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Manu Jaiswal

Assistant Professor, Faculty of Veterinary and Animal Science, Institute of Agricultural Sciences, Rajiv Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur, Uttar Pradesh, India

PC Shukla

Professor and Head Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur

Alok Mishra

Assistant Professor, Faculty of Veterinary and Animal Science, Institute of Agricultural Sciences, Rajiv Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur, Uttar Pradesh, India

Preeti Bisht

Veterinary officer, Uttarakhand Government, Uttarakhand, India

Correspondence

Manu Jaiswal

Assistant Professor, Faculty of Veterinary and Animal Science, Institute of Agricultural Sciences, Rajiv Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur, Uttar Pradesh, India

Clinical score and haemato-biochemical alterations in acute diarrhoea in calves

Manu Jaiswal, PC Shukla, Alok Mishra and Preeti Bisht

Abstract

The objective of the present work was to investigate the clinical, haematological and biochemical changes associated with acute diarrhoea in calves in and around Jabalpur, M.P. Blood and serum sample were collected from 40 diarrhoeic cattle calves (0-3 month old) and 08 apparently healthy cattle calves (0-3 months old). The diarrhoeic calves appeared dull, depressed, rough hair coat, weak and lethargic with reduced appetite. In clinical score-faecal consistency was pasty, semi liquid and watery, dehydration score was mild, moderate and severe, suckling reflex score was mild, moderate and severe. Significant increase ($p < 0.05$) has been detected in respiration and pulse rate whereas, rectal temperature differ non-significantly compare to healthy group. Analysis of blood and serum sample of acute diarrhoeic calves revealed significant increase in, packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), total protein (TP), Potassium (K) while significant decrease in serum sodium (Na) and chloride (Cl) value were recorded. However, no significant changes were observed in Hb values.

Keywords: clinical score, haematological and biochemical, acute diarrhoea, calves

Introduction

Calf rearing is the key for a profitable dairy farm livestock industry, which is an important component of dairy farm to sustain the production. The calf rearing is the key management objective to ensure their survivability and health Guzelbektes *et al.* (2007) [12]. Calf diarrhoea is one of the most devastating diseases of the dairy industry worldwide Elhassan *et al.* (2011) [6] Pourjafar *et al.* (2011) [18]. Diarrhoea is defined as an increased frequency, fluidity or volume of faecal excretion. In diarrhoea, the clinico-biochemical alterations are complex in nature characterized by imbalance of fluid, electrolyte and acid base status Radostits *et al.* (2010) [20]. Clinical symptoms observed in calves with diarrhoea are manifested by lack of appetite, loose stools and abdominal pain. Longer diarrhoea results in dehydration, weakness and loss of suckling reflex. Loss of fluid leads to hypovolemia and circulation disorder, whereas disturbances in the acid-base and electrolyte imbalances are likely to induce neural symptoms with convulsion leading to death Gupta (2016) [11].

Diarrhoea causes increase cost of treatment, weight loss, retarded growth or even significant mortalities of young. Etiology of diarrhoea is multiple, including infectious agents, poor management, reproductive factors, nutritional factors and immune status. In diarrhoeic animal's loose fluid, rapid dehydration, electrolyte loss and acidosis were seen. Though infectious agents may only cause initial damage to the intestine whereas death is usually results from dehydration, acidosis and loss of electrolytes.

Material and Methods

A total of 40 calves having acute diarrhoea aged within 0-3 months were taken under present study from various Private Dairy Farms/Goshala in and around, Jabalpur. Additionally 08 healthy calves were selected from ILFC Adhartal, Jabalpur as healthy control group.

Clinical examination

All affected calves were clinically examined for body temperature ($^{\circ}$ F), pulse rate (beats/min.), respiration (breaths/min.) dehydration score and skin fold test Radostits *et al.* (2010) [20]. Faecal consistency (normal, pasty, semi-liquid, watery) and suckling reflex in respect of each calf were recorded and scoring has been done as per Mir (2009) [17] with slight modification (Table 01).

Table 1: Clinical scores recorded in calves under study

Score	Faecal consistency	Dehydration score	Suckling reflex score
0	Normal	Normal bright eyes, pliable skin	Normal vigorous suckles
1	Pasty faeces	Mild dehydration, skin tent<3 sec.	Mild depression, calf suckles but not vigorously
2	Semi liquid faeces	Moderate dehydration, skin tent >3 sec.	Moderate depression, calf unable to stand, suckling is weak or disorganized
3	Watery Faeces	Severe dehydration, skin tent>8 sec.	Severe depression, unable to stand and suckle

Collection of sample for Haemato-biochemical Studies

Seven ml blood was collected aseptically from jugular vein of each calf with the help of 18 Gauge needle and stored in clean, dry, sterilized labelled glass vials containing EDTA @ 1 mg/ml of blood. The haematological attributes included total erythrocyte count (TEC), haemoglobin (Hb) concentration, packed cell volume (PCV), and total leukocyte count (TLC). The haematological investigations were carried out by Auto cell analyzer (model Abacus). Serum was separated and preserved at 4°C in refrigerator and analyzed for biochemical investigations.

