *Moniezia* sp., *Strongylus* sp., and *B. coli* infections, while buffaloes are more susceptible to *Toxocara* sp. infection. Figure 2 shows infection rates ranging from 16.7% to 100%. The infection rates of *Paramphistomum* sp., Tapeworm, *Taenia* sp., *Moniezia* sp., *Strongylus* sp., and *B. coli* are higher in cows compared to buffaloes. In contrast, *Toxocara* sp. shows a higher infection rate in buffaloes than in cows. This suggests that cows are more susceptible to *Paramphistomum* sp., Tapeworm, *Taenia* sp., *Moniezia* sp.,

Strongylus sp., and *B. coli* infections, while buffaloes are more susceptible to *Toxocara* sp. infection.

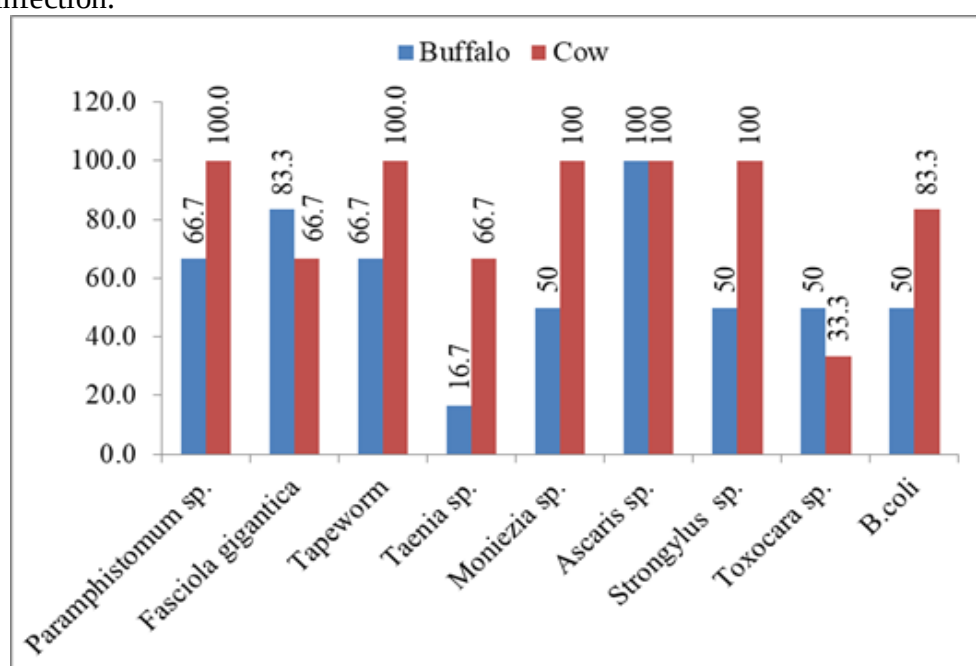


Figure 2: Overall prevalence (%) of internal parasites in cows and buffaloes

Prevalence Percentage of Gastrointestinal Parasites

Table 2 shows that *Ascaris* sp. had the highest infection rate (15.79%), with 12 positive samples. *Paramphistomum* sp. and tapeworm had an infection rate of 13.16 %, with 10 positive samples each. *Moniezia* sp. and *Strongylus* sp. had an infection rate of 11.84 %, with 9 positive samples each. *Fasciola gigantica* and *B. coli* had an infection rate of 10.53 %, with 8 positive samples each. *Taenia* sp. and *Toxocara* sp. had the lowest infection rate (6.58%), with 5 positive samples each.

Table 2: Percentage of prevalence of different internal parasites in cows and buffaloes

GI Parasites	No. of positive sample	Infection (%)
<i>Paramphistomum</i> sp.	10	13.16
<i>Fasciola gigantica</i>	8	10.53
<i>Tape worm</i>	10	13.16
<i>Taenia</i> sp.	5	6.58
<i>Moniezia</i> sp.	9	11.84
<i>Ascaris</i> sp.	12	15.79
<i>Strongylus</i> sp.	9	11.84
<i>Toxocara</i> sp.	5	6.58
<i>B. coli</i>	8	10.53
Total	76	

