COMPARATIVE STUDY OF HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN HEALTHY AND ASCARIOSIS AFFECTED BUFFALO CALVES*

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ABSTRACT

The blood was collected from 15 healthy buffalo calves and 6 ‘mild’, 6 ‘moderate’ and 6 ‘severe’ ascariosis affected buffalo calves and haematological and various biochemical parameters were estimated. In haematological study involving packed cell volume (PCV), there was a significant increase in PCV in moderate and severely affected buffalo calves. In the biochemical study, parameters like calcium, triglycerides, cholesterol, globulins and albumin : globulin (A:G) ratio showed no significant difference in mild, moderate and severe ascariosis as compared to healthy buffalo calves. The blood phosphorus level of buffalo calves affected with mild and severe ascariosis was significantly increased. The Calcium:Phosphorus (Ca:P) ratio was drastically decreased in severe and mild ascariosis and moderately decreased in moderate ascariosis affected buffalo calves. The SGOT levels were significantly increased in moderate and severe ascariosis whereas the SGPT and total bilirubin levels were significantly increased in severe ascariosis. The glucose and total plasma proteins level were significantly decreased in severe ascariosis.

INTRODUCTION

Ascariosis caused by Toxocara vitulorum is one of the major helminthoses in calves. The disease is much more common in buffalo calves as compared to cow calves (Das and Singh, 1955) and is considered as the number one cause of calf morbidity and mortality in buffalo calves (Radostits et al., 1994), inflicting considerable economic loss to the farmers. The migrating larvae of T. vitulorum in infected calves cause pathological changes in the liver and lungs and the adult worms can cause intestinal obstruction which can end in death of calves (Srivastava, 1963; Lai and Ganu, 1979). Since the exact cause of death is not known and many buffalo calves of this region and probably of other regions viz., Haryana (Gupta et al., 1985), Uttar Pradesh (Agnihotri, 1993), Andhra Pradesh (Srinivasa Rao et al., 2000), Bihar (Usharani Devi et al., 2000) etc., die of ascariosis, it is essential to study haematological and biochemical changes of calves suffering from ascariosis for proper understanding of the pathogenesis which will be very useful in formulating the proper therapeutic measures.

MATERIAL AND METHODS

The buffalo (Bubalus bubalis) calves presented to Teaching Veterinary Clinical Complex of Veterinary College, Bidar and calves of neighbouring villages of Bidar were utilized in the present study. The data pertaining to age, breed and sex were collected. The calves with natural infection of ascariosis were used for the haematological and biochemical studies. The buffalo calves were divided broadly into two groups after faecal examination. The first group of buffalo calves which appeared healthy wherein the clinical parameters viz., temperature, respiratory rate and heart rate were within the normal range and upon faecal examination were negative for ova of T. vitulorum were considered as ‘healthy buffalo calves’. The second group of buffalo calves showing clinical signs of ascariosis and the faecal samples positive for the ova of T. vitulorum were considered as ‘ascariosis affected buffalo calves’. Based on the clinical

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signs, these buffalo calves were further subdivided into mild, moderate and severe ascariosis affected buffalo calves to understand the haematological and biochemical changes properly. The calves which were not showing clinical signs of ascariosis and which were standing and on faecal examination were positive for ova of T. vitulorum were considered as ‘mild’ ascariosis affected buffalo calves. The calves which were showing the clinical signs of ascariosis like weakness, rough hair coat, pot belly, with or without mild to moderate diarrhoea and in standing position and coprologically positive for T. vitulorum were considered as ‘moderate’ ascariosis affected buffalo calves. The calves which were recumbent, having subnormal temperature, extremities and even sometimes body surfaces cold, constipation with yellow coloured, thick pasty and rancid smelling faeces, hurried shallow respiration, congested to cyanotic mucous membranes and on faecal examination positive for ova of T. vitulorum were considered as ‘severe’ ascariosis affected buffalo calves.

The blood was collected in sterilized vials containing EDTA @ 1 mg/ml of blood. This blood was used to estimate packed cell volume (PCV) by using the micro-haematocrit method as described by Schalm et al. (1986).

The blood was collected, serum separated and used for the estimation of SGOT, SGPT, calcium and phosphorus. However, plasma was used for the estimation of glucose, total proteins, albumin, cholesterol, triglycerides and total bilirubin. The biochemical estimations were carried out with diagnostic kits supplied by Qualigens Fine Chemicals (Glaxo India Limited) using photoelectric colorimeter. The above biochemical parameters were estimated in 15 healthy buffalo calves and in 6 buffalo calves each in mild, moderate and severe ascariosis. The statistical analysis was done by one way ANOVA by using the procedure of Snedecor and Cochran (1967) and the values of healthy buffalo calves were compared with mild, moderate and severe ascariosis affected buffalo calves.

