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Haemato-biochemical changes of parasitic bottle jaw syndrome in calves

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Abstract

The study was conducted to determine the haemato-biochemical changes in calves with bottle jaw syndrome, which were brought for treatment at the Bangladesh Agricultural University Veterinary Clinic during the period from July to December 2002. A total of 15 calves with bottle jaw syndrome of either sex or aged between 6 to 12 months were selected for the study. Results on hematological examination showed significantly ($p < 0.01$) decreased values of haemoglobin concentration, packed cell volume, total erythrocytes and total leucocytes count in calves with bottle jaw syndrome in comparison to normal healthy control calves. Biochemical values revealed significantly ($p < 0.01$) decreased serum calcium, inorganic phosphorus, total serum protein albumin, and glucose levels in calves with bottle jaw syndrome. Serum iron decreased insignificantly and serum chloride value increased significantly ($p < 0.01$) but the serum magnesium level increased insignificantly ($p < 0.05$) in calves with bottle jaw syndrome in comparison to the healthy control calves.

Keywords: Haematological, Biochemical, Bottle jaw, Calf

Introduction

The agro-ecological and geo-climatic conditions of Bangladesh are highly favorable for the growth and multiplication of gastro-intestinal parasites. As a result about 50% apparently healthy cattle population has been recognized to be affected with two or more different species of parasites (Garrels, 1975). Most of the calves maintained under traditional management system start eating grass at their early life, which invariably expose them to early infection. Debnath *et al.* (1990) reported that 50% of calves up to one year of age died due to gastro-intestinal disturbances and opined that malnutrition to be the probable major cause of calf mortality on smallholder traditional farms in Bangladesh. Gastro-intestinal parasites have been recognized to be associated with poor growth rate, digestive disorders, ill-health and mortality. Recently it has been reported that 82.62% clinically sick calves up to 12 months of age are affected with various gastro-intestinal parasitic infection (Samad, 2001^b).

Bottle jaw syndrome has been recorded in 2.27% cattle of all age groups and 3.48% in calves up to one year old (Samad, 2001^a). Although the bottle jaw syndrome associated with hypoproteinaemia is frequently encountered in ruminant practices in Bangladesh but published reports on this clinical problem is lacking in inland literature. (Samad, 2000). Considering the mentioned facts, the present study was undertaken to detect the haemato-biochemical changes of parasitic bottle jaw syndrome in calves.

Material and Methods

Sources of Animals

This study on parasitic bottle jaw syndrome was carried out on randomly selected 15 clinically sick cross bred calves, aged between 6 to 12 months of either sex, which were brought for treatment at the Bangladesh Agricultural University Veterinary Clinic, Mymensingh during the period from July to December 2002. Clinical and laboratory examinations revealed that all the selected calves had bottle jaw syndrome and gastrointestinal parasitic infection.

Six calves of local breed (3 male and 3 female) aged between 8 to 12 months were purchased from the local market under the "Calf morbidity and mortality" project No.99/04/AU (BAURES) on the month of May 2002. These calves were dewormed and maintained in the Large Animal Experimental House of the Department of Medicine, Faculty of veterinary Science, Bangladesh Agricultural University, Mymensingh-2202. These six calves at healthy stage were used as control animal.

Collection of blood for haemato-biochemical examination

The blood sample of each selected calf (6 control healthy and 15 calves with bottle jaw syndrome) were collected from the jugular vein, simultaneously in two separate test tubes, one with double oxalates as anticoagulant and the other tubes without adding any anticoagulant. The anticoagulant added blood samples were used for hematological examination. The sera were separated from the blood collected without any anticoagulant by conventional method and stored at -20°C until biochemical analysis.

Haematological examination

The haemoglobin concentration (Hb, g %) was determined by Spencer Haemoglobinometer, total erythrocyte count (TEC, million/ mm^3) and total leukocyte count (TLC thousand/ mm^3) were determined by Haemocytometer, and the packed cell volume (PCV %) was determined by Wintrobe method as described by Samad (2001^a). The mean corpuscular volume (MCV, μm^3), mean corpuscular hemoglobin (MCH, pg) and mean corpuscular haemoglobin concentration (MCHC, %) were calculated as described by Samad (2001^a).

Biochemical Examination

The biochemical constituents of serum of both the control healthy calves and calves with bottle jaw syndrome were determined by using the diagnostic kits (Human Gesellschaft für Biochemica and Diagnostica mbH, Max-planck-Ring 21, D-65205 Wiebaden, Germany) with the help of Spectronic[®] Geneys[™]-5 (Spectronic Instrument, Inc. Rochester, NY). The serum calcium and phosphorus were determined with a complete test kit Cat. No. 10011 at 570 nm and test Kit. Cat. No. 10027 at 340 nm respectively. The serum iron and serum chloride were estimated by using complete test kit. cat. No. 10229 and 10230 at 623 nm and test kit No. 10115 at 590 nm respectively. And the serum albumin, total serum protein and serum glucose were determined by using complete test kit Cat. No. 10560 at 546 nm, test kit Cat. No. 10570 at 546 nm and complete glucose test kit (Cat. No. 10260, 10121 and 10123) at 500 nm respectively.

