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IMPACT OF VARIOUS DIAGNOSTIC APPROACHES ON THE MANAGEMENT OF PRIMARY KETOSIS IN A MURRAH BUFFALO

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ABSTRACT

Five-year-old female Murrah buffalo was presented to the Madras Veterinary College Teaching Hospital with the history of anorexia for past four days, reduced milk production and animal calved fifteen days back. The physical examination revealed emaciation, tucked up udder and congested mucous membrane. Haemato-biochemical analysis revealed reduced blood glucose level (26 mg/dl), increased β-hydroxybutyrate (BHB) value (2.1 mmol/L) and triglycerides level (78.5 mg/dl). Venous blood gas (VBG) analysis showed increased pH, low potassium and chloride levels. Urinalysis (Keto-Diastix strip test) revealed ketone bodies (+++) in the urine. Ultrasound examination showed hyperechoic pattern of periportal regions in the liver. Based on biochemical, urinalysis, ultrasonography and VBG the case was diagnosed as primary ketosis. The animal was initially treated with intravenous infusion of 20% Dextrose with multiple electrolytes, oral propylene glycol and other supplements. Gradual clinical recovery was noticed after one week.

Keywords: *Bubalus bubalis*, buffaloes, hypoglycaemia, β-hydroxybutyrate, venous blood gas, ketosis

INTRODUCTION

Ketosis is one of the frequently reported production disorders caused by negative energy balance leading to impaired carbohydrate metabolism which results the excessive production of ketone bodies. It is a common metabolic disorder frequently reported during winter and spring seasons. Commonly appeared as a primary ketosis or in association with other pathological conditions called secondary ketosis in dairy cows during the first lactation period (Zhang *et al*., 2012). In buffalo, ketosis remains one of the most important diseases that decrease the productivity (Ghanem and Eldeeb, 2010). Major economic losses are mainly due to reduced milk yield, failure of the animals to return to the normal potential even after complete recovery (Lean *et al*., 1994). In India, ketosis commonly occurs in secondary form due to unhygienic farm conditions, as a result the case of primary ketosis mostly goes unidentified or not been diagnosed or differentiated properly (Patel and Patel, 2017). Hence the present case study provides detailed information about the various

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diagnostic aids for diagnosis of primary ketosis, and it is management in a female Murrah buffalo.

HISTORY AND CLINICAL EXAMINATION

Five-year-old Murrah buffalo was brought to the Large Animal Clinics of Madras Veterinary College Teaching Hospital with the history of calved fifteen days back, reduced appetite and milk production. Detailed clinical examination revealed rectal temperature is 101.4°F, emaciation (Figure 1) and mild congested conjunctival mucous membrane (Figure 2). The heart rate, lymph node and respiration rate were normal. The animal had tucked up udder (Figure 3). Rumen fluid was collected through rumen pump, and it showed reduced large size protozoa and protozoal motility (++). On rectal examination faeces was found to be scanty, mucous coated, and dry. The buffalo had sweetish ketotic odour in breath.

Diagnosis

First day the haemato-biochemical examination revealed negative for blood parasites and elevated liver enzyme, triglycerides and reduced potassium levels (Table 1). The blood glucose and β-hydroxybutyrate (BHB) was estimated by using glucometer and ketone meter, it showed the glucose level of 26 mg/dl (Figure 4) and β-hydroxybutyrate (BHB) level of 2.1 mmol/L (Figure 5) on first day of presentation.

Ultrasound examination of liver showed hyperechoic pattern of periportal regions. Kidney was isoechoic to liver parenchyma. Gall bladder was distended with heterogeneous echogenic content. Diameter of portal vessels was 2.9 cm. Urinalysis showed dark purple colour in Keto-Diastix strip test, indicatives the presence of ketone bodies in the urine (Figure 6). The strip test revealed acidic pH, Specific gravity 1.015, positive for ketone bodies (+++) and negative for bile salts and protein.

