MORPHOMETRIC IDENTIFICATION OF EIMERIA SPECIES AND PREVALENCE OF COCCIDIOSIS IN GOATS UNDER FARM CONDITIONS AT JABALPUR

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Abstract

Coccidiosis is one of the most important protozoan parasitic diseases of goats.Goats are essentially very hardy animals but various agents including virus, bacteria and protozoa are impeding economical production in goat industry, particularly in the first few months of life. It is caused by intracellular protozoan parasite of the genus *Eimeria* and is distributed all over the world. Out of 1065 goats, 300 were found positive for diarrhoea, dullness depression, unthriftness and emaciated. Out of 300, goats examined 206 were positive for coccidiosis. under this study morphometric identification of Eimeria species was done. On the basis of morphological features and sporulation time, four different species of Eimeria were identified under the study i.e. E. arloingi, E. alijevi, E. christenseni and E. ninakohlyakimovae.The overall prevalence of coccidiosis in goats was recorded as 68.66% (206/300).

Keywords: Morphometric identification, faecal sample,Prevalence, goats, coccidiosis

Introduction

World population and its demand for food are growing rapidly and food security of expanding human population is a serious problem to be addressed, So in present scenario, the livestock sector is being looked as a potential resource which can be reliably used to give impetus to sustainable production.Among all species of livestock, goats have the widest ecological range and have been poor people's most reliable livelihood resource since their domestication. Goats are essentially very hardy animals but various agents including virus, bacteria and protozoa are impeding economical production in goat industry. Among protozoa diseases, coccidiosis is one of the most important and serious economic disease of goats, particularly in the first few months of life.

Material and method

The proposed work was conducted in the Department of Veterinary Medicine, College of Veterinary Science & Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh.The study was conducted for a period of 15 month (Jan 2021-march 2022).Prevalence study was conductedin goats of organized and unorganized goat farms viz. goats from livestock farm Amanala, goats brought to VCC, College of Veterinary Science and Animal Husbandry, Jabalpur and goats from unorganized sectors of Sadar, Ranjhi and Adhartal, Jabalpur. Goats were screened on the basis of clinical signs like diarrhea, dehydration, weight loss, unthriftness etc.

Collection of samples

Faecal samples

Coccidia oocyst per gram of (OPG) positive faecal sample will be quantified using Mc Master slide and presence of more than faecal samples were collected directly from rectum (using examination gloves) of the suspected goats into individually marked polythene bags on day 0 (pre-treatment) and on days14, 28 and 42 (post-treatment). The samples will be stored at 4^OC for further examination.

Testing of samples

Faecal sample processing for detection of *Eimeria* species

Each faecal sample was examined for the presence or absence of coccidian oocysts by floatation technique using saturated saline. Coccidian oocysts per gram (OPG) of faeces was quantified using a modified McMaster technique. Oocysts rich positive faecal samples was diluted with distilled water and sieved to remove the large faecal debris. The washed faecal samples was centrifuged at 3000 rpm for 10 minutes with saturated salt solution and oocysts was collected from centrifuge tube. Collected oocysts was washed with water through centrifugation followed by transfer to a shallow petridish and spiked with 2.5% solution of potassium dichromate and incubated at room temperature for 7-10 days to induce sporulation (Arunkumar and Nagarajan 2013)

Morphometric Identification of *Eimeria* spp.

To examine and identify oocysts, the samples collected, spread out in petridish will be shaken and mixed well. A portion of it was put into a glass slide through a pipette and covered by a cover slip. The sample was examined under 400X magnifications (10 X ocular and 40X objective). To identify the species, the criteria of size and morphological characteristics (shape, colour, presence or absence of micropyle and its cap, presence or absence of residual, polar and stiedae bodies) of the oocysts along with sporulation time was recorded (Pellérdy, 1974; Levine, 1985 and Soulsby, 1982). Identified sample was taken up for micrometry to assist identification of various *Eimeria* species (Norton, 1985).

Table 01: Screening of goats at different places of Jabalpur

Place	Goats screened	Faecal sample examined
Organized Sector		
Goat farm, Amanala	223	96
Adhartal&Imiliya farm	44	25
Unorganized Sector		

VCC, C.V.Sc& A.H. Jabalpur	508	80
Unorganized sectors, Sadar	154	59
Unorganized sectors, Ranjhi	23	10
Unorganized sector Kajarwara	30	10
Unorganized sector, Umaria	58	10
Unorganized sector, Shivpuri	25	10
	1065	**300**

Result and discussion

Overall prevalence of Caprine coccidiosis

An epidemiological study was conducted on goats to know the prevalence of caprine coccidiosis in Jabalpur during the period January 2021 to March 2022. A total of 1065 goats were screened from various organized and unorganised sectors of Jabalpur for the presence of diarrhoea and unthriftness.

