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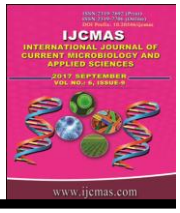

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Prevalence, Clinicohaemato-Biochemical Alterations in Colibacillosis in Neonatal Calves

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A B S T R A C T

Diarrhoea is one of the most important problems of neonatal calves causing huge economic loss to dairy industry. 250 faecal samples were collected from diarrhoeic calves up to 1 months of age from different unorganized dairy farms located in Koderma district of Jharkhand. 104 faecal samples were found positive for *E. coli* with a prevalence of 41.6 %. The prevalence was higher in male calves of below 3 days of age. Incidence of diarrhoea in calves was more after onset of rains and continued till the end of winter and autumn. 30 *E. coli* affected diarrhoeic calves and 6 clinically normal healthy calves were taken to investigate the hemato-biochemical profiles. Analysis of blood and serum samples of the diarrhoeic calves revealed significant increase in Hb, PCV, TEC, TLC, TP, K, and chloride while significant decrease in serum Na and glucose level were recorded. However, no significant changes were observed in ALT and AST.

Introduction

Diarrhoea in farm animals, especially in neonatal calves is one of the most challenging clinical syndromes encountered by veterinary practitioners. Diarrhoea is a leading cause of economic losses to the cattle industry and major cause of calf mortality and morbidity during first few weeks of life (Radostits *et al.*, 2000). The economic losses occur not only from mortality but also from other costs including treatment, diagnostics, labour, veterinary intervention and decreased number of herd replacements as well as subsequent chronic ill thrift and impaired growth performance (Bazeley, 2003).

Calf diarrhea is a multifactorial syndrome includes infective agents, non-infective and the environment or the management factors (Izzo *et al.*, 2011). Infectious diarrhoea in calves is mainly associated with enterotoxigenic *Escherichia coli*, *Cryptosporidium parvum*, rotavirus, corona virus, or some combination of these pathogens (Foster *et al.*, 2009). Among these pathogens, *E. coli* is the important cause of diarrhoea in neonate. The risk of development of infectious disease is greater in calves in which there has been failure of passive transfer of maternal immunoglobulins. The

diarrhoeic calves appeared dull, depressed and lethargic with reduced appetite. The faeces were semisolid to watery with offensive odour, greenish to yellowish white in colour and sometimes even blood stained. Mild to moderate dehydration was found to be a constant feature in diarrhoeic calves. The clinical signs include subnormal body temperature, cold clammy skin, pale mucosae, collapse of superficial veins and periodic apnoea. Because of the multifactorial nature of calf diarrhoea, it is difficult to be controlled effectively (Cho and Yoon, 2014). Identification of the possible causative agent in outbreaks of diarrhoea is important to allow targeted preventative measures, such as vaccination, and identification of possible risk factors or sources of infection (Izzo *et al.*, 2011). The clinicohaemato-biochemical alterations in diarrhoea are complex in nature comprising of serious imbalances of fluid, electrolyte and acid base status threatening the life of the patient.

Materials and Methods

The present study was undertaken at different unorganized private dairy farms located peri-urban region of Koderma, district of Jharkhand in the time period from August 2016 to July 2017. A total number of 250 calves up to one months of age, suffering from diarrhoea were studied.

Collection of samples

A faecal sample was collected directly from the rectum of each of the calves. Then the faecal material was shifted to sterilized plastic containers. Faecal material was kept in contact with ice to avoid further changes in faecal material**.**

Bacteriological examination

One gram of each faecal material was diluted in 3 ml of sterile saline. Samples were cultured and identified according to Quinn *et al.,* (2002). For isolation of *E. coli* strains, a loopful from the diluted specimens was inoculated into Mac Conkey's agar and incubated at 37°C for 18 to24 hours. Lactose fermenter (pink) colonies were streaked onto and eosin methylene blue agar and confirmed as *E. coli* using the standard biochemical tests according to Collee *et al.,* (1996).

Clinical observations

General appearance, temperature, pulse and respiration rates were recorded as per method described by Rosenberger *et al.,* (1979). Those calves positive for *E. coli* were further study for the study of haemato-biochemical profile. The haematological estimation such as Hb, PCV, TLC and DLC were done as per the procedure Schalm *et al.,* (1967). Biochemical estimation viz. serum total protein, serum sodium, serum potassium, serum chloride and serum glucose, ALT and AST were done as per methods of Oser, (1979).

Statistical analysis

All the observations recorded in this study were subjected to statistical analysis by Snedecor and Cochran (1994).

