IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 13, Issue 11 Ser. I (November 2020), PP 25-28
www.iosrjournals.org

Haematological Profile and Clinical Manifestation of Haemoprotozoan Infection in Cattle

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Abstract: *Aim of study was to record the haematological alteration and clinical signs in blood protozoan infested cattle. A total of 323 cattle was screened and presence of haemoprotozoa was confirmed by wet blood film and regent stained smear examination. Blood withdrawn from 20 infected and 10 healthy cattle for haematological profile (Hb, TLC, ESR, DLC and PCV). Fever, anaemia, lacrimation, salivation, diarrhoea, emaciation, anorexia, lymph node swelling and tick infestation was seen in cattle. Haematological examination revealed significant changes in Hb, TLC, ESR, DLC and PCV. Anaemia, blood tinged faeces, high temperature (104-107^0 F) and high tick infestation along with high eosinophil and lymphocyte were prominent features of hemoprotozoan infection.*

Key word: *Haemoprotozoan, Blood, Cattle, Clinical Signs*

Date of Submission: 10-11-2020 Date of Acceptance: 25-11-2020

I. Introduction

Haemoprotozoan diseases, especially theileriosis, babesiosis, trypanosomosis and anaplasmosis are considered some of the major hindrance in livestock production. It causes devastating losses to meat and dairy industry throughout the world[1]. These infections are very common in tropical and subtropical regions of world[2]. It was mainly transmitted by ticks, biting flies and occasionally through blood transfusion[3]. They cause significant morbidity and mortality in cattle and buffaloes. The ticks not only transmitting the diseases to animals but also indirectly causes anaemia, hide damage, tick paralysis, affect working, reproductive and productive performance. The global annual economic losses due to tick borne diseases alone US$18.7 billion, while in India US$ 498.7 million/annum[4], the estimated annual economic losses due to Tropical Theileriosis alone in India was US $800 million[5], whereas, losses in Babesiosis and Anaplasmosis was about US$57 million in India[6]. The tropical and subtropical climate is favourable for growth, multiplication and survival of arthropods, which serves as a vector for many blood-borne protozoan diseases[7]. The clinical manifestation of these infestation is namely fever, anorexia, anaemia, emaciation, threatened abortion and death in the acute form of infections[8]. The animals that recover from acute infection become carriers, creating a potential source of infection to healthy susceptible population[9]. Haemoprotozoan causes parasitaemia in the host, and the parasite's life cycle leads to the destruction of lymphocytes and erythrocytes. Moreover, theileriosis causes minimal changes in host antibody synthesis and nutrient distribution[10].

Vast literature is available on internet about Haemoprotozoan infection in cattle around the world but there were no data regarding southern Rajasthan. Our study is focused on recording haematological changes and clinical manifestation of haemoprotozoan diseases in cattle of Udaipur district, located in southern Rajasthan.

II. Material And Method

The study was conducted from the month of May 2019 to October 2019 in three different villages (Navania, Tarawat and Rupawali) of Vallabhnagar tehsil of Udaipur district in Southern Rajasthan at the Department of Veterinary Parasitology, College of Veterinary and Animal Science, Vallabhnagar, Udaipur. Routinely blood samples were collected from cattle showing clinical signs of high-rise temperature (fever), lymph node enlargement/swelling, lacrimation, salivation, diarrhoea, emaciation and anaemia other clinical symptoms from different of Navania, Tarawat and Rupawali village of Vallabnagar tehsil in Udaipur district (Rajasthan) aseptically from ear vein in blood collection vacutainer containing EDTA anticoagulants. The samples were transported in icebox to the Department of Veterinary Parasitology, College of Veterinary and Animal Science., Navania, Udaipur, Rajasthan for routine procedure of blood smear examination. The various clinical manifestations were noted down regularly irrespective of age, sex and production/working status. A total of 323 blood sample was screened for haemoprotozoan parasites by different methods including wet blood

film examination, Leishman and Giemsa's stained blood smear examination[11]. For assessing the different haematological parameter viz Hb, PCV, ESR, TLC, DLC, approximated 3 ml of blood samples were collected from 10 non-infected animals and 20 animals from infected group. Statistical analysis for haematological parameters was statistical analysed using unpaired t-test[12].

III. Results

A total of 323 animal screened, the various clinical manifestations were observed viz. high rise of temperature/ fever, superficial lymph node swelling/ enlargement, salivation, tick-infestation, diarrhoea, lacrimation, emaciation, anorexia and anaemia (Table 1).