Out of 1065 goats, 300 were found positive for diarrhoea, dullness depression, unthriftness and emaciated. Out of 300, goats examined 206 were positive for coccidiosis. The overall prevalence of coccidiosis in goats was recorded as 68.66% (206/300) (Table 02; Figure 01)

Table 02: Overall prevalence of coccidiosis in goats at Jabalpur

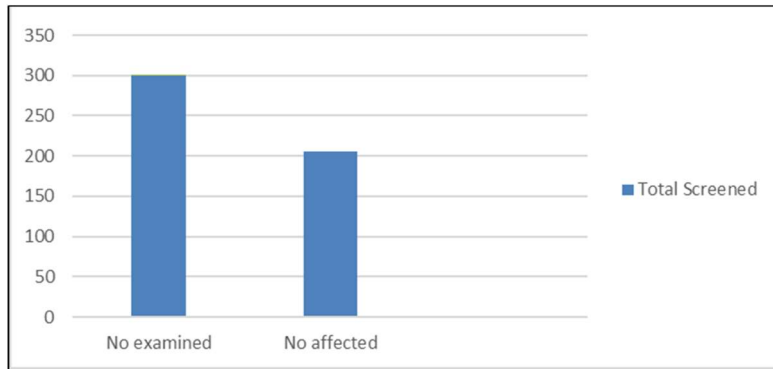| No. of goats examined	No. of goats affected	Prevalence (%)
300	206	68.66

Fig 01: Overall prevalence of coccidiosis in goats at Jabalpur

The literature regarding reports of prevalence of coccidiosis in goats at Madhya Pradesh is meagre. However, Dixit *et al*. (2016) reported an overall prevalence of caprine coccidiosis in and around Jabalpur as 77.67%. Similarly, Suman (2012) reported an over all incidence of coccidiosis in goats in and around Mhow (M.P.) as 95.5%. The disease was also reported worldwide and its prevalence has been estimated around 50%throughout Europe, Asia, Middle south and east America (Koudela and Bokova,1998). Similarly Abdelaziz *et al*.(2021) reported an overall prevalence of Eimeria species in goats in Egypt was 40.63%.

The results of present study indicated the presence of caprine coccidiosis in goats at Jabalpur, although there is variation in the prevalence rates with the results of previous workers. These differences might be attributed to the variation in feeding habbit, management practices and environmental condition at different places. Differences in study design and methodology may also account for differences in estimating the prevalence percentage.

Sector wise prevalence of caprine coccidiosis

To know the sector wise prevalence of caprine coccidiosis different types of sectorswere taken under study and characterized into two sectors i.e. organized and unorganized.

The prevalence of coccidiosis was recorded significantlyhigher in unorganized sectori.e. 77.65 % (139/179) as compared to organized sector i.e. 37% (67/121) (Table 03; Figure 02).

Table 03: Sector wise prevalence of coccidiosis in goats at Jabalpur

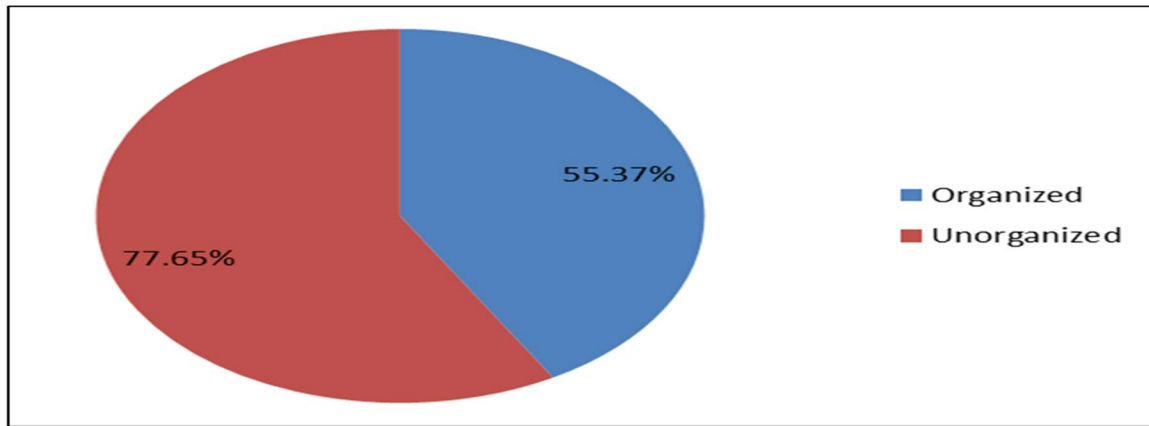| Sector	No. examined	No. affected	Prevalence %
Organized	121	67	55.37
Unorganised	179	139	77.65
$x^2 = 16.65$, df= 1, p= 0.000045 Significant			

