

Research Article

HAEMATOLOGICAL IMPACT OF NATURALLY OCCURRING TICK BORNE HAEMOPARASITIC INFECTIONS IN CATTLE OF WEST BENGAL, INDIA

Apurba Debbarma¹, Soumitra Pandit^{1*}, Ruma Jas¹, Surajit Baidya¹, Subhas Chandra Mandal¹, Lalchawimawia Ralte¹, Partha Sarathi Jana², Nanigopal Shit³

Received 12 June 2017, revised 12 November 2017

ABSTRACT: Haemoparasites reduces productivity and may lead to high mortality among animals. The present study was carried out to evaluate the haematological change in cattle of different districts in West Bengal, India affected with naturally occurring tick-borne haemoparasitic diseases (TBHD). A total of 310 cattle blood samples were screened for the presence of haemoparasites from July, 2015 to June, 2016. The blood samples were examined for haemoparasites by making thin blood smear and staining with Giemsa's stain. The result showed that 108 (34.84%) cattle were found positive with TBHD, out of which 22.9% were *Theileria* sp, 5.8% were *Babesia* sp., 11.93% *Anaplasma* sp., and 5.8% were having mixed infection, respectively. The positive samples were subjected to estimations of haematological parameters *i. e.* Haemoglobin concentration (Hb), packed cell volume (PCV), total erythrocyte count (TEC) and Total leucocytes count (TLC) using standard protocol. The haematological analysis showed statistically a significant ($p < 0.01$) decreased levels of Hb, PCV, TEC and TLC in infected groups of cattle compared to infection free group cattle. This is probably the first systematic report in West Bengal, India. The result showed the haemoparasites have a negative impact on haematological parameters. This study may be useful in disease epidemiological map preparation, parasitic control policy preparation of the study areas.

Key words: Haemoparasitic diseases, Haematological, Cattle, West Bengal.

INTRODUCTION

Cattle play an important role in agricultural based Indian economy. But the optimum productivity of cattle still not reached in highest level due to some constraints. Tick-borne haemoparasitic diseases (TBHDs) are one of the major constraints of cattle production in India. Haemoparasitic diseases account for substantial losses in terms of decreased working capacity, growth and productivity of cattle. Haemoparasites have generally been shown to cause destruction of red blood cells resulting in anaemia, jaundice, anorexia, weight loss and infertility (Akande *et al.* 2010). The direct losses caused by the parasites are attributed to acute illness and death, premature slaughter and rejection of some body parts at meat inspection. Indirect losses include the reduction of productive potential such as decreased growth rate, weight loss in young growing animal and late maturity of slaughter stock (Hanson and Perry 1994). Farmers may not appreciate the effects of these haemoparasites on their

animals, perhaps due to the subclinical nature of presentation and chronic nature on the affected animals (Jatau *et al.* 2011). Namely *Babesia*, *Theileria* and *Anaplasma* are Tick-borne haemoparasites which globally impact on animal health and economy in view of mortality, reduced milk, meat and hide production and lower animal draft power (Radostits *et al.* 2000). In India, due to tropical theileriosis alone the amount of loss is US\$ 800 million annually (Devendra 1995). In TBHDs, early diagnosis based on blood smear examination, haematology, serum biochemical analysis and early treatment can prevent high mortality rates (Modi and Bhadesiya 2014). There are no previous published reports on the haematological alterations in TBHD in cattle in West Bengal, India. Thus the present study was undertaken to investigate the presence of *Theileria* sp., *Babesia* sp. and *Anaplasma* sp. in cattle and evaluate the haematological alterations in TBHD infected and non infected cattle in West Bengal, India.

¹Department of Veterinary Parasitology, ²Department of Veterinary Epidemiology & Preventive Medicine, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, 37, K. B. Sarani, Kolkata – 700 037, West Bengal, India.

³Animal Science Section, Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal, India.

*Corresponding author. soumitrapandit@gmail.com

Table 1. Overall incidence of tick-borne haemoparasitic diseases (TBHD) in cattle in West Bengal.