Venous blood gas (VBG) analysis was performed by using Epoc blood analysis (epoc reader) (Figure-7). The VBG showed decreased glucose 28 mg/dl, Lactate 0.89 mmol/l, creatinine 1.16 mg/dl, increased pH 7.457 (7.286 to 7.412) , low pCO2 30.8 mmHg (39.9 to 52.5), normal pO2 54.4 mmHg (47.6 to 62.3) and cHCO3 21.7 mmol/l (17.9 to 28.5), normal Na+ 123 mmol/l (123 to 145) , low K+ 1.7 mmol/l (4.71 to 5.72) and Cl- 84 mmol/l (93 to 115), low Ca++ 0.54 mmol/l, Hct 44%, cHgb 14.8 g/dl. Based on clinical examination, haemato-biochemical, Urinalysis, Venous Blood Gas analysis (VBG) and Ultrasound examination the case was diagnosed as primary ketosis.

TREATMENT AND DISCUSSION

On the day, the animal was treated with an infusion of 20% Dextrose total dose of 1000 ml iv, as immediate source of energy. Injection Multiple Electrolyte Solution (MES) 1000 ml iv, Vitamin B complex total dose of 20ml intramuscularly, Injection Isoflupredone acetate total dose of 20 mg intramuscularly was also administered. Dextrose was affected the NEFA (Non esterified fatty acids) release and hepatic ketogenesis within few hours of after administration (Savita *et al*., 2020). Hyperglycemia had occurred within 24 h after glucocorticoid administration and appeared to result from a repartitioning of glucose in the body rather than from gluconeogenesis (Constable*et al*., 2016). Corticosteroids had the ability to break down the protein in muscles for production of

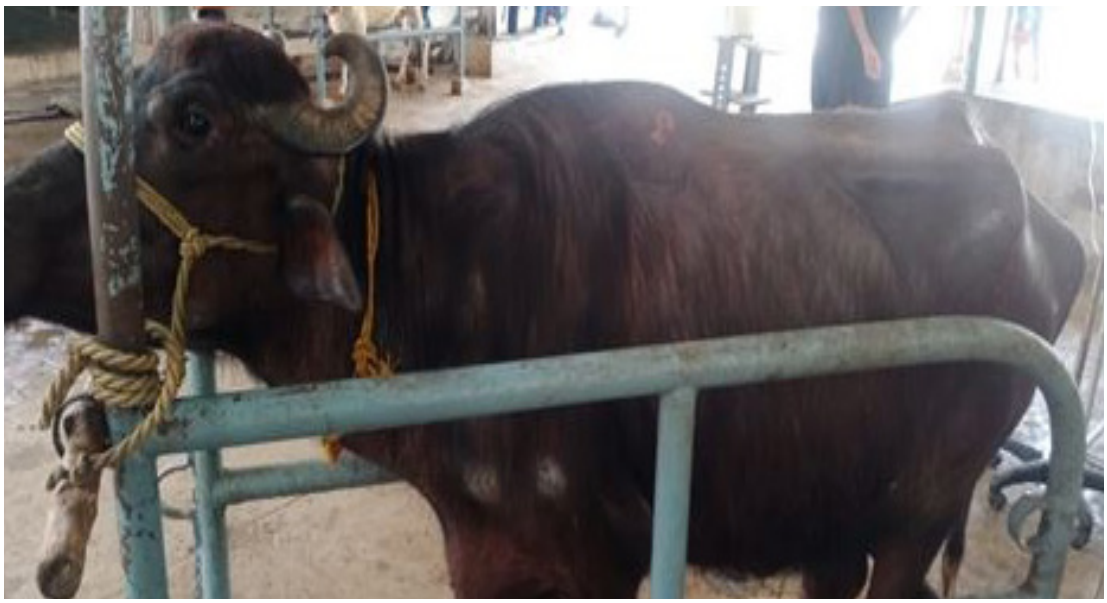


Figure 1. Emaciated Murrah buffalo.



Figure 2. Mild congested CMM.

