

Prevalence of Coccidiosis in Cattle of Lahore, Pakistan

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Received date: July 18, 2017; Accepted date: August 11, 2017; Published date: August 16, 2017

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Abstract

This research article describes a cross-sectional study in cattle of District Lahore which aimed to identify prevalence of *Eimeria* species and risk factors associated with subclinical coccidiosis. A total of 2700 rectal faecal samples were collected from Govt. Dairy Farm, Lahore, Military Dairy Farm, Lahore and peri-urban farm (Gawala Colonies), Lahore under different managemental practices and were screened for different *eimerian* oocysts. 1473 faecal sample were found positive for *Eimeria* species Oocysts Viz *E. bovis* (27.05%), *E. zuernii* (20.14%), *E. subspherica* (11.72%), *E. cylindrica* (23.97%), *E. ellipsoidalis* (19.54%) and the highest (78.66%) month wise prevalence was noted during August whereas the lowest (35.44%) was during April. The results of the study showed that overall the highest (66.22%) prevalence of coccidiosis was noted during Autumn followed by summer (59.66%), winter (51.77%) and lowest during spring (38.2%). The highest (45.33%) prevalence of coccidiosis was observed in animals aged between 6 to 12 months, followed by 41.35% in animals under 6 months of age whereas the lowest (36.00%) above 1 year. Female animals were more frequently affected (41.25%) than males (39.50%). In the present study, the maximum OPG count observed was 55,000 and the minimum count as 2000.

Keywords: Coccidiosis; Cattle; *Eimeria*; Prevalence

Introduction

Coccidia are very host-specific; that is, only cattle coccidia will cause disease in cattle [1]. Coccidiosis in cattle is associated with bloody diarrhoea, poor growth and sometimes death [2]. Coccidiosis in young calves is caused by infection by protozoan parasites called *Eimeria* spp. which parasitize the lining of the alimentary tract causing diarrhoea [3]. At least nine species of coccidia have been reported in cattle which include *Eimeria subspherica*, *E. zuernii*, *E. alabamensis*, *E. ellipsoidalis*, *E. cylindrica*, *E. bovis*, *E. condensens*, *E. bukidonensis* and *E. auburnensis*. Two species i.e. *Eimeria zuernii* and *Eimeria bovis* are more pathogenic and common [4]. Most cases of coccidiosis occur during winter but outbreaks may occur sporadically throughout the year. Bovine coccidiosis occurs most frequently in calves between six-to-twelve months of age. The calves become infected when fed on pastures or dry lots contaminated by the faeces of older cattle or other infected calves [5]. Once calves reach 6 months of age, they have a 100% infection rate even though 5% or less show clinical signs, while 95% losses may be due to sub clinical Coccidiosis [2]. The highest prevalence of coccidial infection was recorded in calves with age of 12-24 months (62.5%) and the lowest in age of 6-12 months (29.9%) Teketel et al. [6]. The most serious losses are seen in dairy herds where large numbers of calves are kept along with older cattle carriers [7]. Overcrowding, poor sanitation and poor nutrition are contributing factors for coccidiosis [8]. Subclinical infection may lead to retarded growth. The extent of death ranged from 7-20% depends on the age of animal; the younger they are the more severe is the course of the disease, Birile et al. [9]. At present coccidiosis in cattle has neither been given importance in most of the developing countries. Keeping in view

the importance of this disease in calves, the project was designed to study the epidemiology of the disease in Lahore District.

Materials and Methods

In this study seasonal dynamic of coccidiosis in cattle was explored in and around Lahore, Pakistan. The study was carried out in bovine calves at Military Dairy Farm, Government Dairy Farm, Peri-Urban Dairy Farms (Gawala Colonies), Lahore for one year. A total of 2700 rectal faecal samples (10 gm of each) i.e. seventy five random samples from each farm were collected in each month Mundt et al. [10].

Group A: Comprised of calves less than 6 months of age.

Group B: Comprised of calves between 6 months to one year of age.