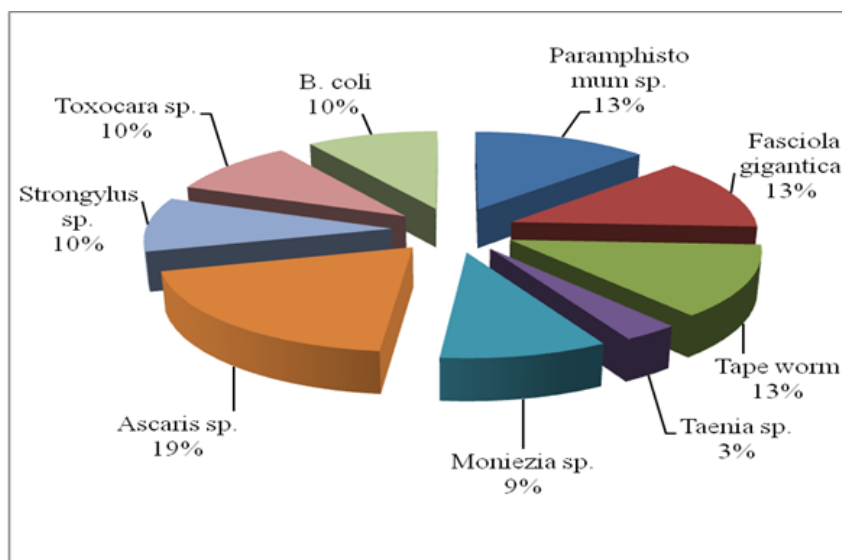


Figure 3: Percentage of prevalence of different internal parasites in buffalo

Figure 3 shows that *Ascaris* sp. has the highest infection rate in buffaloes (19%). *Paramphistomum* sp., Tapeworm, and *Fasciola gigantica* have an equal infection rate of 13%. *Strongylus* sp., *Toxocara* sp., and *B. coli* also have an equal infection rate of 10%. *Moniezia* sp. shows an infection rate of 9%. The lowest infection rate is found in *Taenia* sp., with 3%.

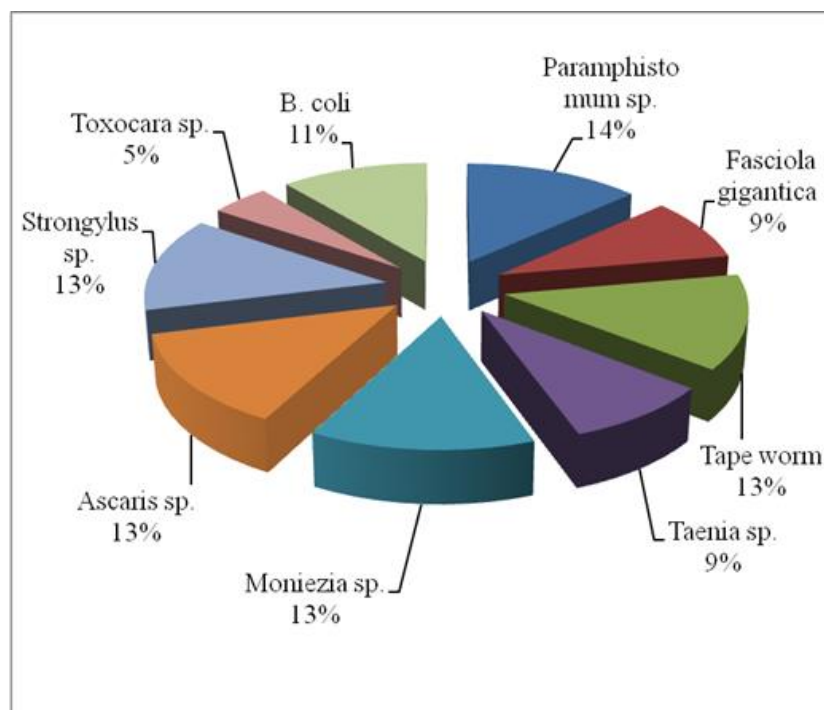


Figure 4: Percentage of prevalence of different internal parasites in cow

Figure 4 shows that *Paramphistomum* sp. has the highest infection rate (14%) among the listed parasites in buffaloes. Tapeworm, *Strongylus* sp., *Ascaris* sp., and *Moniezia* sp. all have an equal infection rate of 13%. *B. coli* also has an infection rate of 11%. *Taenia* sp. has an infection rate of 9%. *Toxocara* sp. has the lowest infection rate, at 5%.