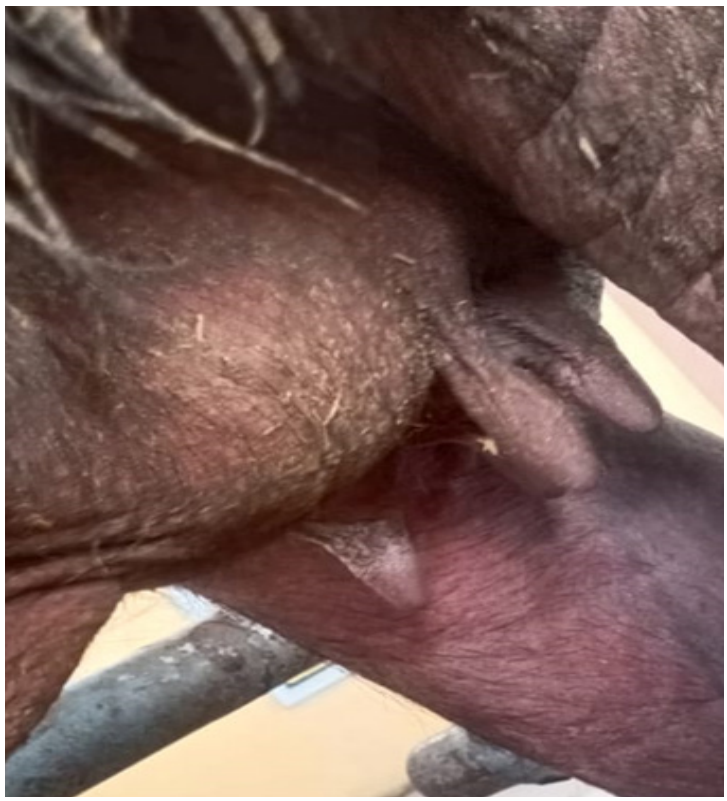


Figure 3. Tucked-up udder.



Figure 4. Blood glucose value.



Figure 5. BHB value.



Figure 6. Dark purple strip colour in Keto-Diastix strip.