Group C: Comprised of animals over one year of age.

Twenty five rectal faecal samples were randomly collected on monthly basis from each group.

Seasonal, sex and age wise distribution pattern of the disease was studied by random sampling from cattle farms of three categories during summer (May-August), autumn (September-October), winter (November-February) and spring (March-April). Ten grams faecal samples were collected directly from rectum of the animals by digital stimulation of the anus Mundt et al. [10] Samples were collected in polythene bags which were carefully labeled and brought to the postgraduate Laboratory, Department of Parasitology, University of Veterinary and Animal Sciences, Lahore for further processing. Samples were examined qualitatively and quantitatively by direct smear method and centrifugal floatation technique, modified McMaster's oocyst counting technique, micrometry [11].

For speciation of *Eimeria* species, the faeces were cultured in petri dishes containing 2.5% potassium dichromate solution. The species were identified by using the morphological characters including size, shape, colour, and record of the sporulated time, texture of oocyst wall, presence or absence of micropyle, polar cap) with the aid of taxonomic keys [12].

Seasonal prevalence of coccidiosis was studied after sampling of target population during whole of the year. Data on stock management and stocking densities was also collected. Epidemiological parameters were calculated as described by [13].

Temperature, humidity and rainfall were also collected from the local meteorological station, Lahore and were correlated with prevalence of the disease Figure 1.

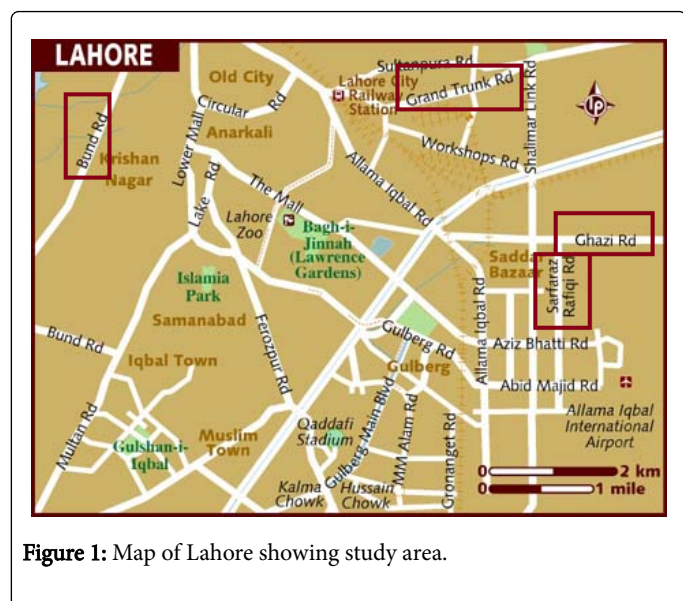


Figure 1: Map of Lahore showing study area.

Statistical Analysis

The Statistical Analysis was performed by using a statistical software programme of SPSS text analysis @SPSS 2004 13.0 for windows. Following parameters were determined.

1. Pearson correlation was used to find significant difference between prevalence of coccidiosis with maximum and minimum temperature, relative humidity, and rain fall.

2. To find significant difference between months and prevalence of coccidiosis pearson Chi Square technique was used.

3. To find significant difference between seasons and prevalence of coccidiosis pearson Chi Square technique was used.

4. To find significant difference in male and female calves with prevalence of coccidiosis Z-test was used by Minitab software programme.

Results and Discussion

In the present study, the highest (66.22%) prevalence of coccidiosis was noted during Autumn followed by summer (58.44%), winter (51.77%) whereas the lowest was during spring (38.11%). During study the prevalence of coccidiosis was highest (78.66%) in the month of August. Similar findings were also reported by [14], who collected faecal samples of buffalo-calves from 17 farms Table 1. They reported prevalence of coccidiosis was 43% of 305 samples during March to June, 71% in rainy season (July to September) and 81 percent in winter (October to February).