Statistical analysis

Results were analyzed statistically with the help of Student's 't' test for significance as described by Gupta (1982).

Results and Discussion

Haematological changes in bottle jaw affected calves

Haematological findings of six healthy control calves and 15 calves affected with bottle jaw syndrome are presented in Table 1.

The average haemoglobin (Hb) concentration, packed cell volume (PCV) and total erythrocyte count (TEC) in calves with bottle jaw syndrome were 5.55 ± 1.32 g%, 17.68 ± 3.98 % and 4.03 ± 0.26 million/mm³, whereas in the normal healthy calves the values 10.50 ± 0.71 g %, 30.50 ± 1.61 % and 9.70 ± 1.11 million/mm³ respectively (Table 1). The mean values of haemoglobin (Hb), packed cell volume (PVC) and total erythrocytic count (TEC) in calves with bottle jaw syndrome decreased significantly ($p < 0.01$) in comparison to normal healthy control calves. It indicates severe anaemia correlated with cachectic health condition and pale visible mucous membrane. Analysis of the erythrocytic index of calves with bottle jaw syndrome in comparison to healthy control calves showed hypochromic microcytic anaemia, which indicates chronic helminthiasis. These findings support the earlier reports of Thakur and Mishra (1973); Haroun and Hussein (1976); Siddique *et al.* (1989); Mohsin *et al.* (1991) and Khandaker and Chanda (1998) who reported similar type of changes in chronic bovine fascioliasis.

The mean total leukocyte count of calves with bottle jaw syndrome was 3.95 ± 0.68 thousand/mm³ whereas in the normal healthy calves the count was 6.19 ± 0.38 thousand/mm³. The mean value of total leukocyte count was significantly ($p < 0.01$) reduced in calves with bottle jaw syndrome in comparison to their respective normal healthy control calves (Table 1). The mean total leukocytic count in calves with bottle jaw syndrome was found significantly ($p < 0.01$) decreased in comparison to the normal healthy calves. Although this finding supports the report of Furmaga and Gundlach (1967); Pachalag *et al.* (1973) and Urvashi *et al.* (1999), but contradict with the reports of Mohsin *et al.* (1991), who reported a significant increase of total leukocyte count in bovine fascioliasis. The difference might be due to different stages of infection and age of the host.

Table 1. Haematological values in normal healthy control calves and affected with bottle jaw syndrome

Parameters	Unit	Normal healthy control calves (n=6)	Calves with bottle jaw syndrome (n=15)	Test of significance 't' values
Haemaglobin (Hb)	g%	07.80-12.00 10.50±0.71	03.00-08.00 05.55±01.32	08.26**
Packed cell volume (PCV)	%	28.00-35.00 30.93±01.88	08.50-25.00 17.68±03.98	15.06**
Total erythrocyte count (TEC)	million/mm ³	08.35-11.60 09.70±01.11	01.60-05.87 04.03±00.26	19.00**
Total leukocyte count (TLC)	thou./mm ³	05.71-06.94 06.19±00.38	02.41-05.27 03.95±00.68	15.02**
Mean corpuscular volume (MCV)	µm ³	25.42-38.32 31.94±4.68	30.66-89.56 47.38±14.67	02.40**
Mean corpuscular haemoglobin (MCH)	pg	08.05-12.42 10.99±01.60	08.52-26.25 13.90±04.67	01.42
Mean corpuscular haemoglobin concentration (MCHC)	%	21.25-37.93 31.47±01.98	29.47-36.84 34.48±02.38	02.82**

n= No. of calves, ** Differed significantly at ($P < 0.01$) level

The mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration in calves with bottle jaw syndrome were $47.38 \pm 14.67 \mu\text{m}^3$, $13.90 \pm 4.67 \text{ pg}$ and $31.47 \pm 1.98 \%$, whereas in normal healthy control calves these values were an average $31.94 \pm 4.68 \mu\text{m}^3$, $10.99 \pm 1.6 \text{ pg}$ and $34.47 \pm 2.38 \%$ respectively. The mean value of MCV, MCH and MCHC were found significantly ($p < 0.01$) increased in bottle jaw affected calves in comparison to their respective normal healthy control calves (Table 1).

Biochemical changes in serum of calves

The biochemical findings in serum of normal healthy calves and calves with bottle jaw syndrome are presented in the Table 2.