Sex	Total no of cattle examined	Total no of cattle positive	Incidence of haemoparasitic diseases				p value
			<i>Thaileria</i> sp.	<i>Babesia</i> sp.	<i>Anaplasma</i> sp.	Mixed infaction	
Male	56	18(32.14%)	8 ^{qb} (14.28%)	1 ^{sb} (1.78%)	11 ^{pa} (19.64%)	2 ^{rb} (3.57%)	p<0.01
Female	254	90(35.43%)	63 ^{pa} (24.8%)	17 ^{ra} (6.09%)	26 ^{qb} (10.24%)	16 ^{sa} (6.29%)	p<0.01
Total incidence	310	108(34.84%)	71(22.9%)	18(5.8%)	37(11.93%)	18(5.8%)	p<0.01
p Value		p<0.01	p<0.01	p<0.01	p<0.01	p<0.01	

Values bearing different superscripts in columns and in rows differ significantly.

Table 2. Haematological changes in haemoparasites infected and uninfected groups of cattle of West Bengal (Mean \pm SE).

Parameter studied	Infected Group	Non-infected Group	p Value
Hb (gm/dl)	7.25 \pm 0.187	11.08 \pm 0.355	p< 0.01
PCV (%)	24.08 \pm 0.839	34.78 \pm 0.760	p<0.01
TEC (x10 ⁶ /mm ³)	5.61 \pm 0.278	7.23 \pm 0.158	p<0.01
TLC (x 10 ³ /mm ³)	9.06 \pm 0.416	6.79 \pm 0.336	p<0.01

MATERIALS AND METHODS

Place and period of the study

The present research work conducted for the evaluation of haematological impact of naturally occurring in cattle in seven (7) districts of West Bengal, India were randomly selected *viz.* Paschim Midnapur, Purulia, Howrah, Hooghly, Kolkata, South 24 Parganas, Nadia, and two organized cattle farm *i.e.* Cattle farm under Institutional Livestock Farm, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, Mohanpur, Nadia and Dairy Farm of Ramkrishna Mission, Narendrapur, South 24 Parganas. These areas having large population size of cattle and that plays an important role in the economy of the study areas. This entire study was conducted in the laboratory of the Department of Veterinary Parasitology having the required facilities. However, as and when required the facilities available in the Department of Veterinary Biochemistry, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences was utilized. The investigation was carried out for a continuous period of one year, *i.e.* from July 2015 to June 2016.

Selection of animals and sampling

A total number 310 cattle blood samples were randomly collected for the presence of TBHD from different districts and farms of West Bengal. The blood samples were examined/ screened for the presence of

haemoparasites by making thin blood smear and staining with Giemsa's stain. After screening 30 - 40 % of the blood samples from both haemoparasites positive and negative animals were subjected to estimate the haematological changes.

Collection of blood samples

About 5 ml of blood from each cattle of both group was carefully drawn by jugular vein puncture and collected in 5 ml sterilized plastic vial containing the requisite quantity of ethylene-diamine tetra acetate (EDTA) and the samples were transferred to the departmental laboratory, Faculty of Veterinary and Animal Science, West Bengal University of Animal & Fishery Sciences for the analyses of haematological parameters.

Haematological parameters studied:

i. Haemoglobin concentration (Hb) was estimated by Sahlis' method as described by Schalm *et al.* (1986) and the value was expressed in gram/deciliter (gm/dl).

ii. Packed cell volume (PCV) was estimated by Wintrobe's haematocrit method and the value was expressed as percentage (%) of total volume as described by Schalm *et al.* (1986).

iii. The total erythrocyte count (TEC) was estimated by haemocytometer (Jain 1993) and the value was expressed as millions per cubic millimeter (x 10⁶/cmm.).

iv. Total leucocytes count (TLC) was estimated by

haemocytometer according to the method described by Jain (1993) and the value was expressed as thousand per cubic millimeter ($\times 10^3/\text{cmm}$).