Seasons	No. Examined	No. Positive	Prevalence %
Summer	300	169	52.66
Autumn	150	98	65.33
Winter	300	143	47.66
Spring	150	51	34
Season wise prevalence of coccidiosis was the highest during autumn (65.33%), followed by summer (52.66%), then winter (47.66%) whereas the lowest (34.00%) during spring season.			
	Seasons	Results	
Chi-Square	34.42	Significant	
P-Value	0.00001		
Seasons wise Prevalence of Coccidiosis in Cattle at Military Dairy Farm Lahore are significant because P-Value is 0.00001 which is lesser than 0.05 using pearson Chi-Square technique.			

Table 1: Season wise Prevalence of Coccidiosis in Cattle at Military Dairy Farm, Lahore.

During the present study no mortality was recorded in cattle. The present findings are in accordance with those reported by [5] Table 2.

He reported that coccidiosis was prevalent throughout the year, although it did not cause heavy mortality.

During the present study, the prevalence of coccidiosis was influenced by temperature, humidity and rainfall as also reported by [15].

Age	No. Examined	No. Positive	Prevalence %
Under 6 Months	300	139	46.33
6 Months to 1 Year	300	170	56.66
Above 1 Year	300	152	50.66
Age wise Prevalence of Coccidiosis in Cattle at Military Dairy Farm Lahore are significant because P-Value is 0.012 which is lesser than 0.05 using pearson Chi-Square technique.			
	Age	Results	
Chi-Square	8.849	Significant	
P-Value	0.012		

Table 2: Age wise Prevalence of Coccidiosis in Cattle at Military Dairy Farm Lahore.

Seasons	No. Examined	No. Positive	Prevalence %
Summer (May-Aug)	300	133	44.33
Autumn (Sept-Oct)	150	74	49.33
Winter (Nov-Feb)	300	115	38.33
Spring (March-April)	150	46	30.33
Seasons wise Prevalence of Coccidiosis in Cattle at Govt. Dairy Farm Lahore are significant because P-Value is 0.004 which is lesser than 0.05 using pearson Chi-Square technique.			
	Seasons	Results	
Chi-Square	13.193	Significant	
P-Value	0.004		

Table 4: Season wise prevalence of Coccidiosis in Cattle at Govt Dairy Farm, Lahore.

During the present study prevalence of coccidiosis was highest (71.55%) in Peri-urban dairy farms (Gawala Colonies) Lahore, and lowest (40.88%) in Government Dairy Farm, Lahore. The difference in the epidemiology status of the coccidiosis reported in the present studies may be due to difference in the management conditions of the farms). In peri urban dairy farms more animals were kept as the capacity of farm is not enough so there was over crowding resulting more coccidiosis occurrence. Prevalence of coccidiosis had no significant effect on pregnancy. The management at peri urban dairy farms was very poor as compared to government dairy farm and military dairy farm. The management of government dairy farm is better than other two farms so prevalence of coccidiosis was lower than other two farms. The stocking pattern observed in three categories of farms showed the highest herd size of 50 animals while the lowest herd size 20 animals was recorded under different management system. Stocking density was more in Peri Urban Dairy Farm. Normally 20 Sq. Ft. space is required by each animal (3-4 months age) and 40 to 50 sq. ft. space is required by adult animal. In Peri urban dairy farm more animals were kept as the capacity of farm was not enough. Similar finding were reported by McKellar [16] and

Constable [17] described that clinical coccidiosis is more prevalent under conditions of poor sanitation, poor nutrition, and overcrowding Table 5. Similar findings were also reported by Berit Bangoura [18], he reported husbandry management and metaphylaxis are essential factor for control of coccidiosis.

Species	Positive cases	% age infection
<i>E. bovis</i>	135	29.25
<i>E. zuernii</i>	120	22.9
<i>E. cylindrical</i>	108	21.97
<i>E. ellipsoidal</i>	98	21.8
Total	461	

Table 3: Prevalence of positive cases of *Eimeria* Species in cattle at Military Dairy Farm Lahore.

