



Research Paper

Investigation of *Toxocara Vitulorum* in Calves

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Abstract	Manuscript Information
<p>This study, titled "Investigation of <i>Toxocara vitulorum</i> in Calves," aimed to determine the prevalence of <i>Toxocara vitulorum</i> in calves in Nagurjuna Municipality. A total of 200 fecal samples were collected, with 100 samples from domesticated cattle calves and 100 from street cattle calves. Among the domesticated cattle calves, 15 (15%) were positive for <i>Toxocara vitulorum</i> ova, while 17 (17%) of the street cattle calves were positive. The prevalence was higher in younger calves (less than 3 months old) at 25.58%, compared to 7.091% in older calves (more than 3 months old), a difference that was statistically significant ($p = 0.010$). Additionally, male calves showed a higher prevalence (21.05%) compared to female calves (13.58%), though this difference was not statistically significant ($p = 0.642$). The prevalence in undrenched calves (16%) was higher than in drenched calves (8%), but this difference was also not statistically significant ($p=0.797$). The study concluded that <i>Toxocara vitulorum</i> is more prevalent in street cattle than domesticated cattle, likely due to poor feeding habits and lack of anti-helminthic drug use. The higher prevalence in younger calves may be attributed to their lower resistance, lack of hygiene, or inadequate care by farmers. These findings highlight the need for improved management practices to control <i>Toxocara vitulorum</i> infections in calves.</p>	<ul style="list-style-type: none"> ▪ ISSN No: 2583-7397 ▪ Received: 20-05-2024 ▪ Accepted: 07-06-2024 ▪ Published: 13-08-2024 ▪ IJCRM:3(4); 2024: 137-143 ▪ ©2024, All Rights Reserved ▪ Plagiarism Checked: Yes ▪ Peer Review Process: Yes
	<p>How to Cite this Manuscript</p> <p>Jasmin Adhikari, Upendra Man Singh, Rameshower Aryal, Prativa Shrestha. Investigation of <i>Toxocara Vitulorum</i> in Calves. International Journal of Contemporary Research in Multidisciplinary.2024; 3(4): 137-143.</p>

Keywords: *Toxocara vitulorum*, Prevalence, Hepato-tracheal migration, Toxocariasis, Feces.

1. INTRODUCTION

Toxocara vitulorum is a parasitic ascarid primarily found in cattle and water buffalo in tropical and subtropical climates. This parasite mainly infects cattle, buffalo, zebu, and occasionally sheep and goats. Cows are typically infected through the ingestion of larvated eggs, which hatch, penetrate the small intestine, and remain in the somatic musculature as hypo biotic larvae (Warren, 1971). [19] During parturition, these larvae become active, travel to the mammary glands, and are transferred to young calves through lactogenic routes (Chelladurai *et al.*,

2015). [6] These lactogenic allies acquired larvae mature into adult worms in the calves' small intestine without undergoing somatic migration. The adult worms mate, and the mature females produce eggs, which are excreted in the feces. Calves typically expel these worms in their feces by six months of age. A high number of worms can irritate the intestinal mucosa and cause potential impaction. Calves with concurrent diseases or poor nutrition are particularly susceptible to severe infections, which can result in fatalities.

An adult female *Toxocara vitulorum* can produce about 1,000 eggs per day, with egg production reaching up to 8,000 eggs per day or as high as 100,000 eggs per gram of feces per day (Roberts, 1989). The infective eggs hatch within the host, and the larvae penetrate the intestinal wall, attaching to the somatic musculature as hypobiotic larvae (Avcioglu & Balkaya, 2011).^[3] Patent toxocariasis is observed in young calves around six months old when adult worms are expelled in the feces (Roberts, Fernando, & Sivanathan, 1990).^[16] Intestinal toxocariasis can lead to diarrhea, poor performance, intestinal and biliary obstruction, and ultimately death (Refuerzo & Albis-Jimenez, 1954).^[14] If the infection escalates, disease prevalence can reach up to 100% in calves, resulting in high mortality rates.

Although *Toxocara vitulorum* is considered a parasite of the tropics, some studies have reported its presence in more temperate climates, such as Europe. For instance, a 12% prevalence was noted in bison calves in the province of Manitoba, Canada (Woodbury *et al.*, 2012).^[20] This suggests that the parasite's range may be broader than previously thought.

