Full Length Research Paper

Haemato-biochemical parameters as prognostic indicators in elephant colic

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Haemato-biochemical parameters were found to be useful prognostic indicators in assessing the severity of colic. Significant increase in packed cell volume (PCV), leucocytosis, neutrophilia and lymphocytosis was observed in case of severe colicky elephants. Significant increase in the blood urea nitrogen (BUN) and creatinine levels was observed in moderate and severe colic cases. In severely colicky elephants, the elevation of glucose was found to be double than that of mild and moderate colicky elephants. Hypoproteinemia and hypoalbuminemia was observed in all the three groups of colicky elephants. Lactate dehydrogenase (LDH) was found to be significantly elevated in elephants with moderate and severe colic cases.

Key words: Elephant colic, haematology-Hb, packed cell volume (PCV), total erythrocyte count (TEC), white blood cell (WBC) and DC-biochemistry-blood urea nitrogen (BUN), creatinine, glucose, total protein and albumin.

INTRODUCTION

Colic is considered as the most frequent emergency encountered in elephant practices worldwide. Although a correct clinical diagnosis and localization of the site and type of the intestinal lesion is often difficult, it is necessary for diagnosis and prognosis (Blikslager and Roberts, 1995). The prognosis in these cases therefore remains the deciding factor for whether to treat or not and the type of treatment. The prognostication for elephant colic is basically categorized into prognosis for life, prognosis for future use and prognosis for a future free of colic. In recent times, studies were performed to identify clinical and laboratory variables that could be used to predict survival chances of the affected elephants (Moore,

2006). In this backdrop, the present study is planned to evaluate the usefulness of commonly assessed clinical and laboratory parameters for prognostication in elephants with colic (Turner et al., 1984). Currently, no major studies in this regard are available in this part of the country. The objective of the present study was to evaluate the haemato-biochemical parameters as prognostic indicators in elephant colic.

MATERIALS AND METHODS

Thirty clinical cases of colic in India involving elephants, aged between 2 and 60 years old in the various elephant camps in Tamil

Nadu, Karnataka and elephants in the annual rejuvenation camp were used for the clinical study. Ten apparently healthy elephants were used as healthy control. The study composed of four groups as follows: Group I healthy elephants (n=10), Group II mild colic (n=13), Group III moderate colic (n=9) and Group IV severe colic (n=8).

Blood samples were collected from each animal from auricular vein as per standard protocols of Youssef et al. (2009). A total of 5 ml of blood was collected from auricular vein; 2 ml of blood was transferred into a vaccutainer containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant for the hematological studies and 3 ml of blood was transferred into a vaccutainer without anti-coagulant for serum collection.

Hematological analysis was done using an automated hematology analyzer (MINDARY-BC-2800 VET) and hematological parameters such as hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), differential leukocyte count (DLC), and platelet count were assessed as per standard protocols of Piccione et al. (2005). Serum samples were subjected for estimation of blood urea nitrogen (BUN), creatinine, total serum protein, glucose, albumin, globulin and lactate dehydrogenase using automated biochemical analyzer (A – 15 BIO SYSTEM). Statistical analysis was carried out using statistical software package SPSS – 12.0. The results were presented in figures, tables and discussed critically.

RESULTS

The mean ± standard error (SE) values for hemogram (Hb, PCV, TEC, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) of control and different groups of colic cases in elephants are shown in Table 1.

No significant differences were observed in the mean of hemoglobin, TEC and MCH among different groups. The PCV and MCV values in severe colic cases showed a significant increase as compared to the control, mild and moderate colic cases. No significant difference was observed in PCV and MCV values between mild and moderate type of colic cases. There was no significant difference of MCHC value within the colic groups, whereas significant difference was observed in these three groups when compared with control group elephants.