During the present study prevalence of coccidiosis was highest (71.55%) in Peri-urban dairy farms (Gawala Colonies) Lahore, and lowest (40.88%) in Government Dairy Farm, Lahore. The difference in the epidemiology status of the coccidiosis reported in the present studies may be due to difference in the management conditions of the farms). In peri urban dairy farms more animals were kept as the capacity of farm is not enough so there was over crowding resulting more coccidiosis occurrence. Prevalence of coccidiosis had no significant effect on pregnancy. The management at peri urban dairy farms was very poor as compared to government dairy farm and military dairy farm. The management of government dairy farm is better than other two farms so prevalence of coccidiosis was lower than other two farms. The stocking pattern observed in three categories of farms showed the highest herd size of 50 animals while the lowest herd size 20 animals was recorded under different management system. Stocking density was more in Peri Urban Dairy Farm. Normally 20 Sq. Ft. space is required by each animal (3-4 months age) and 40 to 50 sq. ft. space is required by adult animal. In Peri urban dairy farm more animals were kept as the capacity of farm was not enough. Similar finding were reported by McKellar [16] and

Age	No. Examined	No. Positive	Prevalence %
Under 6 Months	300	124	41.33
6 Months to 1 Year	300	136	45.33
Above 1 Year	300	108	36
Prevalence of coccidiosis was slightly higher 41.28 % in female animals than (39.50%) in males.			

Table 5: Age wise prevalence of Coccidiosis in Cattle at Govt Dairy Farm, Lahore.

The resistance of adult animals to coccidiosis as compared to young animals reported in the present study was in accordance with findings

that bovine coccidiosis usually affects cattle under one year old, but may be occasionally seen in yearlings and adults Chibunda et al. [19] Table 6 and 7.

Sex	No. Examined	No. Positive	Prevalence %
Male	200	79	39.5
Female	700	289	41.28

In present study, the maximum OPG count observed was 55,000 and the minimum count as 2500. The counts were variable in different age groups and

found to be decreasing in adult animals. The mean OPG of group A, B, C was 42,000, 35,000 and 20,000 respectively.

Table 6: Sex wise prevalence of Coccidiosis in Cattle at Govt. Dairy Farm, Lahore.

In the present study, prevalence in female calves (17.5%) was similar to that of males (19.8%) and analysis of sex for the occurrence of coccidiosis has showed that there was no statistically significant association ($P>0.05$) between sex and coccidiosis Table 8. Similar findings were reported by Birile et al. [9].

Farms/Seasons	Summer Prevalence %	Autumn Prevalence %	Winter Prevalence %	Spring Prevalence %	Coefficient of Variation
Military Dairy Farm	52.66	65.33	47.66	34	25.9563
Govt. Dairy farm Lahore	44.33	49.33	38.33	30.33	20.1584
Peri-Urban Dairy Farms Lahore	78.33	84	69.33	50	21.1463

Table 7: Season wise Prevalence of coccidiosis in cattle at Military Dairy Farm Govt. Dairy Farm and Peri-urban Dairy Farms Lahore.

Months	Temperature		Relative Humidity	Rain Fall	Disease Prevalence %
	Max	Min			
September	33.9	25.5	67.5	75.8	72
October	32.5	19.8	51	0	60.44
November	27.5	14.9	66.5	10.2	54.22
December	20.8	9	65.5	3.3	52.88
January	17.9	7	61	24.3	56
February	21.2	9.5	59.5	5.6	49.33
March	30.9	18.4	51	-1	40.88
April	33.3	21.4	43	38.7	35.55
May	37.7	25.5	40	36.7	41.33
June	35.9	27.2	63.5	68.4	52
July	35.6	28.4	70	117.9	61.33
August	33.6	26.7	76.5	287.2	78.66

Table 8: Comparison of Humidity, Temperature & Rainfall with Coccidiosis Prevalence in District Lahore.