Despite the significance of *Toxocara vitulorum* in bovines, limited studies have been conducted on this topic. Toxocariasis is prevalent in bovine calves, especially in buffalo calves, due to breeding practices. However, water buffalo are generally more resistant to this disease. This resistance may be due to genetic factors, differences in immune response, or variations in management practices between different types of livestock.

In summary, *Toxocara vitulorum* is a significant parasitic threat to cattle and buffalo, particularly in tropical and subtropical regions. The lifecycle of the parasite involves several stages, including ingestion of larvated eggs, migration of larvae, and eventual excretion of eggs in feces. Understanding the prevalence, lifecycle, and impact of *Toxocara vitulorum* is crucial for developing effective management and control strategies to protect livestock health and productivity.

Problem Statement

This study was conducted to determine the prevalence of *Toxocara vitulorum* based on age, sex, drenching history, and the comparison between street and domesticated cattle. Specifically, the study aimed to assess whether the prevalence of *Toxocara vitulorum* is higher in younger calves (less than 3 months old) compared to older calves (more than 3 months old). Additionally, the study sought to compare the prevalence between male and female cattle, and between drenched and non-drenched cattle. These parameters were chosen based on their use in previous research.

To address these objectives, the research was conducted in Nagarjun Municipality, where 100 fecal samples were collected from domesticated cattle calves and another 100 from street cattle calves. The primary reason for this research is the vertical transmission of *Toxocara vitulorum* through milk, with larvae present in milk for 3-4 weeks post-parturition. Calves under 6 months can be infected through milk as larvae undergo hepato-tracheal migration, while older calves can be infected through the ingestion of larvated eggs. In older calves, the larvae undergo somatic migration, attaching to tissues such as the liver, lungs,

muscle, brain, kidney, and lymph nodes. These larvae remain dormant in female calves until late pregnancy, resuming development and migrating to the mammary gland during parturition, thus allowing transmission through milk.

The clinical signs of *Toxocara vitulorum* in calves under 6 months include unthriftiness, catarrhal enteritis, intermittent diarrhea, intestinal obstruction, and occasionally intestinal perforation leading to peritonitis and death. Therefore, it is necessary to examine the presence of *Toxocara vitulorum* through fecal examination and provide timely treatment using a range of anthelmintics such as benzimidazoles and ivermectin.

The main research question of this study is: "What factors determine the prevalence of *Toxocara vitulorum* in calves aged 3 to 6 months, and how do these factors affect the presence of *Toxocara vitulorum* in fecal samples?"

The major objective of the study is, "to identify and examine the presence of *Toxocara vitulorum* in calves aged between 3 and 6 months."

2. LITERATURE REVIEW

A literature review summarizes earlier studies (Bell, Bryman, & Harley, 2022)^[5] on a subject of inquiry and examines scholarly books, journals, and other pertinent sources. In this review, authors describe, summarize, and critically evaluate each source. Literature reviews reveal areas that require more research, gaps, or conflicts in the literature and justify the research work (Kothari, 2004).^[10] They assess data related to the researcher's chosen field, providing a theoretical framework that defines the scope of the investigation. This framework, based on established theories, reflects the study's suggestions and acts as the cornerstone of the research (Saunders & Lewis, 2017).^[18] Literature suggests various perspectives that the research must consider, supporting or refuting beliefs or practices with evidence (Aryal, 2022).^[2]

Avcioglu and Balkaya (2011)^[3] conducted research between February and May 2010 to determine the distribution of *Toxocara vitulorum* in calves in Erzurum, Turkey. They collected fecal samples from 508 calves of different ages, genders, and breeds from 15 villages. Using the Fulleborn saturated salt solution method, they found *Toxocara vitulorum* eggs in 113 out of 508 (22.2%) fecal samples. The prevalence was 24% in calves below six months old and 10.6% in those aged 6-12 months.

Borgsteede *et al.*, (2012)^[4] investigated a Dutch farmer's beef cattle and suckling calves, where one calf had diarrhea and large white worms. Fecal tests revealed *Toxocara vitulorum* eggs. After treating the affected calf with albendazole, which was successful, they reinvestigated and found two more calves positive for *Toxocara vitulorum*. After treatment with doramectin for a month, the calves tested negative. To prevent further infections and dissemination, the farmer decided to slaughter all his cattle.