Fig 02:Sector wise prevalence of coccidiosis in goats at Jabalpur

In the present study,prevalence of coccidiosis in goats was higher in unorganized sector.No traceable literature has been found regarding sector wise prevalence of coccidiosis in goats. However, prevalence of G.I parasites in goats was reported higher under farm conditions (100%) than that of field conditions (96.46%) but the difference was non significant (Dixit *et al*. 2016).

In the present study, higher prevalence of coccidiosis in unorganised sector might be attributed to the fact that only 5-10% of internal parasites actually residewith in an individual animal and the rest are present in the pasture infecting the animals as they graze. Moreover, inadequate management practices are followed in unorganised sectors, therefore animals are more prone to infections.

Age wise prevalence of caprine coccidiosis

To know the age wise prevalence of caprine coccidiosis, goats of varying age were studied and characterized into four categories. The age wise prevalence was found to be highest in the goats below 6 monthsof age (84.12%) followed by the age group of 6-12 month of age (74.39%), 1–2-year age group of goats (66.66%) and least in the age group of above 2 year (47.45%) respectively. Significant difference was observed in age wise prevalence of coccidiosis in goats (Table 04, Figure 03).

Table 04: Age wise prevalence of coccidiosis in goats at Jabalpur

Age group	No. examined	No. affected	Prevalence %
< 6 months	63	53	84.12

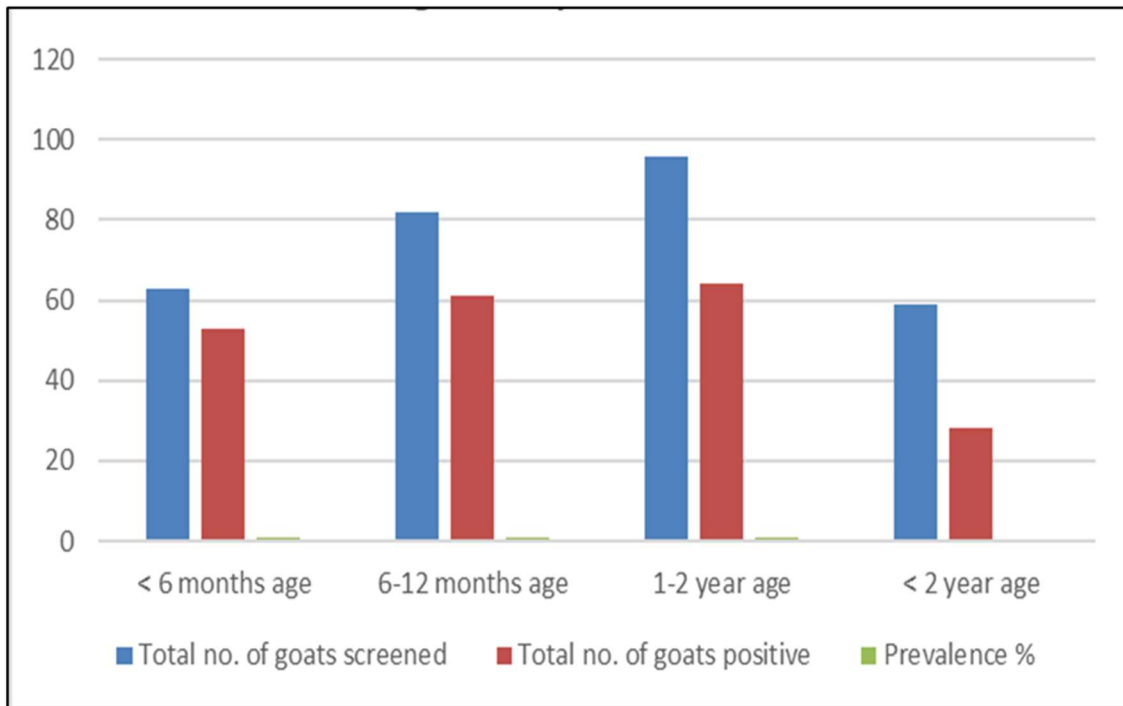| 6-12months	82	61	74.39
1-2 Year	96	64	66.66
>2 year	59	28	47.45
x^2= 20.76, df= 3, p= 0.0000118; Significant			