Statistical Analysis

All the data were statistically analyzed (Analyze - Compare Means) for the mean value along with standard error (SE) by Duncan method (One way ANOVA) and the significance (P value) was recorded at 5% level ($p < 0.05$) and 1% level ($p < 0.01$). The complete statistical analysis was made by Statistical Package for Social Scientists (SPSS), Windows Version 20.0.

RESULTS AND DISCUSSION

The result showed that out of 310 samples, 108 (34.84%) cattle were found positive with TBHD. The overall incidence rate of haemoparasites infection showed that the highest infection of *Theileria* sp. (22.9%), followed by *Anaplasma* sp. (11.93%), *Babesia* sp. (5.8%) and having mixed infection (5.8%), respectively (Table 1).

The result showed the negative impact of haemoparasites on haematological values in infected cattle as compared to noninfected group. The hematological values of infected and noninfected groups of cattle were analyzed and the results showed a statistically significant ($p < 0.01$) decreases level in total erythrocyte count (TEC), mean hemoglobin concentration (Hb), packed cell volume (PCV), and total leukocyte count (TLC). The animals infected by bovine theileriosis, babesiosis and anaplasmosis exhibited macrocytic hypochromic anemia with abnormal morphology of erythrocyte as anisocytosis, poikilocytosis, basophilic stippling, hypochromasia, cremated RBC and polychromasia.

The value in respect of all the four haematological parameters was compared between the infected and uninfected groups. However, a significant ($p < 0.01$) negative impact of tick-borne haemoparasitic diseases were found in infected and non infected group of cattle on the mean value of Hb concentration (7.25 and 11.08), PCV value (24.08 and 34.78), TEC level (5.61 and 7.23) and TLC values (6.79 and 9.06), respectively (Table 2).

Theileria, *Babesia* and *Anaplasma*, are tick borne blood parasites which globally impact on animal health and economic. In this study the diagnosis of these TBHD in blood smear of cattle, were made in West Bengal on the basis of their morphological characteristics.

This decline in levels of Hb, PCV, TEC and TLC count is attributed to persistent loss of blood caused by permanent blood sucking ticks leading to anaemia (Durani *et al.* 2008) and lysis of erythrocytes by piroplasms which infects and replicate in it and erythrophagocytosis

(Modi *et al.* 2015). This erythrophagocytosis has been initiated by parasitic damage to erythrocytes and increased level of activated complement products and removal of destroyed cells by bovine reticuloendothelial system (Ashuma *et al.* 2013). The decreased erythrocyte counts could also be attributed to increased levels of activated complement products (Omer *et al.* 2003, Khan *et al.* 2011). Whereas, Mbassa *et al.* (1994) reported all these changes in haemogram occur as a result of anaemia which occurs due to toxic metabolites of tick-borne haemoprotozoa which have harmful effect on bone marrow as they interfere with the process of erythropoiesis. The alteration in hematological indices observed during the infection were consistent with the findings of Ananda *et al.* (2009), Ganguly *et al.* (2015), Modi *et al.* (2015) in theileriosis; Zulfiqar *et al.* (2012) in babesiosis and Ashuma *et al.* (2013) in anaplasmosis. In contrast to present study, Vahora *et al.* (2012) recorded normal values of PCV along with decrease in RBC count and Hb levels.

CONCLUSION

Based on the present observations, it can be concluded that TBHD is associated with alteration in haemogram which may results in production loss. These alterations should be considered in order to achieve early diagnosis and initiation of disease diagnosis, epidemiological mapping and parasitic control policy preparation of the study areas.

ACKNOWLEDGEMENT

The authors thankfully acknowledge to Dean, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences and Late Prof. J. D. Ghosh, Department of Veterinary Parasitology, Kolkata for providing funds with necessary facilities to conducting this study under the Department of Veterinary Parasitology.