In the present study age-wise analysis of results showed that five species were found in all age groups. The most predominant species were *E. bovis* (27.15%), *E. zuernii* (20.14%), *E. cylindrica* (23.97%), *E. ellipsoidalis* (19.54%), *E. subspherica* (11.72%). Similar results were reported by Thomas et al. [20] who reported five *Eimeria* species of cattle i.e. *E. bovis*, *E. zuernii*, *E. ellipsoidalis*, *E. alabamensis* and *E. auburnensis*. Manya Priti et al. [21] and Pandit [4] also reported that *E. bovi* and, *E. zuernii* were the most prevalent species Table 9.

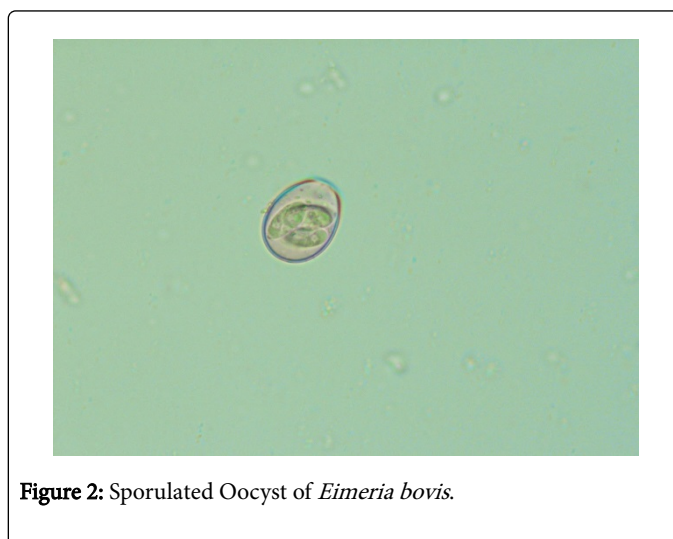


Figure 2: Sporulated Oocyst of *Eimeria bovis*.

In the present study, the maximum OPG count observed was 55,000 and the minimum count as 2000. The counts were variable in different age groups and found to be decreasing in adult animals. Our findings are not in accordance with findings of Pilarezyk et al. [22] who carried out studies on coccidiosis in cattle and reported six species of coccidia i.e. *E. bovis*, *E. auburnensis*, *E. zuernii*, *E. ellipsoidalis*, *E. subspherica*, *E. cylindrica*. Number of oocysts per gram of feces in calves ranged from 333 to 2237 [23], reported that most of animals examined had low OPG, suggesting that the infections were usually sub-clinical Figure 2.

During the study, the effect of temperature & humidity on developmental stages of *Eimeria*, was studied. It was noted that moderate temperature and humidity greatly enhanced the development of *Eimeria* as was also concluded by Murray J. Kennedy [24] Figure 3 and 4.

Control Variables		Correlations				
		Temperature Maximum	Temperature minimum	Relative humidity	Rainfall	
Prevalence	Temperature Maximum	Correlation	1.000	0.983	-0.401	0.479
		Significance (2-tailed)	.	0.000	0.222	0.136
		Df	0	9	9	9
	Temperature minimum	Correlation	0.983	1.000	-0.290	0.566
		Significance (2-tailed)	0.000	.	0.387	0.069
		Df	9	0	9	9
	Relative humidity	Correlation	-0.401	-0.29	1.000	0.056
		Significance (2-tailed)	0.222	0.387	.	0.869
		Df	9	9	0	9
	Rainfall	Correlation	0.479	0.566	0.056	1.000
		Significance (2-tailed)	0.136	0.069	0.869	.
		Df	9	9	9	0

Table 9: Pearson correlation Used To Compare Humidity, Temperature & Rainfall With Coccidiosis Prevalence in District Lahore.