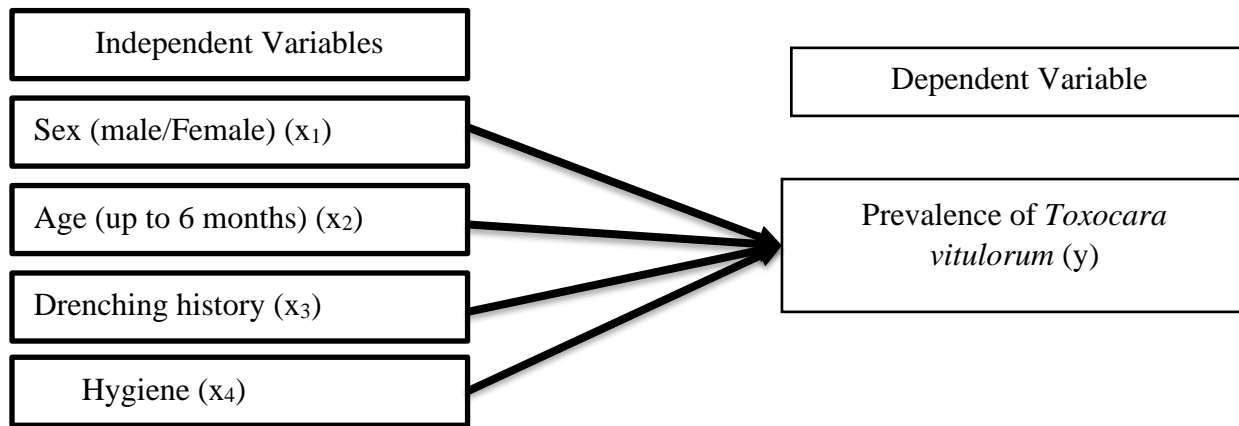
Raza *et al.*, (2013)^[13] conducted research from January to March 2008 in Multan District, Pakistan, to determine the prevalence of *Toxocara vitulorum* in cattle and buffalo. They examined the Gastro-Intestine Tract (GIT) of 426 large ruminants (cattle and

buffalo) slaughtered at Multan abattoir. Among 282 buffalo, 180 were positive, indicating a prevalence of 63.83%. Among 144 cattle, 54 were positive, indicating a prevalence of 37.50%. The age-wise study divided cattle and buffalo into three groups: Group A (more than one year old), Group B (1-5 years old), and Group C (less than five years old). The prevalence was 72.09% in Group A, 18.18% in Group B, and 35.29% in Group C. Das and Phukan (2016) studied the prevalence of *Toxocara vitulorum* infection in calves in and around Guwahati from January to December 2013. They examined 1,120 fecal samples using the flotation method and found an overall prevalence of 26.16%. The prevalence was higher in female calves (31.09%) compared to male calves (20.31%). The age-wise prevalence was highest (49.23%) in the age group of 0-30 days, followed by 31-60 days (39.38%), 61-90 days (29.82%), 91-120 days (18.85%), 121-150 days (12.93%), 151-180 days (9.23%), and above 180 days (2.33%). The breed-wise prevalence was higher in local calves (27.89%) than in crossbreed calves (23.54%). Research conducted in Afyonkarahisar, Turkey, between March 2018 and April 2019, examined the prevalence of *Toxocara vitulorum* in calves. They collected fecal samples from 603

calves from 22 villages and used the Fulleborn saturated saltwater flotation method. They found five of 603 calves (0.83%) were infected with *T. vitulorum*, mostly in animals aged 0-6 months (Kozan, Birdane, Erez, & Göksu, 2021).[11] Parihar et al., (2022) conducted a study in and around Mhow, District Indore, and Madhya Pradesh, to determine the prevalence of *Toxocara vitulorum* in buffalo calves. They collected 200 fecal samples from the rectum or freshly passed stool and used parasitological investigation following flotation technique and Egg per Gram (EPG) by McMaster technique. They found 45 samples positive for *T. vitulorum*, with an overall prevalence of 22.5%. The age-wise prevalence was 78% in calves aged 0-6 months and 22% in calves aged 6-12 months. The sex-wise prevalence was higher in female calves (27%) compared to male calves.