REFERENCES

- Akande FA, Takeet MI, Makanju OA (2010) Haemoparasites of cattle in Abeokuta, South West Nigeria. *Sci World J* 5(4): 9 - 21.
- Ananda KJ, D'Souza PE, Puttalakshamma GC (2009) Prevalence of haemoprotozoan diseases in crossbred cattle in Bangalore north. *Vet World* 12: 15-16.
- Ashuma, Sharma A, Singla LD, Kaur P, Bal MS, Bath BK, Juyal PD (2013) Prevalence and haemato-biochemical profile of *Anaplasma marginale* infection in dairy animals of Punjab (India). *Asia Pac J Trop Med* 6: 139-144.
- Devendra C (1995) In *Global Agenda for Livestock research*, EDS, ILRI, Nairobi. 41-48.

- Durrani AZ, Shakoori AR, Kamal N (2008) Bionomics of *Hyalomma* ticks in three districts of Punjab, Pakistan. J Ani P Sci 18: 17-23.
- Ganguly A, Bhanot V, Bisla RS, Ganguly I, Singh H, Chaudhri SS (2015) Haematobiochemical alterations and direct blood polymerase chain reaction detection of *Theileria annulata* in naturally infected crossbred cows. Vet World 8(1): 24-28.
- Hanson J, Perry B (1994) The Epidemiology, Diagnosis and Control of Helminth Parasites of Ruminants. A Hand Book, Food and Agricultural Organization of the United Nations, Rome, Italy. 72-89.
- Jain NC (1993) Essentials of Veterinary Haematology. Lea and Febiger, Philadelphia, USA.
- Jatau ID Abdulganiyu A, Lawal AI, Okubanjo OO, Yusuf KH (2011) Gastrointestinal and Haemoparasitism of sheep and goats at slaughter in Kano, northern-Nigeria. Sokoto J Vet Sci 9(1): 7 - 11.
- Khan IA, Khan A, Hussain A, Riaz, Aziz A (2011) Hemato-biochemical alterations in cross bred cattle affected with bovine theileriosis in semi arid zone. Pak Vet J 31(2): 137-140.
- Mbassa GK, Balmba O, Maselle RM, Mwaga NV (1994) Severe anaemia due to hematopoietic precursor cell destruction in field cases of East Coast Fever in Tanzania. J Vet Parasitol 52: 243-256.
- Modi DV, Bhadesiya CM (2014) Tick-borne *Theileria annulata* infection in dairy cows. A short note for field vets. Int J Life Sci Res 2(4): 127-129.
- Modi DV, Bhadesiya CM, Mandali GC (2015) Hematobiochemical changes in crossbred cattle infected with *Theileria annulata* in Banakantha district of Gujarat. Int J Sci Res Pub 5(1): 1-4.
- Omer OH, El-Malik KH, Magzoub M, Mahmoud OM, Haroun EM, Hawas A, Omar HM (2003) Biochemical profiles in Friesian cattle naturally infected with *Theileria annulata* in Saudi Arabia. Vet Res Commun 27: 15-25.
- Radostits OM, Blood DC and Gay GC (2000) Veterinary Medicine: A text book of disease of cattle, sheep, pigs, goats and horse. 9th. Edn, Baillere Tindall Publication, London 1172-1173, 1289-1290.
- Schalm OW, Jain NC, Carroll EJ (1986) Veterinary Haematology, 4th edn. Lea and Febiger, Philadelphia.
- Vahora SP, Patel JV, Patel BB, Patel SB, Umale RH (2012) Seasonal incidence of Haemoprotozoal diseases in crossbred cattle and buffalo in Kaira and Anand districts of Gujarat, India. Vet World 5(3): 223-225.
- Zulfiqar S, Shahnawaz S, Ali M, Bhutta AM, Iqbal S, Hayat S, Qadir S, Latif M, Kiran N, Saeed A, Ali M, Iqbal F (2012) Detection of *Babesia bovis* in blood samples and its effect on the hematological and serum biochemical profile in large ruminants from Southern Punjab. Asia Pacific J Trop Biomed 104-108.

***Cite this article as:** Debbarma A, Pandit S, Jas R, Baidya S, Mandal SC, Ralte L, Jana PS, Shit N (2017) Haematological impact of naturally occurring tick borne haemoparasitic infections in cattle of West Bengal, India. Explor Anim Med Res 7(2): 175-178.