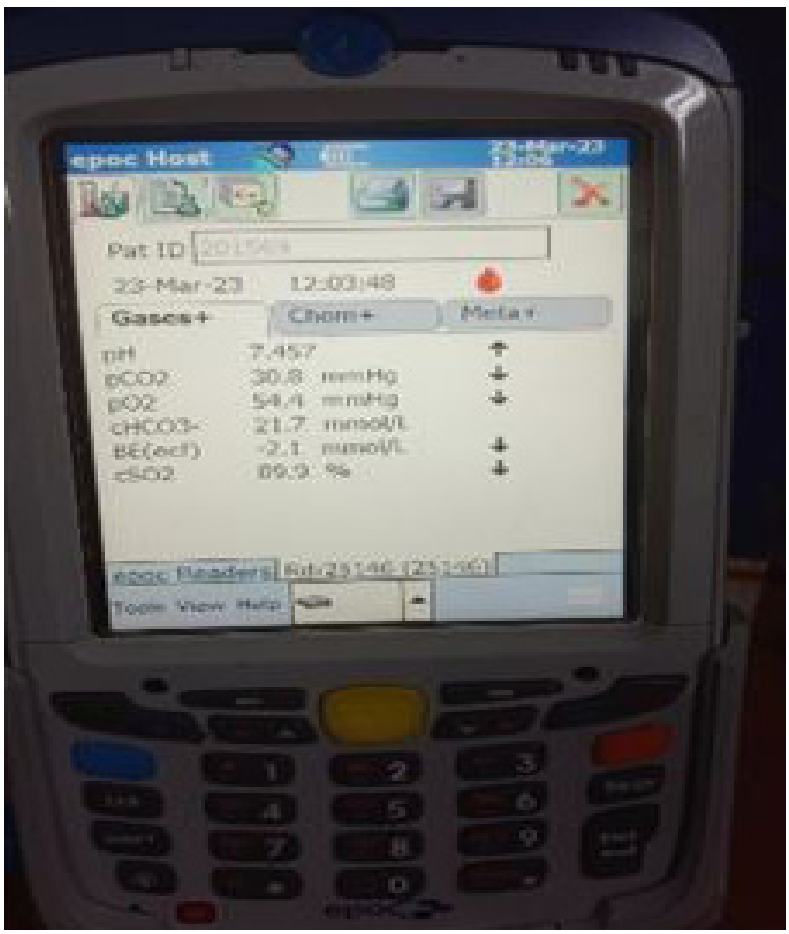


Figure 7. Epoc blood analysis (epoc reader).

Table 1. Haemato-biochemical values.

Parameters	Day 0	Day 3	Reference value
Haematology			
Hb (g/dl)	9.4	9.6	8.0-15.0
PCV (%)	26.4	28.1	24-46
RBC (m/cmm)	5.87	5.89	5.0-10.0
WBC (/cmm)	8,400	8800	4.0-12.0
Platelets (/cmm)	2,00,000	2,32,000	1.0-8.0
Neutrophils (%)	34	36	15-45
Lymphocytes (%)	60	60	28-75
Monocytes (%)	6	4	2-7
Serum biochemistry			
Glucose (mg/dl)	26	42	40-60
Cholesterol (mg/dl)	81	78	80-128
Total proteins (g/dl)	5.7	5.9	6.7-7.4
Albumin (mg/dl)	3.1	3.1	3-3.6
BUN (mg/dl)	12.96	14.6	20-30
Creatinine (mg/dl)	1.39	1.42	1-2
ALP (U/L)	423	416	0-488
GGT (U/L)	24	18	6.1-17.4
Triglycerides (mg/dl)	78.5	62.3	30.33- 39.99
BHB (mmol/L)	2.1	1.4	< 1.0
Calcium (mg/dl)	10.4	10.8	9.7-12.4
Phosphorus (mg/dl)	5.9	6.1	5.6-6.5
Sodium (mmol/L)	127	122	132-152
Potassium (mmol/L)	2.99	3.1	3.9-5.8
Chloride (mmol/L)	81.8	79.4	97-111

glucose, which replenishes the depressed blood glucose levels immediately. It is important to provide an excessive amount of glucose to prevent excessive breakdown of muscle protein (Savita *et al*., 2020). The reduction of triglycerides level in ketosis buffaloes mainly due to increase in hepatic cell lipid uptake. Further it leads to development of hepatic lipidosis and a concurrent reduction in hepatic triglyceride output, which decrease the level of circulating triglycerides (Vermunt, 2003). Cyanocobalaminis essential for gluconeogenesis from propionate.

Oral supplementation of Propylene glycol total dose of 250 ml single dose for 2 days, followed by 125 ml for the next 2 days, Bolus. Ecotas (probiotic enriched with prebiotic and growth stimulants) 2 bol BID, powder Rumen-FS (vitamins, minerals, yeast, probiotic and Rumen stable multienzymes supplement) 25 gm BID and liver supplements 100 ml/day orally. The given propylene glycol was metabolized to propionate in the rumen and absorbed, whereas some of the propylene glycol was absorbed directly across ruminal epithelium and acts to reduce ketogenesis by increasing mitochondrial citrate concentrations then metabolized by liver (Constable *et al*., 2016). Rumen-FS powder normally act as rumen buffer is combination of live yeast culture (*Saccharomyces cerevisiae*) and probiotics. Stanislaw and Przemyslaw (2009) reported that supplementation of *Saccharomyces cerevisiae* increased serum glucose concentration level and effective in therapeutic management of ketosis in dairy animals.

CONCLUSION

The primary ketosis can be diagnosed by Keto-Diastix strip test and BHB strip test even at field level. Further confirmation of primary ketosis can be diagnosed by using other special diagnostic procedure. Early detection was helpful in prevent the heavy economic losses to farmer due to ketosis and quick recovery of the animal.

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