Conceptual Framework

From the above discussion researcher constructed the conceptual framework for the study as follows:



Source: Raza, et al., (2013), Das & Phukan, (2016) and Parihar, et al., (2022)

Theoretical Foundation of the Study

The theoretical framework is the structure that can support a theory of a research study. It serves as a foundational review of theories, providing a roadmap for developing the arguments that the research will address. Researchers use or develop theories to explain phenomena, establish connections between study variables, and make predictions (Cassell et al., 2017).[8] Therefore, the theoretical framework justifies and contextualizes the research studies.

Positivist Research Paradigm

This research is guided by the positivist paradigm, where data is derived from observation and experimentation. Knowledge is generated through experimentation and validated by observation and statistical tests (Addae & Quan-Baffour, 2015). Objective and quantitative data are collected in line with the research objectives, and knowledge is acquired through statistical testing, which accepts scientific methods of inquiry.

The knowledge creation process involves measuring phenomena in numbers and figures to enhance accuracy (Kothari, 2004).[10] This approach focuses on identifying and unfolding relationships between variables based on the belief that perceptions and statements are either true or false, reflecting a stable and unchanging reality (Saunders & Lewis, 2012).[17]

Experimental Research Design

This study is based on the philosophical foundation of experimental research perspectives. The research design primarily focused on the relationship between independent and dependent variables. Random sampling and random assignment were used to create a control group and an experimental group (Cassell et al., 2017).[8] The results of the experiment were compared to determine whether there was a significant difference between the treatment and control groups. The study aimed to understand the effect of various independent variables such as sex, age, drenching history, and hygiene (domesticated

vs. street cattle) on the dependent variable, which is the prevalence of *Toxocara vitulorum* in calves aged 3 to 6 months in Nagarjun Municipality. This experimental research design sought to explore the cause-and-effect relationships between the assigned dependent and independent variables.

Sources of Primary Data

Primary data were collected from fecal analyses for *Toxocara vitulorum* from various fecal samples of calves aged 3 to 6 months collected during field surveys.

Sources of Secondary Data

Secondary data for this research were collected from various sources, including journal articles, books, and dissertations, after reviewing related materials concerning *Toxocara vitulorum* in street calves aged 3 to 6 months. This secondary data was used to compare and make inferences about the primary data used in this study.

3. MATERIALS AND METHODS

Studies on the prevalence of *Toxocara vitulorum* infection in calves were conducted from September 2018 to November 2018. A total of 200 samples were collected, with 100 fecal samples randomly collected from domesticated calves (19 males and 81 females) and another 100 fecal samples from street cattle (93 males and 7 females). Samples were collected from different localities within Nagarjun Municipality.

Sample Animal (Calves) Selection Process

For the age-wise prevalence study, calves less than 3 months and those more than 3 months old were selected. The sex of the calves was recorded to study the sex-wise prevalence of *Toxocara vitulorum*. The history of deworming was recorded to study prevalence based on deworming history.

Faecal Sample Collection

Fecal samples were collected directly from the rectum by backracking from individual animals using latex gloves. Each sample was kept in separate sterile plastic containers and labeled properly. After collecting feces from one animal, hands were washed thoroughly before collecting the next sample to prevent cross-contamination of helminthic eggs. After collection, samples were examined in the laboratory of HICAST.

Laboratory Examination

Fecal samples were examined for the presence of *Toxocara vitulorum* eggs by the sedimentation method according to the procedure of Urquhart *et al.*, (1987). Whenever *Toxocara vitulorum* eggs were encountered, the corresponding fecal samples were recorded as positive.

Data Discussion

Statistical analysis was performed by Minitab 17 software by applying Chi Square test. The differences between various

groups were tested to be significant at $P < 0.05$ and $P < 0.01$. Sex-wise prevalence of *Toxocara vitulorum* in calves (Household).