Biochemical analysis

A total of 7 ml blood was collected from each animal in a sterilized glass at each of the specified intervals for estimating Serum total protein (g/dl), albumin (g/dl), chloride, sodium and potassium (mEq/L). Blood was allowed to coagulate by keeping the tubes in slants and serum was separated by spinning at 3000 rpm for 10 minutes.

Sodium, Potassium and Chloride estimations were estimated using automatic electrolyte analyzer (Cornley Acculyte-3P Electrolyte Analyzer) and the values were expressed in mEq/L.

Total protein estimation was done using diagnostic reagent kits on blood chemistry Auto Analyser (model Erba Mannheim CHEM-5 plus v2). Ten µl of serum was taken in eppendorf tube and admixed with 500 µl total protein reagent for total protein estimation. For present study, a total of 40 acute diarrhoeic calves were randomly divided in to five groups (T₁, T₂, T₃, T₄ and T₅) whereas, in T_c, eight normal healthy calves have served as the control group

Statistical analysis

The recorded data were analyzed as per the standard procedures outlined by Snedecor and Cochran (1994) [23].

Result and Discussion

Under the present study the diarrhoeic calves were appeared to be dull, depressed, lethargic, sunken eyes with reduced appetite. The faeces was semi solid to watery with offensive odour with mild to moderate dehydration and sub-normal body temperature. These findings were similar to the findings of (Cho and Yoon, 2014) [4], who have reported the cold clammy skin, pale mucosa, collapse of superficial vein and periodic apnoea. These findings are in agreement with earlier reports of Verma *et al.* (1995) [26] and Guzelbektes *et al.* (2007) [12].

During the present investigation the calf with acute diarrhoea showed faecal score ranging from 1 (pasty faeces) to 3 (watery faeces) with offensive odour and variable colouration. Further, the degree of dehydration reported in terms of dehydration score as 1 (Mild dehydration, skin tent <3 sec) to 3 (Severe dehydration, skin tent >8 sec.). As regards the suckling reflex score observed in the calves under study were evident by variable suckling reflex scores viz. ranging between 1 (Mild depression and the calf suckled but not vigorously) to 3 (Severe depression, calf is unable to stand and suckle).

In the present study, the rectal temperature (°F) reported was 101.68±0.15 in diarrhoeic calves. In contrast, the subnormal temperature was reported by Shaheen *et al.* (2002) [22] and Fernandes (2006) [13], whereas, the rise of body temperature during the phase of diarrhoea was recorded by Gupta and Chawla (1978) [10]. Increased in the pulse and respiratory rate were reported in the present study. The increased value of pulse rate (beat /min.) were also obtained by (Bhalerao *et al.*, 2000) [2] and (Shaheen *et al.*, 2002) [22] possibly as a result of tachycardia Radostits *et al.* (2010) [20]. Increase in respiration rate was probably due to metabolic upsets as reported by White (1993) [28] and Groove-White and White (2004) [9].

Table 2: shows alteration in temperature, pulse and respiration rate in acute diarrhoeic calves compared to healthy one (T_c)

P	T _c	T ₁	T ₂	T ₃	T ₄	T ₅
T	101.69±0.16	101.10±0.54	101.12±0.33	101.01±0.36	100.82±0.41	100.82±0.45
P	101.88 ^a ±1.42	96.50 ^{Aab} ±1.62	92.50 ^b ±1.32	94.37 ^b ±2.70	96.25 ^{ab} ±2.78	98.50 ^{Aab} ±1.32
R	24.62 ^c ±0.56	26.87 ^{bc} ±1.65	31.50 ^a ±1.67	32.12 ^{Aa} ±1.39	31.75 ^{Aa} ±1.44	29.75 ^{Aab} ±1.70

* P- Parameter, T- temperature, R- Respiration Rate

In haematological picture the mean value of packed cell volume (PCV), total leukocyte count (TLC) shows significant increase in acute diarrhoeic calves compared with corresponding values in healthy (control, T_c) one, while mean value of haemoglobin (Hb) and total erythrocyte count (TEC) increase but not significantly in acute diarrhoeic calves.

The increase mean value of haemoglobin (Hb) in acute diarrhoeic calves was also reported by (Gupta, 2016) [11], advocating the reason as the haemo-concentration associated with the loss of large quantum of body fluid from the body, which was collaborated by Santos *et al.* (2002) [21] and Ghanem *et al.* (2010) [8]. However, (Radostits *et al.*, 2007) [19] have explained the reason of increased mean value of Hb as dehydration which leads to decreased plasma volume.