Results and Discussion

A total of 250 faecal samples collected from diarrhoeic calves were screened. Among that 104 faecal samples were found positive for *E. coli* with a prevalence of 41.6 %. This finding was in accordance with Roy *et al.,* 2009 and Malik *et al.,* 2011. The prevalence of colibacillosis varied widely between geographic locations, herds and different age groups in calves (Sherwood *et al.,* 1983). The higher incidence in unorganized dairy farming might be due to poorly constructed calf sheds as uneven and damp floors support and shelter infectious agents; unhygienic living

conditions and physical and nutritional stresses with inadequate colostrum feeding (Dubey and Rao, 1997 and Tikoo *et al.,* 2009). The age wise prevalence of colibacillosis in calves was 57.73, 41.33, 23.40 and 19.35 in age groups of, < 3 days; 4-7 days; 8-14 days and 15-30 days respectively (Table 1). Majority of the affected calves that were found positive for *E. coli* were in the age group of < 3 days, indicating that the prevalence decreased with advancement of age, which was in agreement with the findings of Tikoo *et al.,* (2009) and Roy *et al.,* (2009). Higher incidence during first 3 days of age was attributed to the absence of humoral immunity and depressed response to cell mediated immunity in these calves (Mohan *et al.,* 1990). Male calves were more susceptible to colibacillosis than female calves; the incidence was 62 and 38 % respectively.

Higher incidence in male calves was also reported by Panchsara *et al.,* 2009. The prevalence was higher in male calves as they were less cared by the owners. Another reason could be due to less absorption of immunoglobulin from the gut of male calves (Sangwan *et. al*.1985). The month wise incidence of diarrhoea in calves revealed that highest cases were reported after the onset of rains and continued till the end of winter and autumn, which appears to be related to post calving season and climatic stress (Fig. 1).

The variation of incidence of calf diarrhoea among different farm might be because of awareness among owners; managemental practices adopted in particular area and the level of education of animal owners (Radostits *et al.,* 2007). Majority of diarrhoeic calves were found to be dull, depressed, off fed with varying degree of yellowish white foul smelling faeces. The faeces were semisolid to watery streaked with mucous and sometimes blood soiling hind quarter and tail. Significant elevation in rectal temperature, pulse rate and respiration rate were found in all the diarrhoeic calves (Table 2). The observations seem to agree well with the findings of Sridhar *et al.,* (1988) and Kumar and Mandial (2002). The haemato-biochemical changes recorded in *E. coli* affected diarrhoeic calves (30) and control calves (6) are depicted in table 3. The haematological findings revealed a significant elevation in haemoglobin, packed cell volume, total erythrocyte count in diarrhoeic calves (Table 3). Loss of extracellular fluid in diarrhoea leads to haemoconcentration and hypovolemia. The total leukocyte, increased in diarrhoea i.e. leukocytosis might have occurred due to normal reaction of body defence mechanism against infections. Present findings are in accordance with those as obtained by Bali *et al.,* (1999) and Kumar and Mandial (2002).

The lymphocyte and eosinophils count did not varied significantly but the neutrophil and monocyte and count increase significantly in diarrhoeic calves, similar findings reported by Sridhar *et al.,* (1988). A significant fall in the level of serum sodium in scouring calves was recorded against the normal healthy calves.

These findings are in agreement with the findings of Bali *et al.,* (1999) and Grove-White and White, (1999). Hyponatremia occurs due to excessive secretion of the sodium ions by intestinal villus which is lost through the intestinal tract particularly in enterotoxigenic *E. coli* induced diarrhoea Radostits *et al.,* (2007). Most of the diarrhoea causing microorganisms disrupt the intestinal function and dehydrate the body either by increasing the chloride-secreting activity of the crypt cell or impairing the absorption of sodium by the villus cells or both Hirschhorn *et al.,* (1991). Then the fluid that is normally returned to the blood across the intestinal wall is lost in the watery stool. Significant increased in serum potassium level during the clinical phase of disease.

Table.1 Age wise prevalence of Colibacillosis in calves

Sl. No	Age	No. of diarrhoeic calves	Male	Female	No. calves positive for *E. coli*	Percentage
1.	< 3 day	97	50	47	56	57.73
2.	4-7 day	75	50	25	31	41.33
3.	8-14 day	47	34	13	11	23.40
4.	15-30 day	31	21	10	06	19.35
Total		250	155(62%)	95(38%)	104	

Table.2 Clinical parameters changes in healthy and diarrhoeic calves

Clinical parameters	Healthy calves(N=6)	Diarrhoeic calves (N=30)
Temperature °F	101.64±0.20	102.72±0.15*
Pulse/min	83.32±1.98	103.16±1.23*
Respiration/min	24.36±0.36	33.86±0.67*