Fig 03:Age wise prevalence of coccidiosis in goats at Jabalpur

The results of present study are in accordance with the findings of various scientists (Kumar *et al.,* 2005; Sharma *et al.,* 2009 and Rashi and Tak, 2012) who reported higher prevalence of coccidiosis in kids (0-5m). Higher prevalence of coccidiosis in goat kids could be due to age susceptibility, low immune status and close proximity with their dams. The lowest prevalence was recorded in goats of more than 2 years of age which might be attributed to the development of resistance due to previous exposure.

Gender wise prevalence of caprine coccidiosis

Out of 300 goats studied, 205 were female and 95 were male. The prevalence of caprine coccidiosis was higher in female goats i.e. 69.75% (156/205) as compared to male goats i.e. 66.31% (50/95). Significant difference was observed in gender wise prevalence of coccidiosis in goats (Table 05, Figure 04).

Table 05: Gender wise prevalence of Caprine coccidiosis

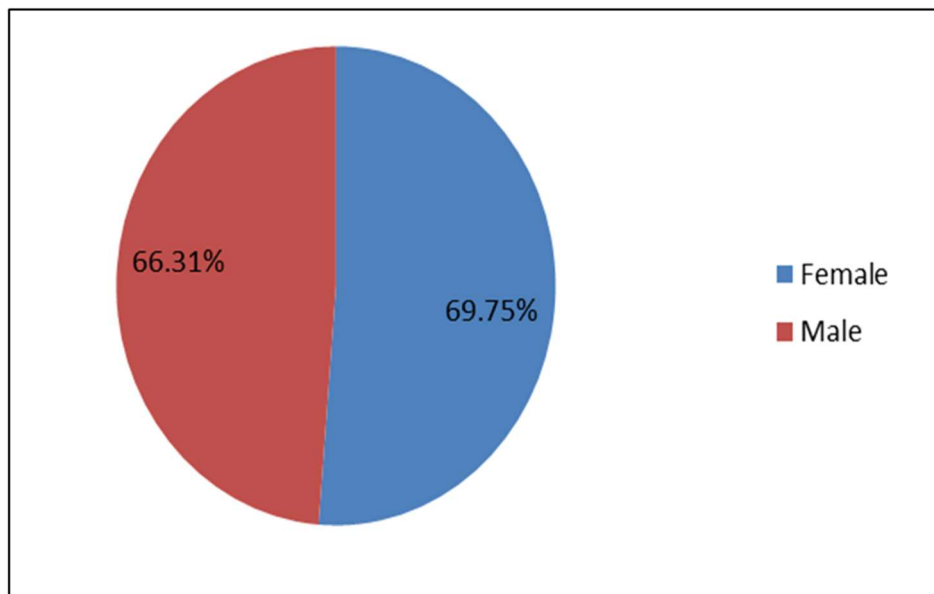| Gender	No. examined	No. affected	Prevalence %
Female	205	156	69.75
Male	95	50	66.31
x^2= 16.61, df= 1, p= 0.000046; Significant			

Fig 04: Gender wise prevalence of coccidiosis in goats at Jabalpur

The results of present study corelate well with the findings of kumar*et al.,* 2005 and Sharma *et al.,* 2009 who also reported higher prevalence in female goats. which may be attributed to the flocking behaviour of female goats. Moreover, female goats are more prone to stress factors like lactation, pregnancy,nutritional imbalance etc.