Sex-wise prevalence of *Toxocara vitulorum* in calves (household)

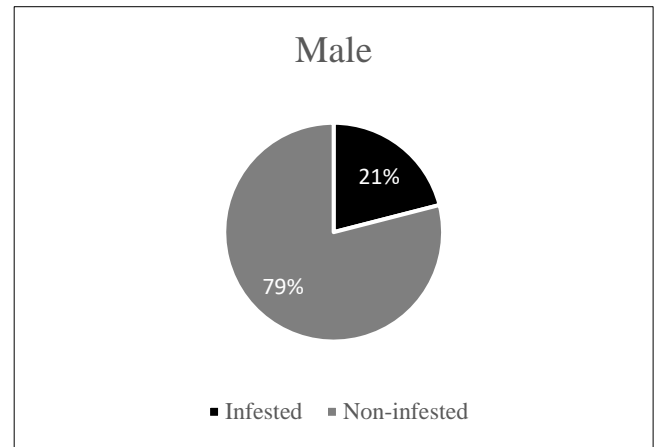


Figure 1: Pie chart showing prevalence of *T. Vitulorum* in male calves

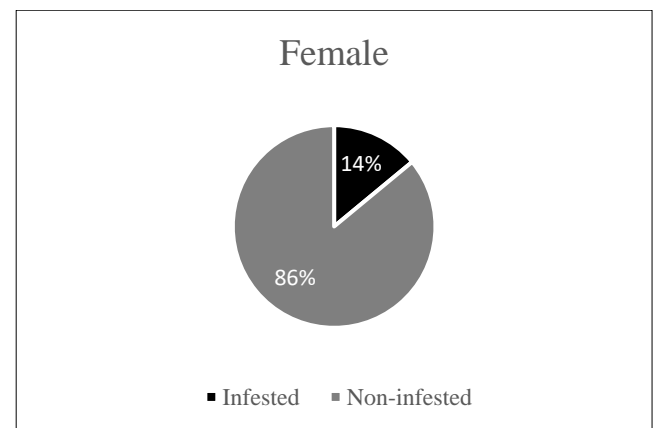


Figure 2: Pie chart showing prevalence of *T. Vitulorum* in female calves

The sex wise prevalence of *Toxocara Vitulorum* infestation in calves shows that there was prevalence of 21.05% in male and 13.58 % in female. (Fig. 1 and Fig. 2)

Prevalence based on history of Drenching (Household)

Among 100 samples, 12 samples were from drenched and 88 samples were from undrenched calves. Out of 12 drenched samples, 1 sample was found to be positive for *Toxocara Vitulorum* (Fig 3) and from 88 undrenched samples, 14 samples were found to be positive for *Toxocara Vitulorum*. (Fig. 3 and fig. 4)

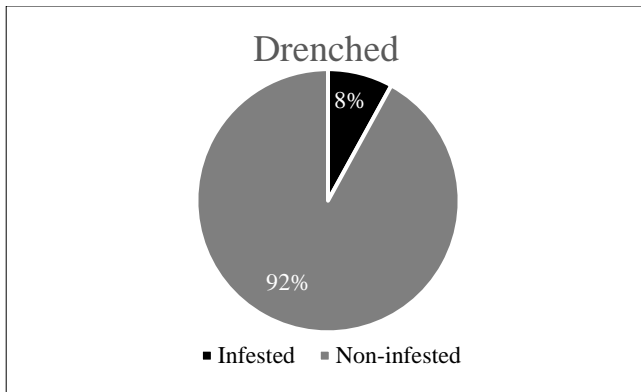


Figure 3: Pie chart showing prevalence of *T. Vitulorum* in drenched calves

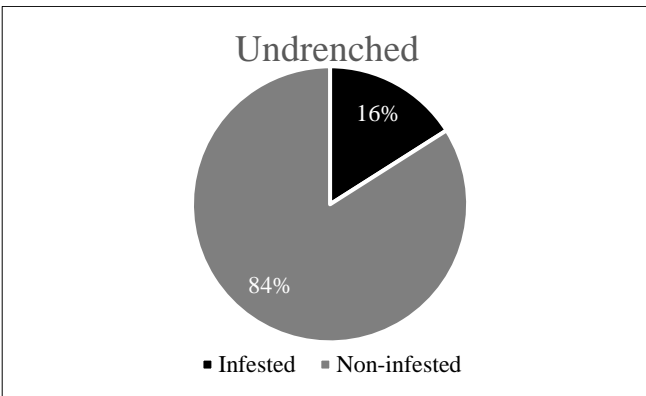


Figure 4: Pie chart showing prevalence of *T. Vitulorum* in undrenched calves

Age-wise prevalence of *Toxacara Vitulorum* in calves (Household)

Out of 43 samples collected from cattle calves below 3 months 11 samples were infested and 32 samples were non-infested. Similarly, out of 57 samples collected from calves above 3 months 4 samples were infested and 53 samples were non-infested. (Fig 5).