The mean ± SE values of total and differential leukocyte count are shown in Table 2. The total and differential leukocyte count was highly significant in severe colic cases when compared with the control, mild and moderate group elephants. The absolute neutrophil count was highly significant in severe colic, when compared with control, mild and moderate group of elephants. There was no significant difference in absolute lymphocyte count between mild and moderate colic cases, whereas significant increase was observed when compared with control group in severe colic cases compared with mild and moderate colic cases.

The mean ± SE values of BUN, creatinine, blood glucose, total protein, albumin and lactate dehydrogenase (LDH) of control, mild, moderate and severe colic groups are shown in Table 3. No significant differences in the mean value of blood urea nitrogen and creatinine were observed among control and mild colic cases. There was highly significant increase in the BUN level in moderate and severe colic when compared with control and mild type of colic, and being higher in Group IV than in Group III. Significant increase in the creatinine level in moderate and severe colic cases was noticed as compared to the control group and mild colic group elephants.

In the present study, there was a highly significant increase in glucose level in severe colic cases as compared to the control, mild and moderate groups. The increase in glucose levels may be due to stress or activation of catecholamines leading to glucogenolysis. No significant difference was observed in glucose level between control, mild and moderate colic cases. There was a significant decrease in total protein and serum albumin in different colicky elephants when compared with the control group, with greater difference in the most severe colics.

In the present study, there was a highly significant increase of LDH value in different colic groups. A significant difference in LDH value was noticed between moderate and severe colic cases and these two groups in relation to Groups I and II. There was no significant difference in LDH value between control and mild colic cases. Significantly increased value of LDH was observed in severe colic elephants as compared to the control, mild and moderate groups.

DISCUSSION

In the present study, 80% of the severe colicky elephants had died and their hematocrit was found to be the highest (59.35 ± 0.73) among all the groups. This proved that PCV is one of the best prognostic parameter in colicky elephants. These findings were in accordance with Parry et al. (1983), who reported that PCV values of 30, 45, 60 and 65% were associated with probable survival rates of 93, 64, 20 and 10%, respectively.

In the present study, significant leucocytosis, neutrophilia and lymphocytosis was observed in the case of severe colicky elephants. Thus, white blood cell (WBC) count and differential count also proved to be an important prognostic variable in assessing the severity of colic. The findings observed in this study were in accordance with Sabev and Kannakov (2008) who reported that there was marked leukocytosis (left shift) with neutrophilia in colic cases.

In the present study, in severe colicky elephants, azotemia was almost double that of mild and moderate colicky elephants which emphasized the utility of BUN and creatinine as important biochemical parameters for prognostication (White, 1990). These findings were agreement with Southwood (2006) who reported that it

Table 1. Mean ± SE value of erythrogram for control and different groups of colicky elephants.

Parameter	Group I (Control) n=10	Group II (Mild) n=13 Survival 100%	Group III (Moderate) n=9 survival 100%	Group IV (Severe) n=8 non survival 20%	F value
Hemoglobin (g/dl)	17.38 ± 0.58^a	17.06 ± 0.62^a	16.95 ± 0.39^a	17.86 ± 0.43^a	0.634^{NS}
PCV (%)	45.48 ± 1.33^a	51.02 ± 0.28^b	53.15 ± 1.02^b	59.35 ± 0.73^c	35.665^{**}
TEC ($\times10^6$/μl)	8.44 ± 0.11^a	8.54 ± 0.14^a	8.67 ± 0.15^a	8.67 ± 0.14^a	0.683^{NS}
MCV (fl)	53.92 ± 1.55^a	59.88 ± 1.02^b	61.54 ± 1.91^b	68.62 ± 1.40^c	16.195^{**}
MCH (pg)	20.61 ± 0.70^a	19.97 ± 0.63^a	19.59 ± 0.50^a	20.69 ± 0.75^a	0.661^{NS}
MCHC (g/dl)	38.57 ± 1.83^a	33.41 ± 1.13^b	31.98 ± 0.89^b	30.14 ± 0.82^b	8.636^{**}

Same superscript in row do not differ significantly. NS: Not significant (P > 0.05); **Highly significant (P<0.01).

