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

TC Nayak, AP Singh, Savita, JP Kachhawa, SR Gupta and R Yadav

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 at private dairy farms as well as animals of individual holdings in Bikaner district of Rajasthan. A total number of 32 diarrheic 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 diarrheic 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 diarrheic 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, 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, Coronavirus, bacteria (E. Coli K99; Clostridiun 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 Diarrheagic E. coli (DEC). DEC is subdivided in different pathotypes based on their virulence properties (Natao et al., 1998) [3]. The clinicohaematobiochemical 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 diarrheic 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 (°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 Mandal (2002) [6], Shaheen et al. (2002) [7], Tikoo and Soodan (2009) [8], Kumar et al. (2010) [9], Asati et al. (2010) [10], Maharishi (2011) [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 ± 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 (°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 (x10⁶/μl) 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 haemoconcentration 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 Pinsent, 2004) [19, 20].

The mean ± 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 ± 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) [11] who also reported increased MCV and MCH values in calves affected with diarrhoea but decrease in the values of MCHC profile. The mean ± SE values of TLC (x10⁹/μl) 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 Pincent, (2004) [24] leukocytosis 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 circulating 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) [22] and Maharishi (2019) [11].

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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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6. References


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### Table 2: Mean ± SE values of haematological parameters of healthy control and colibacillosis affected calves

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Healthy calves (n=8)</th>
<th>Diarrhoeic calves (n=32)</th>
<th>Statistical analysis (T test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hb (g/dl)</td>
<td>10.48±0.22</td>
<td>12.64±0.09</td>
<td>**</td>
</tr>
<tr>
<td>2.</td>
<td>PCV (%)</td>
<td>39.31±0.99</td>
<td>48.81±0.41</td>
<td>**</td>
</tr>
<tr>
<td>3.</td>
<td>TEC (106/µl)</td>
<td>7.98±0.17</td>
<td>8.88±0.19</td>
<td>**</td>
</tr>
<tr>
<td>4.</td>
<td>MCV (fl)</td>
<td>49.37±1.35</td>
<td>55.47±0.04</td>
<td>**</td>
</tr>
<tr>
<td>5.</td>
<td>MCH (pg)</td>
<td>13.19±0.46</td>
<td>14.38±0.25</td>
<td>*</td>
</tr>
<tr>
<td>6.</td>
<td>MCHC (g/dl)</td>
<td>26.81±1.08</td>
<td>25.93±0.22</td>
<td>NS</td>
</tr>
<tr>
<td>7.</td>
<td>TLC (103/µl)</td>
<td>10.26±0.14</td>
<td>13.86±0.26</td>
<td>**</td>
</tr>
<tr>
<td>8.</td>
<td>DLC (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Neutrophils (%)</td>
<td>38.25±0.96</td>
<td>45.13±0.52</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>(ii) Lymphocytes (%)</td>
<td>39.75±1.11</td>
<td>53.47±0.58</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>(iii) Eosinophils (%)</td>
<td>1.63±0.38</td>
<td>0.97±0.16</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>(iv) Basophils (%)</td>
<td>0.50±0.18</td>
<td>0.44±0.08</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

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