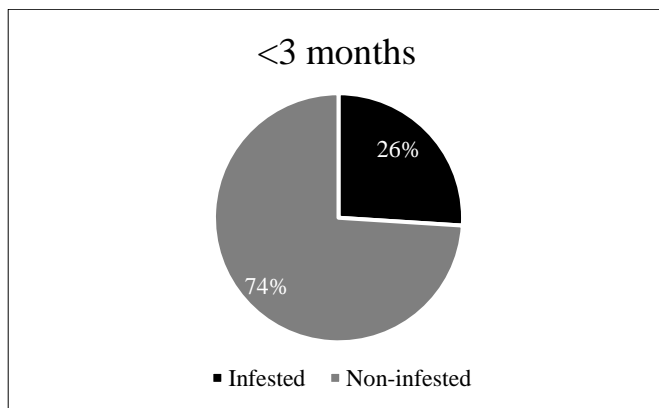


Fig 5: Pie chart showing infested and non-infested samples below 3 months

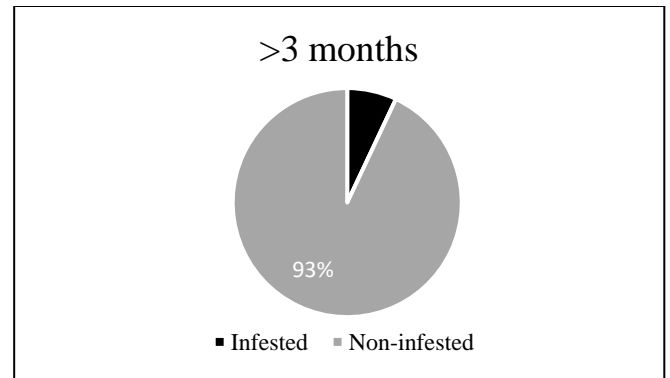


Fig 6: Pie chart showing infested and non-infested samples above 3 months

Table 1: Sex wise prevalence of *Toxoxora Vitulorum* with Chi-square test performed in household farm

Sex	No. of Animal	Infested	Non-infested	Prevalence (%)	P-value
Male	19	4(2.85)	15(16.15)	21.05	0.642 (not significant)
Female	81	11(12.15)	70(68.85)	13.58	

Table 1 shows that infected rates in household female calves is more (i.e. female 81 and male 19) than male calves. Similarly, prevalence percentage in male is higher (i.e. 21.05%) than in female (i.e. 13.58%). So, the Chi-square test shows the significant relationship between males and female i.e. the p-value is 0.642 which is more than 0.05.

Table 2: Sex wise prevalence of *Toxoxora Vitulorum* with Chi-square test performed in Street cattle

Sex	Total no. of animal	Infested	Non-infested	Prevalence (%)	P-value
Male	93	15(15.81)	78(77.19)	16.12	0.746 (not significant)
Female	7	2(1.19)	5(5.81)	28.57	

Table 2 shows that infected rates in street male calves is more (i.e. male 93 and female 7) than female calves. Similarly, prevalence percentage in female is higher (i.e. 28.57%) than in male (i.e. 16.12%). So, the Chi-square test shows the significant relationship between males and female i.e. the p-value is 0.746 which is more than 0.05.

Table 3: Prevalence based on history of drenching with Chi-square test performed in household cattle

Status	Total no. of animal	Infested	Non-infested	Prevalence (%)	P-value
Drenched	12	1(1.80)	11(10.20)	16.67	0.797 (not significant)
Un-drenched	88	14(13.20)	75(74.80)	14.77	

Table 3 shows that infected rates in household un-drenched infected rate is more (i.e. un-drenched 13.2% and drenched 1.8%) than drenched. Similarly, prevalence percentage in drenched is higher (i.e. 16.67%) than in un-drenched (i.e. 14.77%). So, the Chi-square test shows the significant

relationship between drenched and un-drenched *i.e.* the p-value is 0.746 which is more than 0.05 in household cattle.