Table 2. Biochemical values in serum of healthy control calves and calves with bottle jaw syndrome

Parameters*	Unit	Normal healthy control calves (n=15)	Calves with bottle jaw syndrome (n=15)	Test of significance 't' values
Calcium (Ca)	mg/dl	08.33-09.61 08.93±00.42	04.70-09.22 07.21±01.32	02.28**
Phosphorus (P)	mg/dl	06.09-08.13 07.09±00.68	02.51-05.13 03.92±00.87	08.86**
Magnesium (Mg)	mg/dl	02.32-02.38 02.36±00.02	02.02-02.71 02.43±00.19	00.85
Iron (Fe)	$\mu\text{g/dl}$	100.32-111.36 104.29±03.46	87.59-112.76 99.77±07.34	01.39
Chloride (Cl)	mmol/l	102.24-104.27 103.51±00.91	99.87-112.86 108.92±03.03	03.79**
Albumin (Ab)	g/dl	03.28-04.50 03.84±00.39	01.98-03.30 02.35±00.28	09.35**
Total Serum Protein (TSP)	g/dl	06.43-07.51 06.86±00.40	04.46-06.05 05.24±00.46	07.13**
Glucose	mg/dl	75.32-92.42 86.58±06.88	44.37-78.57 61.53±11.73	04.66**

n= No. of calves. **Significantly ($p < 0.01$) differed from the normal healthy control calves. * Biochemical values are estimated by using commercial kits (Human Gesellschaft für Biochemica and Diagnostica mbH, Max-Planck-Ring 21, D-62205 Wiesbaden, Germany) with the help of Spectrophotometer (Spectronic^(R) GenesysTM-5), - : Not done.

The mean value of calcium ($8.93 \pm 0.42 \text{ mg/dl}$) and phosphorus ($7.09 \pm 0.68 \text{ mg/dl}$) in normal healthy control calves decreased significantly ($p < 0.01$) to $7.21 \pm 1.32 \text{ mg/dl}$ and $3.92 \pm 0.87 \text{ mg/dl}$ respectively in calves with bottle jaw syndrome. The significant decrease in the level of calcium and phosphorus may be due to decreased absorption, utilization or intake. Similar observations were reported by Dessouky and Moustafa (1978) and Choudhuri *et al.* (1988) in fasciolosis in buffaloes.

The mean value of magnesium ($2.43 \pm 0.19 \text{ mg/dl}$) in calves with bottle jaw syndrome increased insignificantly than the normal healthy calves ($2.36 \pm 0.02 \text{ mg/dl}$). This finding could not be compared due to lack of similar report in the available literature. The mean value of iron ($99.77 \pm 7.34 \mu\text{g/dl}$) in calves with bottle jaw syndrome decreased insignificantly than the

normal healthy calves ($104.29 \pm 6.80 \mu\text{g/dl}$). This observation supports the reports of Mahanta and Roy Choudhury (1978); Chaudhuri *et al.* (1988) and Waghmare *et al.* (1993) who reported similar changes in caprine haemonchosis and fascioliasis and GI helminthiasis in buffalo calves. The mean serum value ($108.92 \pm 3.03 \text{ mmol/l}$) in calves with bottle jaw syndrome increased significantly ($p < 0.01$) in comparison to the normal healthy calves ($103.51 \pm 0.91 \text{ mmol/l}$). The finding of the serum chloride in calves with bottle jaw syndrome remained uncomparated due to lack of similar reports in the available literature.

The serum albumin in calves with bottle jaw syndrome ($2.35 \pm 0.28 \text{ g/dl}$) decreased significantly ($p < 0.01$) in comparison to the serum albumin value of normal healthy control calves ($3.84 \pm 0.39 \text{ g/dl}$). It indicates that there may be decrease synthesis of serum albumin due to damage of liver cell by bottle jaw causing parasites. The result supports the reports of Ross *et al.* (1966); Holmes *et al.* (1968); Viana and Campos (1973); Haroun and Hussein (1976); Waghmare *et al.* (1993) and Bandyopadhyay and Dasgupta (2000) who reported similar changes in bovine fascioliasis and gastro-intestinal helminthiasis

The mean value of total serum protein (TSP) concentration in calves with bottle jaw syndrome were $5.24 \pm 0.46 \text{ (g/dl)}$, which decreased significantly ($p < 0.01$) in comparison to the normal healthy control calves ($6.86 \pm 0.35 \text{ g/dl}$). Edema or bottle jaw invariably occurs when the total plasma protein falls near the critical level (5 g/dl). In most of the animals studied the serum protein level had fallen near the critical level causing bottle jaw syndrome. The decrease in serum protein may be the result of malfunctioning of liver and digestive organs and hence to malnutrition. This result supports the results of Viana and Campos (1973); Smith and Gibbs (1981); Kumar *et al.* (1982); Chaudhuri *et al.* (1988); Waghmare *et al.* (1993) and Bandyopadhyay and Dasgupta (2000), who reported similar changes in bovine fascioliasis and gastrointestinal helminthiasis.

The serum glucose level in calves with bottle jaw syndrome ($61.53 \pm 11.73 \text{ mg/dl}$) decreased significantly ($p < 0.01$) in comparison to the blood glucose level of normal healthy control calves ($86.58 \pm 6.88 \text{ mg/dl}$). The serum glucose level in calves with bottle jaw syndrome is comparable with the result reported by Waghmare *et al.* (1993) and Bandyopadhyay and Dasgupta (2000) in calves with gastro-intestinal nematodiasis.

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