RESULTS AND DISCUSSION

The comparative study of haematological and biochemical values of healthy and ascariosis affected buffalo calves is given in the Table 1. The PCV of buffalo calves affected with moderate (38.17 ± 2.04%) and severe (51.33 ± 1.96%) ascariosis were significantly increased as compared to healthy buffalo calves (28.67 ± 1.13%) which may be due to dehydration occurring as a result of diarrhoea as reported by Baruah et al. (1979).

The biochemical parameters like calcium, triglycerides, cholesterol, globulins and A:G ratio showed no significant difference in mild, moderate and severe ascariosis as compared to healthy buffalo calves.

The blood phosphorus level of buffalo calves affected with mild (4.15 ± 0.22 mg%) and severe (4.95 ± 0.63 mg%) but not in moderate ascariosis (3.41 ± 0.50 mg%) was significantly increased (P<0.01) as compared to healthy buffalo calves (2.88 ± 0.14 mg%). The reasons for these changes are not clearly understood.

The calcium:phosphorus ratio of healthy buffalo calves was 1.76:1 and the same in mild, moderate and severe ascariosis affected buffalo calves was 0.89:1, 1.44:1 and 0.76:1 respectively. This clearly indicates that Ca:P ratio is almost normal in healthy buffalo calves whereas the same is drastically decreased in severe and mild ascariosis and moderately decreased in moderate ascariosis affected buffalo calves. The exact reason for this moderate to drastic decrease is not clearly understood. Probably, the adult worms in the intestine utilizes the calcium for their metabolic activities. In addition, these worms may secrete some metabolites which may affect the various
<table>
<thead>
<tr>
<th>S.Nb.</th>
<th>Haematological and biochemical parameters</th>
<th>Healthy calves¹ (Mean±SE)</th>
<th>Calves affected with ascariosis (Mean±SE)</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mild (Mean±SE)</td>
<td>Moderate (Mean±SE)</td>
<td>Severe (Mean±SE)</td>
</tr>
<tr>
<td>1</td>
<td>PCV (%)</td>
<td>28.67 ± 1.13 a</td>
<td>30.50 ± 1.20 a</td>
<td>38.17 ± 2.04 b</td>
</tr>
<tr>
<td>2</td>
<td>Calcium (mg%)</td>
<td>5.00 ± 0.42</td>
<td>3.75 ± 0.56</td>
<td>4.17 ± 0.58</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorus (mg%)</td>
<td>2.88 ± 0.14</td>
<td>4.15 ± 0.22</td>
<td>3.41 ± 0.50</td>
</tr>
<tr>
<td>4</td>
<td>Calcium : Phosphorus ratio</td>
<td>1.76 ± 0.14</td>
<td>0.89 ± 0.10</td>
<td>1.44 ± 0.33</td>
</tr>
<tr>
<td>5</td>
<td>Triglycerides (mg%)</td>
<td>15.71 ± 2.34</td>
<td>21.66 ± 2.78</td>
<td>20.18 ± 4.97</td>
</tr>
<tr>
<td>6</td>
<td>Cholesterol (mg%)</td>
<td>178.74 ± 9.09</td>
<td>169.63 ± 16.62</td>
<td>178.27 ± 11.75</td>
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<td>7</td>
<td>SGOT (units/ml)</td>
<td>37.07b ± 1.91</td>
<td>20.33 a ± 1.20</td>
<td>52.67c ± 3.55</td>
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<tr>
<td>8</td>
<td>SGPT (units/ml)</td>
<td>12.07 ± 1.51</td>
<td>8.83 ± 1.40</td>
<td>12.00 ± 1.91</td>
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<tr>
<td>9</td>
<td>Total bilirubin (mg%)</td>
<td>1.37 ± 0.12</td>
<td>1.13 ± 0.23</td>
<td>0.42 ± 0.11</td>
</tr>
<tr>
<td>10</td>
<td>Glucose (mg%)</td>
<td>65.20 b ± 4.94</td>
<td>79.89bc ± 9.04</td>
<td>95.39c ± 6.28</td>
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<td>11</td>
<td>Plasma proteins:</td>
<td></td>
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<tr>
<td></td>
<td>a Total proteins (gm%)</td>
<td>5.72a ± 0.14</td>
<td>5.16a ± 0.15</td>
<td>5.87a ± 0.14</td>
</tr>
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<td></td>
<td>b Albumin (gm%)</td>
<td>3.04 ± 0.06</td>
<td>3.24a ± 0.24</td>
<td>3.61a ± 0.11</td>
</tr>
<tr>
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<td>c Globulin (gm%)</td>
<td>2.68 ± 0.16</td>
<td>1.93 ± 0.29</td>
<td>2.25 ± 0.13</td>
</tr>
<tr>
<td></td>
<td>d Albumin : Globulin ratio</td>
<td>1.19 ± 0.07</td>
<td>1.96 ± 0.42</td>
<td>1.64 ± 0.13</td>
</tr>
</tbody>
</table>