DISCUSSION

As poverty rises, cows and buffaloes are crucial to Nepal's economy for milk production. However, Gastrointestinal parasites (GIPs) adversely affect livestock productivity and impose substantial economic losses on farmers ([Subedi and Karmacharya 2026](#)). Farmers spend a considerable amount of money treating these animals' gastrointestinal parasites. In the present study, we collected 126 fecal samples from Bharatpur Metropolitan City wards. We also collected samples from wards 6, 8, 11, and 12 of Chitwan district to identify gastrointestinal parasites in cows and buffaloes, since little research has screened cows and buffaloes for parasites in the district. Overall, 70.37% of samples were positive for various types of gastrointestinal parasites. This result was similar to research by [Ntonifor et al. \(2013\)](#) in ruminants in Jakiri, Bui Division, Northwest Region of Cameroon (66.9%), and 63.4% prevalence in Tangail, Bangladesh by [Rahman et al. \(2017\)](#). [Adhikari et al \(2022\)](#) reported a 90% prevalence of GIPs found in buffalo in Chitwan, Nepal. Variations from previous reports may be due to differences in the number of fecal samples examined and geo-climatic conditions such as temperature, humidity, etc. The highest prevalence (80.36%) was observed among cows, and the lowest among buffaloes (44.29%). The higher prevalence in buffaloes and goats may be due to differences in feeding habits and habitats of each species.

The extent and severity of parasitic infections are affected by local environmental and microclimatic conditions, as well as by animal management ([Maganga et al 2019](#)). Failure to carry out regular parasite control and treatment can also lead to infection ([Omoruyi and Agbinone 2020](#)). The high prevalence found in this study may also be linked to limited awareness among farmers and improper anthelmintic use ([Khan et al 2022](#)), as well as differences in climate, grazing methods, water sources, hygiene, and animal management systems ([Harizt et al 2021](#)). Another significant factor is seasonality, since monsoon conditions offer favorable environmental conditions for the development, survival, and transmission of gastrointestinal parasites ([Marskole et al 2016](#)).

Cows and buffalo at the survey sites were infected with gastrointestinal parasites, namely *Paramphistomum sp.*, *Fasciola gigantica*, Tapeworm, *Taenia sp.*, *Moniezia sp.*, *Ascaris sp.*, *Strongylus sp.*, *Toxocara sp.*, and *Balantidium coli*. In this study, the prevalence of *Ascaris sp.* was highest (44%), followed by *Moniezia sp.* (15%), while *Toxocara sp.* had the lowest prevalence (2.07%). In the sex-wise study, the highest infection percentage was found in males (70.37% in buffalo, 100% in cow) and the lowest in females (27.91% in buffalo, 68.57% in cow). [Iassan et al. \(2000\)](#) studied the prevalence dynamics of fascioliasis versus other gastrointestinal helminths in buffaloes and cattle in Giza Governorate. They reported a 10.35% prevalence in cattle, similar to the present study. The helminths included mainly other GI parasites such as *Paramphistomum sp.* and *Moniezia sp.* In this study, the lowest infection with gastrointestinal parasites was found in calves (<12 months) (47.65%), whereas it was higher in adults (83.33% in 12-14 months, 86.67% in >24 months). Our findings are similar to those of [Khan et al. \(2022\)](#), who observed that adult cows were highly affected by GI parasites (56.12%), while a higher occurrence was also observed in adult buffaloes (73.8%). [Qureshi and Tanveer \(2009\)](#) and [Cheru et al. \(2014\)](#) also reported that GI parasite prevalence rises with age.

This study did not include parasitological or molecular analyses to confirm the zoonotic potential of the identified parasites. Future research should include these investigations to characterize parasite species better and assess their potential zoonotic significance.

CONCLUSION

Cows and buffalo in Bharatpur Metropolitan City, Wards 6, 8, 11, and 12 of Chitwan district, were infected with gastrointestinal parasites, including *Paramphistomum* sp., *Fasciola gigantica*, Tapeworm (*Taenia* sp.), *Moniezia* sp., *Ascaris* sp., *Strongylus* sp., *Toxocara* sp., and *Balantidium coli*. *Ascaris* sp. had the highest prevalence, followed by *Moniezia* sp. The incidence of gastrointestinal parasitic infection varied with species, age, and sex. Prevalence was highest in cows and lowest in buffaloes. Males had the highest infection rate, while females had the lowest. Calves were less affected than adults. Infection with internal parasites is a major problem because it directly reduces growth, health, and productivity in cows and buffaloes. Therefore, it was necessary to monitor the incidence of GI nematode parasite infection through periodic surveillance activities in various regions in Chitwan. Good cattle husbandry for parasite prevention, associated with urgent and effective treatment, is recommended.

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Authors' Contributions

Sajana Rai: Conceptualization, Investigation, Methodology, Formal Analysis, Data curation, Writing- original draft, writing review & editing. Amir Sadaula: Conceptualization, Methodology, Formal Analysis, writing review & editing. All authors contributed to revising the manuscript and gave final approval for submission.

Conflicts of Interest

The author(s) declare that they have no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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