Out of 323 screened animals, 235 (72.75%) showed rise in temperature/fever whereas 121 (51.48%) were found to be positive for haemoprotozoan infection. The fever was categorised in two categories, one for animal with temperature ranging from 102-104^{0}F. In this group 132 (40.86%) showed fever whereas only 45 (34.09%) we found to be positive. In the second group, selected animals have temperature ranging from 104-107^{0}F. A total of 103 (31.88%) animal showed fever but 73 (54.88%) were positive for haemoprotozoan infection.

In the present study cattle showing swelling/enlargement of superficial lymph node was 133 (41.17%) but 73 (54.88%) of them were positive for haemoprotozoan infection. None of them showed enlargement of pre-femoral lymph node.

Cattle with tick-infestation were 298 (92.26%), but only 130 (43.62%) animals were positive. They were further categorized as high and low tick infestation. The cattle with high tick infestation were 124 (38.39%) and 87 (70.16%) of them were positive. The cattle with low tick infestation were 174 (53.86%) and only 43 (24.71%) were positive.

In the present study, 92 (28.48%) animals having diarrhoea but only 52 (56.52%) were found to be positive for haemoprotozoan infection. The diarrhoea was classified in two groups viz. watery diarrhoea and blood tinged diarrhoea. Blood tinged diarrhoea seen in 23 (07.12%) animals and 20 (86.95%) of them were positive for haemoprotozoa infection. Watery diarrhoea was seen in 69 (21.36%) and 32 (46.37%) out of them were found to be positive for haemoprotozoan infection. Among 114 (35.29%) emaciated animals, 68 (59.64%) were found positive. Anorexia was observed in 130 (40.24%) animals, 84 (64.61%) out of them were positive. Anaemia was observed in 208 (64.39%) animals and 178 (85.57%) of them were positive for haemoprotozoan infection. Animals showing salivation were 161 (49.84%), but only 71 (44.09%) of them were positive for haemoprotozoan infection. Out of 323 animals, lacrimation was observed in 170 (52.63%) animals and 70 (41.17%) of them were positive for haemoprotozoan.

Table: 1. Clinical Manifestation of haemoprotozoan infection in cattle of Udaipur district

S. No.	Symptoms	Number of animal sowing symptom	Percentage	Number of positive animals	Percentage
1	Temperature rise	235	72.75%	121	51.48%
	102-104	132	40.86%	45	34.09%
	104-107	103	31.88%	76	73.78%
2	Superficial lymph node swelling/enlargement	133	41.17%	73	54.88%
	Scapular lymph node	133	41.17%	73	54.88%
	Femoral lymph node	0	0%	0	0%
3	Salivation	161	49.84%	71	44.09%
4	Tick-infestation	298	92.26%	130	43.62%
	High	124	38.39%	87	70.16%
	Low	174	53.86%	43	24.71%
5	Diarrhoea	92	28.48%	52	56.52%
	Tinge of Blood	23	07.12%	20	86.95%
	Watery diarrhoea	69	21.36%	32	46.37%
6	Lacrimation	170	52.63%	70	41.17%
7	Emaciation	114	35.29%	68	59.64%
8	Anorexia	130	40.24%	84	64.61%
9	Anaemia	208	64.39%	178	85.57%

Haematological parameters

1. Haemoglobin (g/dl)

The mean haemoglobin value was found 04.98 ± 02.32 in infected cattle and in non-infected 11.00 ± 00.70 (Table 2). The results showed significant decrease in haemoglobin concentration in haemoprotozoa infected (P=0.000010).

2.Packed cell volume (PCV) (%)

The mean Packed Cell Volume value was found to be 19.45 ± 01.49 in infected cattle and 24.35 ± 01.91 in non-infected cattle (Table 2). The results showed significant decrease in Packed Cell Volume in haemoprotozoa infected cattle (P=0.000011).

3.Erythrocyte Sedimentation Rate (ESR) (mm/hr)

The mean Erythrocyte Sedimentation Rate value was found 01.57±00.31 in infected cattle and 01.08 ± 00.26 in non-infected cattle (Table 2). The significant difference is noticed between infected and non- infected cattle (P=0.000798).

4.Total Leukocyte Count (TLC) (X10/cu mm)

The mean Total Leukocyte count value was found to be 06.99 ± 00.31 in infected cattle and non-infected cattle 07.98 ± 00.49 (Table 2). The results showed that TLC was significantly different in both cattle group (P=0.000010).