Note:
- ¹ = Mean ± SE of 15 buffalo calves;
- ² = Mean ± SE of 6 buffalo calves;
- ³ = Mean ± SE of individual ratios;
- * = Significant at P<0.01 level;
- ** = Significant at P<0.001 level;
- NS = Not significant;
Mean with common superscripts within a parameter doesn’t differ significantly from each other (P>0.01).
functions of the calf. Firstly, it may prevent the absorption of calcium from the intestine into the blood. Secondly, it may suppress the parathyroid from releasing of parathormone and thus the calcium from the bones is not withdrawn. Finally, it may prevent the excretion of phosphates by the kidneys. Probably these are the fruitful areas of research to be undertaken in future.

Even though significant difference was not noticed in triglycerides and cholesterol level, these values increased as the severity increased. The reason for this pattern is not clearly understood. Probably, two factors may be involved. Firstly, utilization of nutrients by the adult worms in the intestine and anorexia may be responsible for utilization of stored food especially by breaking down of fat leading to more production of triglycerides and cholesterol. Secondly, migrating larvae can damage the liver and muscles (skeletal as well as cardiac) which may be responsible for increase in cholesterol and triglycerides. In addition, increase in cholesterol and triglycerides may lead to death of the calf due to cardiac failure since, such thing has been documented in human beings wherein high serum cholesterol levels is considered as a risk factor in coronary heart disease (Colton, 1974).

The findings of the present study clearly indicates the liver damage. Firstly, the SGPT level was significantly increased \((P<0.01)\) in calves affected with severe ascariosis \((25.00\pm2.50\ \text{units/ml})\) as compared to healthy buffalo calves \((12.07\pm1.51\ \text{units/ml})\). Secondly, the SGOT level was significantly increased \((P<0.01)\) in moderate \((52.67\pm3.55\ \text{units/ml})\) and severe \((68.00\pm5.82\ \text{units/ml})\) ascariosis as compared to healthy buffalo calves \((37.07\pm1.91\ \text{units/ml})\). These findings were similar to the ones reported by El-Abdin et al. (1975) and Srivivas Rao (1995) who did not classify the ascariosis affected calves on the basis of severity, as done in this study. Thirdly, the total bilirubin level of buffalo calves affected with severe ascariosis \((1.86\pm0.15\ \text{mg%})\) was significantly increased \((RP<0.01)\) as compared to healthy buffalo calves \((1.37\pm0.12\ \text{mg%})\). This finding was almost similar to the findings of Gupta et al. (1976). Fourthly, the plasma glucose level of buffalo calves affected with severe ascariosis \((15.27\pm2.19\ \text{mg%})\) was significantly decreased as compared to healthy buffalo calves \((65.20\pm4.94\ \text{mg%})\) and was similar to the findings reported by Hariprasad (1985) and Srivivas Rao (1995). Finally, the total proteins of buffalo calves affected with mild \((5.16\pm0.15\ \text{gm%})\) and severe \((4.94\pm0.21\ \text{gm%})\) ascariosis were significantly decreased \((P<0.01)\) as compared to healthy buffalo calves \((5.72\pm0.14\ \text{gm%})\).

Thus the above findings clearly demonstrated the liver damage wherein, hepatic cell damage resulted in the release of enzymes \((\text{SGPT, SGOT})\), less synthesis of albumin and glucose and impaired excretion of bile pigments. What is the cause for liver damage? Is it due to the migration of 3rd stage larvae of \(T.\ vitulorum\) in the liver? or is it due to the intestinal obstruction by the adult worms of \(T.\ vitulorum\)? Does this causes the release of toxins from the enteropathogens like \(E\). coli or \(S\). typhosa or products of intestinal epithelial cells acting as toxins or substances released by the adult parasitic worms. Any one or all these factors may be leading to toxemia. The clinical findings of severe ascariosis, the haematological and the biochemical findings of the present study are strongly suggestive of toxemia. The cause(s) of toxemia has to be known before fruitful therapeutic regimen is proposed to save the precious lives of many buffalo calves which are dying of severe form of ascariosis.

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REFERENCES