Breed wise prevalence of caprine coccidiosis

The prevalence of coccidiosis was studied in different breeds of goats at Jabalpur. The highest prevalence was recorded in Sirohi breed i.e. 80.21%(73/91) followed by Black Bengal i.e.75.64%(59/78) followed by Barbari i.e. 73.43% (47/64) and lowest prevalence being of non-descript breed i.e. 40.29%(27/67). Significant difference was observed in breed wise prevalence of coccidiosis in goats (Table 06, figure 05)

Table 06: Breed wise prevalence of coccidiosis in goats at Jabalpur

Breed	No. examined	No. affected	Prevalence %
Barbari	64	47	73.43

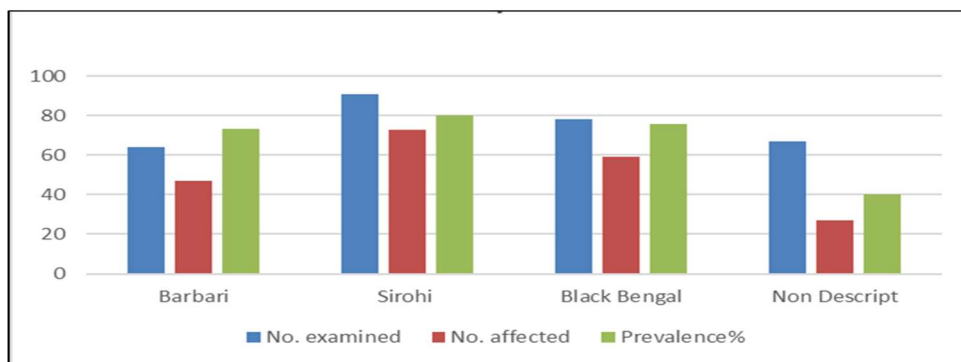| Sirohi | 91 | 73 | 80.21 |
Black Bengal	78	59	75.64
Non-Descript	67	27	40.29
x^2 = 33.14, df= 4, p= 0.00001			

Fig 05:Breed wise prevalence of coccidiosis in goats at Jabalpur

In the present study,Sirohi breed of goats showed highest prevalence of coccidiosis and lowest prevalence was observed in non descript breeds of goats .No traceable literature has been found on the studies related to breed wise prevalence of coccidiosis in goats. However, lowest prevalence in non descript breeds of goats may be due to their resistance towards parasitic infection. However, varying rates of prevalence in different breeds of goats might be due to the sampling differences.

In the present study, four different species of Eimeria were identified on the basis of morphological features and sporulation time for which exhaustive observations on longitudinal and horizontal diameters were taken and summarized. Similarly sporulation time has been also taken in to consideration for species identification (Table 07).

Table 07:   Species wise micrometric and sporulation characteristics of Eimeria spp

Structural characteristics	Longitudinal x horizontal diameter	Average sporulation time	Species identified
No/inconspicuous	15-21 x 10- 21	1-6 days	*E. alijevi*
Micropyle	24-30x15-20	1-6 days	*E. arloingi*
Micropyle present with prominent cap	32-45x20-28	1-5 days	*E. christenseni*
Micropyle present with prominent cap	15-25 x10-21	1-6 days	*E. ninakohlyakimovae*

In the present study, out of 300 samples examined four different species of Eimeria viz *E. alijevi, E. arloingi, E. christenseni* and *E. ninakohlyakimovae* were identified with the help of morphometry. A proper identification of Eimeria species is fundamental to estimate the importance of any anticoccidial treatment as different species have different role in pathogenicity.

In general, the morphometric identification revealed that the species identified in this study were similar to the species found in previous study with divergence of few species. Previous reports suggest that infection by different species and different frequencies vary according to animal or region. Co-infection with one or more species were observed in almost all positive goats. Discrete individual intraspecific variations may be due to varying environmental factors as well as host susceptibility.

Conclusion

Caprine coccidiosis is prevalent under farm conditions at Jabalpur district of Madhya Pradesh and an overall 68.66% prevalence was observed. Prevalence was significantly higher in unorganized sector (77.65%), in goats below 6 months of age (84.12%) and in female goats (69.75%). Breed-wise prevalence was significantly higher in Sirohi breed (80.21%). On the basis of morphological characteristics and sporulation time, four different species of Eimeria i.e. *E. alijevi, E arloingi, E christenseni, E. ninakohlyakimovae* were identified. On the basis of therapeutic response evaluation , oral administration of Azadirachta Indica (dried leaf powder) @ 100 mg/kg, once daily for 28 days and Curcuma longa (powder) @ 200 mg/kg, once daily for 14 days was found to be most effective for treatment of caprine coccidiosis.

Acknowledgements

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