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A study on alteration in clinico-haematological parameters in colibacillosis affected diarrhoeic cattle calves

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Abstract

The objective of the present study was to evaluate clinico-haematological changes occurred in colibacillosis affected diarrhoeic calves below one month of age. The study was undertaken in cattle calves at private dairy farms as well as animals of individual holdings in Bikaner district of Rajasthan. A total number of 32 diarrhoeic calves (*Escherichia coli* positive) and eight clinically normal healthy calves (as control) were taken to investigate the clinico-haematological profiles. *E. coli* was isolated from the diarrhoeic calves and the animals found positive on the basis of multiplex polymerase chain reaction, were used for the study. Analysis of clinical profile and blood samples of the diarrhoeic calves revealed significant increase in haemoglobin, PCV, TEC, MCV, MCH, TLC and neutrophils while significant decrease in lymphocytes were recorded. However, no significant changes were observed in MCHC, eosinophils, basophils, rectal temperature, respiration rate and heart rate.

Keywords: colibacillosis, *E. coli*, diarrhoea, cattle calves

1. Introduction

Diarrhoea in calves especially below 1 month of age known as neonatal calf diarrhoea or calf scours, it is a common disease affecting newborn calves. Calves are susceptible especially during the first 28 days of their life. The greatest losses occur when calves are kept in close confinement, as chances for transmission of the causative agents of NCD are enhanced. Causative agents attack the intestinal epithelium of the calves and cause diarrhoea, which results in poor absorption of essential nutrients and leads to weight loss and dehydration. There are numerous infectious causes of NCD like Rota virus, Corona virus, bacteria (*E. Coli* K99; *Clostridium perfringens* Type C, *Salmonella* spp.) and parasites (*Cryptosporidia* and *Coccidia*) (Stair *et al.*, 1973 and Constable *et al.*, 2017) [1, 2]. Calf diarrhoea caused by *E. coli* is called colibacillosis, which is a very common and severe disease. There are many strains of disease causing (entero-pathogenic) and non-disease causing (non-pathogenic) *E. coli*. The pathogenic strains inducing gastroenteric disease are known as Diarrhegenic *E. coli* (DEC). DEC is subdivided in different pathotypes based on their virulence properties (Natao *et al.*, 1998) [3]. The clinicohaemato-biochemical alterations in diarrhoea are complex in nature comprising of serious imbalances of fluid, electrolyte and acid base status threatening the life of the patient.

2. Materials Methods

2.1 Animals

The present study was undertaken in calves (irrespective of sex and breed, below 1 month of age) at private dairy farms as well as animals of individual holdings in Bikaner district of Rajasthan.

2.2 *Escherichia coli*

E. coli was isolated from the diarrhoeic calves and confirmation was made by polymerase chain reaction. Those animals found positive for *E. coli* (on the basis of polymerase chain reaction) were used for the study of clinic-haematological profile.

2.3 Haematological Profile

Blood samples were collected in EDTA coated vial for examination of haematological parameters viz. haemoglobin (Hb), packed cell volume (PCV), total leukocyte count (TLC),

total erythrocyte count (TEC), hemoglobin (MCH), mean corpuscular hemoglobin differential leucocyte count (DLC), mean corpuscular concentration (McHc) and mean corpuscular volume (MCV). The analyses were performed as per standard haematological methods cited by Schalm's veterinary haematology (Jain, 1993) [4].