5.Differential Leukocyte Count (DLC) (%)

The values for different cells of leucocyte is represented in (Table 3). The mean percentage value of neutrophil in the infected cattle was 12.25 ± 02.57, lymphocytes 84.00 ± 04.25, eosinophil 19.90 ± 02.17, monocyte 08.69 ± 00.61 and basophil 01.61 ± 00.23. In non-infected cattle, neutrophil was 20.30 ± 03.09, lymphocyte 76.90 ± 04.88, eosinophil 11.30 ± 02.35, monocyte 05.75 ± 01.35 and basophil 00.70 ± 00.43. In the present study lymphocyte, eosinophil, monocyte and basophil was found to be increased in infected cattle but neutrophil was decreased in infected cattle. There was significant difference between neutrophil, eosinophil and monocyte but lymphocytes and basophil were non-significant (P=0.000018 in neutrophils, P=0.001562 in lymphocytes, P=0.000011 in eosinophils, P=0.000011 in monocytes and P=0.057748 in basophil).

Table 2. Haematological parameters of haemoprotozoa infection in both of infected and non-infected cattle

Parameters	Infected cattle (N=20)	Non-infected cattle (N=20)
Hb (g/dl)	04.98±02.32	11.00±00.70
PCV (%)	19.45±01.49	24.35±01.91
ESR(mm/hr)	01.57±00.31	01.08±00.26
TLC (X103/cu mm)	06.99±00.31	07.98±00.49

Table 3. Differential Leukocyte Count in haemoprotozoa infection in both of infected and non-infected cattle

Parameters	Infected cattle (N=20)	Non-infected cattle (N=20)
Neutrophils (%)	12.25±02.57	20.30±03.09
Lymphocytes (%)	84.00±04.25	76.90±04.88
Eosinophil (%)	19.90±02.17	11.30±02.35
Monocytes %)	08.69±00.61	05.75±01.35
Basophil (%)	01.61±00.23	00.70±00.43

IV. Discussion

The clinical manifestations associated with haemoprotozoa were observed as fever, salivation, tick-infestation, diarrhoea, lacrimation, emaciated, anorexia, anaemia which is also noted by Pupin et al[13], Radostits et al[14], Ugalmugle et al[15] and Kumar et al[16]. Before confirmation of hemoprotozoan infection, above mentioned studies and present study both have similar history of fever, anorexia, reduced milk yield and tick infestation. Even Masare et al[17] also cited multiple effects of the disease occurrence which was found to be higher in indigenous calves below 2 months of age during winter. Clinically, fever, tachycardia, polypnea, reduced appetite, dullness, pale to icteric mucous membrane and enlargement of lymph-nodes and haematological examination revealed anaemia.

The reduction in Hb and PCV may be attributed to acute loss of blood by sucking activity and haemorrhages caused by various haemoprotozoan. Similar findings were mentioned by Khan et al[18]and Ramin et al[19]. Enwezor et al[20], Zulfiqar et al[21], Ademola and Onyiche[22], Ariyaratne et al[23]and Lelisa et al[24]reported decrease in Hb concentration in haemoprotozoan infected cattle. Paul et al[25], Kim et al[26], Kumar et al[27], Chaudhri et al[28] and Bal et al[29]reported that the severe anaemia may be due to the presence of haemoprotozoa infection. Haematological findings of affected cattle showed significant decrease in haemoglobin, packed cell volume, suggesting anaemia condition in comparison with healthy cattle, which substantiate the findings of anaemic condition similarly noted by Khan et al[30]. The observed significant haematological changes in affected cattle reflects the hypersensitivity to haemoprotozoa and the slightly variation in the ESR may be attributed to the same.

There was almost normal value for all haematological parameters in non-infected group. The Total Leukocyte count showed decrease in infected cattle (06.99±00.31). In present study the decrease in TLC is caused due to decrease in local immune response. In the DLC in the Infected cattle lymphocytes (84.00±04.25), eosinophils (19.90±02.17), monocytes (08.69±00.61) were increased. The increase in monocytes and

eosinophils are caused due to phagocytic activity of the cell digesting the particulate matter and debris of parasites as an effect of cell mediated immune response. Increase in level of lymphocytes is associated with an increase in cell-mediated immunity and antibody-mediated immunity. The present study is similar in line to those previously reported by Khan et al[18]and Enwezor et al[20].

V. Conclusion

The present study shows that there is prevalence of haemaprotozoa infections in cattle in these villages and it emphasizes that in haemoprotozaon infections haematological alterations occurs and the clinical signs are related with the same. Proper control measures should be adopted and also there is scope for molecular studies for proper diagnosis.

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