Table 4: Age-wise prevalence of *Toxocara Vitulorum* in calves with Chi-square test performed (Household)

Age groups (months)	Total no. of animal	Infested	Non-infested	Prevalence (%)	P-value
<3 months	43	11(6.45)	32(36.55)	25.58	0.010 (significant)
>3 months	57	4(8.55)	53(48.45)	7.01	
	100	15	85		

Table 4 shows that infected rates in less than 3-month calves are more than the infected rates on more than 3-month age (*i.e.* infected rate in less than 3 month is 6.45% and infected rate more than 3-month calves is 8.55%). Similarly, prevalence percentage in less than 3 months age calves is 25.58% is higher than more than 3 months of age *i.e.* 7.01%. So, the Chi-square test shows the significant relationship between more than 3 months of age and less than 3 months of age *i.e.* the p-value is 0.010 which is less than 0.05.

Major Finding of the Study

The study yielded the following major findings:

- The sex-wise prevalence of *Toxocara vitulorum* infestation in calves was 21.05% in males and 13.58% in females.
- Among the 100 samples, 12% were from drenched calves, and 88% were from undrenched calves.
- Out of the 12 drenched samples, 1 sample (8.33%) was positive for *Toxocara vitulorum*. Out of the 88 undrenched samples, 14 samples (15.9%) were positive for *Toxocara vitulorum*.
- Of the 43 samples collected from calves below 3 months old, 11 samples (25.6%) were infested, and 32 samples (74.4%) were non-infested.
- Of the 57 samples collected from calves above 3 months old, 4 samples (7.01%) were infested, and 53 samples (92.98%) were non-infested.
- There was a higher prevalence of *Toxocara vitulorum* (25.5%) in calves less than 3 months old compared to those older than 3 months (7.01%), which is a significantly different prevalence (p). This result indicates that calves less than 3 months old are more prone to infestation by *Toxocara vitulorum*.

5. CONCLUSION

This study reveals that the overall prevalence of *Toxocara vitulorum* infection in the areas surrounding Nagarjuna Municipality was 15% in domesticated cattle and 17% in street cattle. The findings indicate a significant difference in prevalence based on age, with the highest prevalence (25.58%) observed in calves younger than 3 months and the lowest prevalence (7.01%) in calves older than 3 months. This suggests that younger calves are more susceptible to *Toxocara vitulorum*

infection, possibly due to their underdeveloped immune systems and greater exposure to contaminated environments.

The study also examined the prevalence of *Toxocara vitulorum* based on sex, finding a higher prevalence in female calves compared to male calves. This could be due to physiological or behavioral differences, although further research is needed to understand the underlying reasons for this disparity.

A notable finding is the higher prevalence of *Toxocara vitulorum* in street cattle compared to domesticated cattle. This difference may be attributed to the poorer feeding habits and lack of anti-helminthic drug use in street cattle. Street cattle are more likely to graze in contaminated environments and have less access to veterinary care, increasing their risk of infection. In contrast, domesticated cattle are generally better cared for, receive regular veterinary attention, and are more likely to be dewormed, reducing their risk of infection.

The study also highlighted the importance of hygiene and care in preventing *Toxocara vitulorum* infections. The higher prevalence of *Toxocara vitulorum* eggs in younger animals may be due to their lesser resistance and the lack of hygiene or care by farmers. Farmers often delay the administration of anti-helminthic drugs until 25 days or one month after the birth of calves, leaving young calves vulnerable to infection during this critical period.

These findings underscore the need for improved management practices to reduce the prevalence of *Toxocara vitulorum* in cattle. Regular deworming, better hygiene practices, and timely veterinary care are essential to control the spread of this parasite. Additionally, targeted interventions to support street cattle, such as community-based veterinary services, could help reduce the prevalence of *Toxocara vitulorum* and improve the overall health of these animals.

In conclusion, this study provides valuable insights into the prevalence and risk factors associated with *Toxocara vitulorum* infection in calves in Nagarjuna Municipality. The higher prevalence in street cattle and younger calves highlights the need for targeted interventions and improved management practices to control this parasitic infection. By addressing these factors, it is possible to reduce the burden of *Toxocara vitulorum* and improve the health and productivity of cattle in this region.

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