3. Results and Discussion

3.1 Clinical profile

The colibacillosis affected diarrhoeic calves were found dull, depressed with reduced appetite and disorganized suckling, mild to moderate dehydration, eyes not recess or slightly recess in to orbit and loss of skin elasticity were observed. The calves had a clinical evidence of mild to moderate diarrhoea with semisolid to watery faeces having offensive odour. The faeces were yellow-white to greenish in a colour, sometimes blackish, mucoid and even blood stained. The tail and perineum region of the calf patients was soiled with faeces. The frequency of defaecation was found increased. The mean rectal temperature ($^{\circ}$ F), mean heart rate (per

minute) and mean respiration rate (per minute) in healthy calves were 101.25 ± 0.24 , 114.2 ± 0.58 and 18.47 ± 0.55 , respectively whereas corresponding values in colibacillosis affected diarrhoeic calves were 102.21 ± 0.33 , 117.3 ± 0.48 and 20.13 ± 0.37 respectively. It revealed that there was slight increase in the mean rectal temperature, heart rate and respiration rate in the diarrhoeic calves affected with *E. coli* infection but the increase in above parameters was non-significant, statistically. Similar findings have also been reported by Baber *et al.* (2000) [5], Kumar and Mandial (2002) [6], Shaheen *et al.* (2002) [7], Tikoo and Soodan (2009) [8], Kumar *et al.* (2010) [9], Asati *et al.* (2010) [10], Maharishi (2019) [11]. Devkate *et al.* (2010) [12] and Sharma (2013) [13] reported increase in body temperature in colibacillosis affected calves, whereas Kalita *et al.* (2000) [14] and Fernandes *et al.* (2009) [15] observed subnormal temperature. Kalita *et al.* (2000) [14], Devkate *et al.* (2010) [12] and Sharma (2013) [13] reported increase in respiration rate, heart rate and pulse. Diarrhoea leads to excess loss of intestinal fluid resulting in severe dehydration (Demigne *et al.*, 1980) [16].

Table 1: Mean \pm SE values of clinical parameters of healthy control and colibacillosis affected calves

S. No.	Parameters	Healthy calves (n=10)	Diarrhoeic calves (n=30)	Statistical analysis (T test)
1.	Rectal temperature ($^{\circ}$ F)	101.25 ± 0.24	102.21 ± 0.33	NS
2.	Heart rate (per minute)	114.2 ± 0.58	117.3 ± 0.48	NS
3.	Respiration rate (per minute)	18.47 ± 0.55	20.13 ± 0.37	NS

3.2 Haematological Profile

Mean values of Hb (g/dl), PCV (%) and TEC ($\times 10^6/\mu$ l) in healthy calves were 10.48 ± 0.22 , 39.31 ± 0.99 and 7.98 ± 0.17 , whereas, in colibacillosis affected diarrhoeic calves were; 12.64 ± 0.09 , 48.81 ± 0.41 and 8.88 ± 0.19 respectively. There was significant increase in the mean values of Hb, PCV and TEC in colibacillosis affected diarrhoeic calves as compared to healthy control group. It is in agreement with the report of Roy *et al.* (2009) [16], Fernandes *et al.* (2009b) [17], Tikoo and Soodan (2009) [8], Kumar *et al.* (2010) [9], Mir *et al.* (2010) [18], Sharma (2013) [13] and Maharishi (2019) [11]. Increase in Hb, PCV and TEC values in affected calves were due to haemo-concentration associated with dehydration and hypovolaemia, as diarrhoea leads to excess loss of intestinal fluid resulting in severe dehydration (Demigne *et al.*, 1980 and Eddy and Pincet, 2004) [19, 20].

The mean \pm SE values of MCV (fl), MCH (pg) and MCHC (g/dl) in healthy calves were; 49.37 ± 1.35 , 13.19 ± 0.46 , 26.81 ± 1.08 respectively ($p > 0.05$) and in colibacillosis affected diarrhoeic calves were; 55.47 ± 0.84 , 14.38 ± 0.25 , 25.93 ± 0.22 respectively. There was significant increase in mean \pm SE values of MCV and MCH while there was non-significant decrease in MCHC values in colibacillosis as compared to healthy control. Results in the present investigation were in agreement with Asati *et al.* (2008) [10], Mir *et al.* (2010) [18] and Sharma (2013) [13] who also reported increased MCV and MCH values in calves affected with diarrhoea but decrease in the values of MCHC profile. The mean \pm SE values of TLC ($\times 10^3/\mu$ l) in healthy calves were 10.26 ± 0.14 and in colibacillosis affected diarrhoeic calves were 13.86 ± 0.26 . The mean value of TLC of colibacillosis affected diarrhoeic calves was significantly ($p < 0.01$) higher than the control calves. Similar finding was reported by Bashir *et al.* (2015) [21], Shekhar *et al.* (2017) [22] and