Table 2. Mean±SE value of Leukogram for control and different groups of colicky elephants.

Parameter	Group I (Control) n=10	Group II (Mild) [n=13, survival 100%]	Group III (Moderate) [n=9 survival 100%]	Group IV (Severe) [n=8 non survival 20%]	F value
WBC (μl^{-1})	7840 ± 210.39^a	9100 ± 147.57^b	9330 ± 152.78^b	15590 ± 303.11^c	267.067^{**}
Absolute neutrophils (μl^{-1})	5116 ± 133.39^a	5906.6 ± 108.23^b	6040.2 ± 149.84^b	11628.4 ± 283.63^c	271.57^{**}
Absolute lymphocytes (μl^{-1})	2724 ± 97.57^a	3123 ± 71.69^b	3196.9 ± 66.42^b	3835.2 ± 200.19^c	14.298^{**}

Same superscript in row do not differ significantly. NS: Not significant (P > 0.05); **Highly significant (P<0.01).

Table 3. Mean±SE value of serum biochemistry profile for control and different groups of colicky elephants.

Parameter	Group I (Control) n=10	Group II (Mild) [n=13 survival 100%]	Group III (Moderate) [n=9 survival 100%]	Group IV (Severe) [n=8 non survival 20%]	F value
BUN (mg/dl)	12.13 ± 0.28^a	14.04 ± 0.21^a	17.42 ± 0.53^b	35.86 ± 1.27^c	234.873^{**}
Creatinine (mg/dl)	0.75 ± 0.08^a	1.04 ± 0.09^a	1.52 ± 0.02^b	2.57 ± 0.22^c	40.669^{**}
Glucose (mg/dl)	75.70 ± 0.70^a	76.10 ± 0.82^a	86.40 ± 3.52^a	168.10 ± 10.88^b	60.478^{**}
Total protein (g/dl)	6.24 ± 0.08^a	5.91 ± 0.06^b	5.21 ± 0.03^c	4.63 ± 0.08^d	121.064^{**}
Albumin (g/dl)	2.92 ± 0.02^a	2.08 ± 0.13^b	1.75 ± 0.08^c	1.45 ± 0.07^d	32.479^{**}
LDH (U/L)	164.70 ± 2.26^a	175.00 ± 2.55^a	222.80 ± 4.56^b	482.20 ± 17.66^c	259.989^{**}

Same superscript in row do not differ significantly. NS: Not significant (P > 0.05); **Highly significant (P<0.01).

was attributed to decreased renal blood flow resulting from systemic hypotension.

In the present study, in severely colicky elephants, the elevation of glucose was found to be double than that of mild and moderate colicky elephants. In severe colicky elephants 80% of them died and this proved that glucose is also an important parameter in prognosticating the elephant colic. The changes in glucose level and survival observed in the study were in accordance with the previous reports of Parry et al. (1983) who reported that blood glucose values of 90, 200 and 235 mg/dl corresponded to survival probabilities of 65, 46 and 45%, respectively.

In the present study, both total protein and albumin were significantly reduced in all the three groups of colicky elephants. These findings were in accordance with Southwood (2006) who reported that high haematocrit and low protein was found to be associated with less favorable prognosis for elephants with colic. Hypoproteinemia and hypoalbuminemia was also documented in an elephant with severe colic due to dorsal colitis (Galvin et al., 2004).

In this study, the LDH was found to be significantly elevated in elephants with moderate colic (222.80 ± 4.56) and severe colic (482.20 ± 17.66). This underscored the utility of LDH as a prognostic variable in elephants with colic. The findings of LDH elevation in this study was in accordance with the report of Sabev and Kanakev (2008)

who reported extremely elevated LDH activity in elephants with caecal impaction. Haemato biochemical parameters were considered to be very useful for prognostication of elephant colic.

Conflict of interest

Authors have none to declare.

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