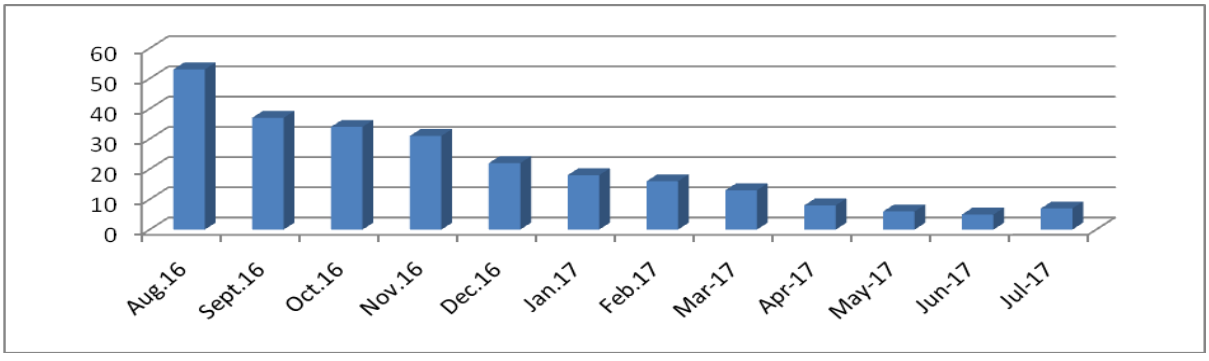
*Statistically significant at 5% level (P<0.05)

Table.3 Haemato- biochemical changes in healthy and diarrhoeic calves

Parameters	Healthy calves (N=6)	Diarrhoeic calves (N=30)
Hb (g%)	11.50±0.11	12.78±0.15*
PCV (%)	34.27±1.3	40.42±1.2*
TEC($x10^6$/cumm)	9.58±0.27	13.03±0.70*
TLC($x10^3$/cumm)	8.98±0.11	12.44±0.11*
Neutrophil (%)	36±0.47	41.58±0.28*
Lymphocyte (%)	63.07±0.27	63.24±0.26
Monocyte (%)	1.63±0.05	1.92±0.32*
Eosinophil (%)	1.38±0.06	1.39±0.09
Serum Na(mEq/L)	138.05±0.61	126.00±0.42*
Serum K(mEq/L)	5.25±0.33	6.07±0.07*
Serum Chloride(mEq/L)	98.00±0.57	109.40±0.71*
Total Protein gm/dL	7.45±0.05	7.98±0.06*
Glucose mg/dL	74.11±1.52	41.46±1.97*
ALT (U/L)	37.68±1.12	37.82±1.17
AST(U/L)	16.57±1.21	16.44±0.99

*Statistically significant at 5% level (P<0.05)

Fig.1 Month wise prevalence of diarrhoea in calves in dairy farm located around Koderma district of Jharkhand (Aug16 toJuly17)



Hyperkalaemia may be due to increased potassium retention by kidney and also due to cellular damage (Fisher, 1971) or it may be metabolic acidosis, which might have induced translocation of potassium ion from intracellular to extracellular compartment Grove-White and White, (1999) and Shrivastava *et al.,* (2001). Hyperchloraemia as observed in present investigation might be due to prolonged increased loss of Cl^- ions in the intestinal tract during diarrhoea and failure of gastric H^+ and Cl^- ions to be reabsorbed by the villi of small intestine (Radostits *et al.,* 2007). The marked increases in Total Serum Protein in diarrhoeic calves were observed apparently due to associated dehydration. Tenant *et al.,* (1972), Constable *et al.,* (1996) and Walker *et al.,* (1998) observed the significant increase in both PCV and TSP, which indicates hypovolemia, hemo-concentration and reduced glomerular filtration rate. The noticeable decrease in the level of serum glucose in diarrhoeic calves as compared to healthy control calves is in close agreement with Lewis *et al.,* (1975). Hypoglycaemia may occur as a result of reduced rate of conversion of lactic acid to glucose (Morris *et al.,* 1985). Other factors involved in causing hypoglycaemia in diarrhoeic calves may include anorexia, decreased intestinal absorption of glucose, low glucose reserves, alteration in tissue metabolism (Bywater *et al.,* 1969; Bywater, 1977; Shelly, 1969 and Tenant *et al.,* 1972). Non-significant changes in ALT and AST activities were observed in diarrhoeic caves indicates the absence of marked hepatic damage Lewis *et al.,* (1975).

Calf scour remains one of the most important problems faced by livestock industry causing great economic losses. The prevalences *E. coli* in diarrheic calves were 41.6 %. The prevalence was higher in male calves of below 3 days of age. Incidence of diarrhoea in calves was more after onset of monsoon and continued till the end of winter and autumn. Analysis of blood and serum samples of the diarrhoeic calves revealed significant increases in Hb, PCV,TEC,TLC TSP potassium and chloride and significant decreases in serum glucose, sodium, no significant alteration were observed ALT and AST levels.

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