The increased mean PCV value found under the study during the phase of diarrhoea were in agreement with the findings of Bijwal and Mishra (1987) [3]; Aly *et al.* (1996) [1]; Kaur *et al.* (2006) [14]; Khan and Zaman *et al.* (2007) [16]. The increased PCV values in diarrhoeic calves were indicative of fluid loss from vascular compartment that can be corrected by overall rehydration solution therapy Dhaliwal *et al.* (1993) [5]. However, (Sridhar *et al.*, 1988) [24] and (Mir, 2009) [17] have reported significant elevation of TEC values in all the scored calves as probably due to haemo-concentration as a result of diarrhoea. Similar results have been obtained by Mir (2009) [17] and Tikko *et al.* (2017) [25]. The possible reason for leukocytosis might have occur due to normal reaction of body defence mechanism against infection.

Table 3: shows alteration in Hb, PCV, TEC and TLC in acute diarrhoeic calves compared to healthy one (Tc)

P*	Tc	T1	T2	T3	T4	T5
HHb	9.50 ±0.36	10.67±0.50	11.39±0.66	9.86 ±0.63	9.23±0.53	10.76 ±0.49
PCV	30.10 ±1.15	34.99 ^A ±1.69	35.56 ±2.25	31.46 ±1.80	30.04 ±1.55	35.35 ±1.82
TEC	8.02 ^b ±0.23	8.43 ^{ab} ±0.32	11.56 ^a ±2.59	7.90 ^b ±0.24	7.77 ^b ±0.24	8.35 ^{ab} ±0.30
TLC	9.89 ^a ±0.97	11.56 ^{bc} ±0.67	15.22 ^{Aa} ±0.61	14.25 ^{Aa} ±0.85	13.37 ^{ab} ±0.60	13.62 ^{Aab} ±0.62

*Parameter

In the present study significant fall in the level of serum sodium (hyponatremia) and chloride (hypochloremia) concentration in acute diarrhoeic calves was recorded against the normal healthy calves while the mean value of serum potassium (hyperkalemia) was increased in the diarrhoeic calves but not significantly compared to healthy one. The significantly ($p < 0.05$) lower circulatory sodium titre signifying hyponatremia in the diarrhoeic buffalo calves in all treatment groups consistent with the earlier reports of (Ghanem *et al.*, 2010) [8] appeared to be the result from accelerated loss of the electrolytes in watery purgation. However (Radostits *et al.*, 2007) [19] emphasized that hyponatremia occurs due to excessive secretion of the sodium ions by intestinal villus which is lost through the intestinal tract. During the diarrhoea the loss of chloride ions in the secretion of the intestinal fluids leads to hypochloremia in diarrhoeic calves Radostits *et al.* (2010) [20]. The significant ($p < 0.05$) increase in plasma potassium concentration in neonatal diarrhoeic calves at pre-treatment

indicating hyperkalemia, that may be attributed to the metabolic acidosis which might have induced the translocation of K^+ from the intracellular to extracellular compartment, thus raising the plasma K^+ concentration whereas (Kerr, 1989) [15] have indicated that in severely dehydrated diarrhoeic calves hyperkalemia resulted due to serious decrease in renal perfusion leading to failure of K^+ excretion. Hyperkalemia in diarrhoeic calves could be attributed to increased renal tubular reabsorption of potassium in response to acidosis and also oligouria or anuria in which kidney failed to eliminate excess potassium Wakwe and Okon (1995) [27]. The mean value of serum total protein shows significant increase in acute diarrhoeic calves as compared to the healthy one. The higher mean values of total serum protein, compared to the healthy control group also reported by Gupta (2016) [11]. This might have highlighted the potentially hazardous clinical status of acute tissue dehydration.

Table 4: shows alteration in Na, K, Cl and TP in acute diarrhoeic calves compared to healthy one (Tc)

P*	Tc	T1	T2	T3	T4	T5
Na	145.03 ^a ±1.73	131.38 ^{Bb} ±0.77	131.64 ^b ±0.55	131.09 ^b ±0.35	130.76 ^b ±0.37	129.46 ^{Bb} ±1.20
Cl	98.57 ^a ±1.55	92.88 ^{Bb} ±0.60	93.26 ^b ±0.70	93.13 ^b ±0.75	93.29 ^b ±0.69	91.93 ^{Cb} ±0.44
K	4.27 ^b ±0.24	5.65 ^{Ab} ±0.17	5.19 ±0.26	5.58 ^b ±0.11	5.57 ^{Ab} ±0.09	5.62 ^A ±0.08
TP	6.45 ^b ±0.60	7.38 ^a ±0.10	7.66 ^a ±0.13	7.64 ^a ±0.07	7.56 ^a ±0.11	7.61 ^{Aa} ±0.11

*Parameter

Conclusion

In acute calf diarrhoea there are imbalances in the electrolyte, so the most important factor that decrease the mortality associated with diarrhoea in calves is parenteral and oral administration of appropriately formulated electrolyte solutions, which correct the dehydration and electrolyte imbalances particularly hyperkalemia and hyponatremia.

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