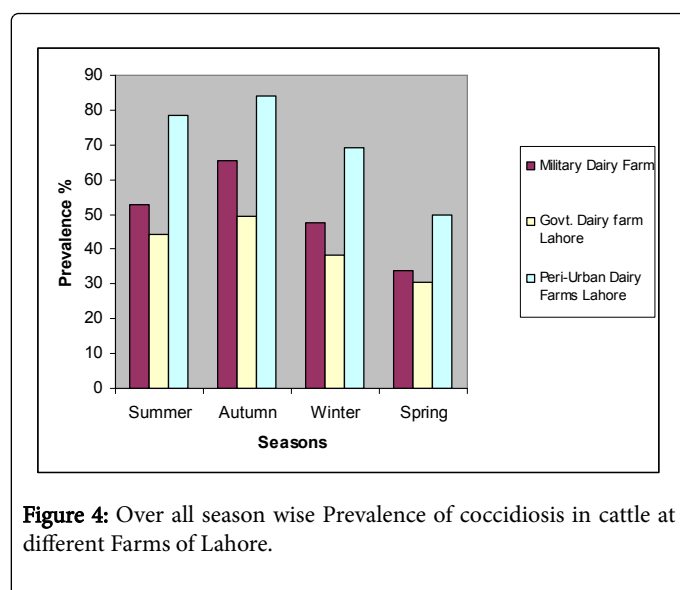
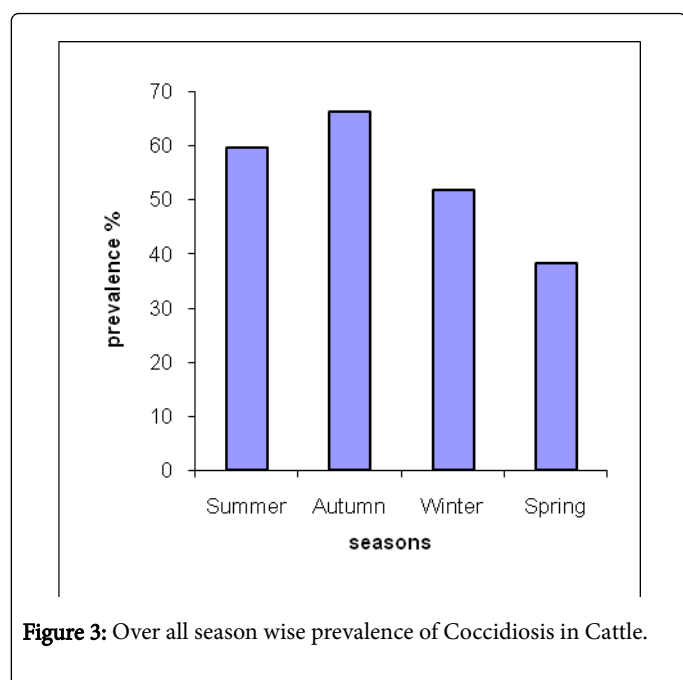


Figure 4: Over all season wise Prevalence of coccidiosis in cattle at different Farms of Lahore.

Conclusion

Coccidiosis is widely distributed in cattle of Lahore. Risk factors significantly associated with coccidiosis are age, month, housing and feeding systems, body condition score and season. The control of coccidiosis is possible only with high level of management and following measures are suggested.

- Overcrowding should be avoided.
- Provide good hygienic and managerial conditions in the farm.
- Feeders and waters should be above the level of the ground.

- Regular use of coccidiostats is the need of the day.
- Animals should be provided well balanced nutritive food and clean water.
- Entry of visitors in the livestock farms should be banned.
- Cemented capacious housing are suggested on the basis of present investigation.

Acknowledgement

I would like to express a deep sense of obligation to my major supervisor Prof. Dr. Azhar Maqbool, Prof. Dr. Mansoor-ud-Din Ahmad, Prof. Dr. Zafar Iqbal Ch, Faculty of Veterinary Sciences, University of Veterinary and Animal Sciences, Lahore, Pakistan and Dr. Muhammad Zahid Ahmad, Kot Khawaja Saeed Teaching Hospital, Lahore and Dr. Shabnum Ilyas Ch Deputy Director Livestock Lahore for their keen interest skillful guidance, enlightened views, valuable suggestions, constructive criticism, unflinching patience and an inspiring attitude during my studies, research project and writing of this manuscript.

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