Maharishi (2019) [11]. *E. coli* infection might be the most probable reason of increase values of TLC. According to Gerros *et al.* (1995) [23] and Eddy and Pincet, (2004) [20] leucocytosis in neonatal calf diarrhoea, of varying magnitude, has been attributed to microbial infection and associated with neutrophilia. The white blood cell picture exhibiting leukocytosis is a reliable indicator of septicaemia often associated with bacterial infection in the intestines (Jain, 1993) [4]. Bukhari (2002) [24] suggested generalized tissue dehydration as the reason for increase in TLC values along with other haematological parameters in neonatal calf diarrhoea. On the other side, Asati *et al.* (2008) [10] reported lower mean values of TLC in colibacillosis, which may be due to a transient leucopenic state in diarrhoeic calves (Santos *et al.*, 2002) [25].

The differential leucocyte count (DLC) revealed mean values of neutrophils (%) in the healthy control and colibacillosis affected diarrhoeic calves were; 38.25 ± 0.96 and 45.13 ± 0.52 , respectively. The mean value of neutrophils in colibacillosis was significantly higher than healthy calves. The mean lymphocyte (%) in colibacillosis affected diarrhoeic calves (59.75 ± 1.11) was significantly lower than healthy calves (53.47 ± 0.58). There was marked neutrophilia and lymphopenia in diarrhoeic calves during our study. Brar *et al.* (2015) [26] also reported neutrophilia with concurrent lymphopenia as a striking feature of the circulatory leukocyte profile in neonatal calves suffering from diarrhoea. Malik *et al.* (2013) [27] suggested that the significant increased number of circulatory neutrophils associated with the leucocytosis in the initial stage of diarrhoea in calves indicated pathogenic bacterial infection. Similar finding were also reported by Bandyopadhyay *et al.* (2008) [28], Sharma (2013) [13], Bashir *et al.* (2015) [21] and Maharishi (2019) [11].

Table 2: Mean \pm SE values of haematological parameters of healthy control and colibacillosis affected calves

S. No.	Parameters	Healthy calves (n=8)	Diarrhoeic calves (n=32)	Statistical analysis (T test)
1.	Hb (g/dl)	10.48 \pm 0.22	12.64 \pm 0.09	**
2.	PCV (%)	39.31 \pm 0.99	48.81 \pm 0.41	**
3.	TEC (106/ μ l)	7.98 \pm 0.17	8.88 \pm 0.19	**
4.	MCV (fl)	49.37 \pm 1.35	55.47 \pm 0.84	**
5.	MCH (pg)	13.19 \pm 0.46	14.38 \pm 0.25	*
6.	MCHC (g/dl)	26.81 \pm 1.08	25.93 \pm 0.22	NS
7.	TLC (103/ μ l)	10.26 \pm 0.14	13.86 \pm 0.26	**
8.	DLC			
	(i) Neutrophils (%)	38.25 \pm 0.96	45.13 \pm 0.52	**
	(ii) Lymphocytes (%)	59.75 \pm 1.11	53.47 \pm 0.58	**
	(iii) Eosinophils (%)	1.63 \pm 0.38	0.97 \pm 0.16	NS
	(iii) Basophils (%)	0.50 \pm 0.18	0.44 \pm 0.08	NS

* Significant at $p < 0.05$, ** Significant at $p < 0.01$

4. Conclusion Analysis of clinical profile and blood samples of the diarrhoeic calves revealed significant increase in haemoglobin, PCV, TEC, MCV, MCH, TLC and neutrophils while significant decrease in lymphocytes were recorded. However, no significant changes were observed in MCHC, eosinophils, basophils, rectal temperature, respiration rate and heart rate.

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