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# Clinical and Haemato-biochemical Studies on Gastro-intestinal Colic in Horses

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## ABSTRACT

**Background:** Colic is an important disease of horses. It is a multifactorial and complex disorder. Colic remains one of the common causes of death in horses therefore in present investigation, clinical and haemato-biochemical changes associated with GI colic in horses were studied.

**Methods:** Total 105 horses were examined to study the clinical and haemato-biochemical parameters in colicky horses in southern part of Rajasthan.

**Result:** Mean respiration rate, pulse rate and capillary refill time was found to be significantly increased in horses affected with colic than healthy control animals (P<0.05). In haematological indices, mean packed cell volume was significantly increased in colic affected horses (P<0.05) whereas mean total platelet count and mean lymphocyte count was found to be significantly decreased (P<0.05). In serum biochemical indices, serum aspartate amino transferase, serum alanine amino transferase, blood urea nitrogen, serum creatinine, serum glucose, serum albumin, serum total protein, serum alkaline phosphate and blood lactate were found to be significantly increased in horses affected with colic than healthy control group (P<0.05).


**Key words:** Blood lactate, Capillary refill time, Colic, Horses, Packed cell volume, Serum alkaline phosphate.

## INTRODUCTION

Colic is the major cause of morbidity and mortality in equines. It is a multifactorial and complex disorder. Equine colic can be divided into 2 major categories, gastro-intestinal and non-gastrointestinal. Gastro-intestinal colic can be caused by different conditions ranging from a harmless spasmodic colic to life threating strangulating obstruction (Behrooz Nikahval, 2009).

An accurate diagnosis and identification of site of pain is often difficult (Farooq *et al*., 2020). Clinical and laboratory investigations can be used not only for diagnosis but also to predict prognosis of colic. Early diagnosis and referral of colicky horses is critical to obtain a successful outcome (Cook and Hassel, 2014). Present investigation was planned to study clinical and haemato-biochemical changes associated with GI colic in horses.

## MATERIALS AND METHODS

### Animals

Total 105 horses of different breed, age and sex were examined under field conditions to study the clinical and haemato-biochemical parameters in colicky horses.

### General information and clinical examination

Colicky horses were identified on the basis of observative clinical signs of abdominal pain. Information with respect to breed, age, sex, diet, water intake, management practices, deworming, *etc.* was recorded. Examination of the colicky horses was done for rectal temperature, respiration rate, pulse rate and capillary refill time. Abdomen was auscultated at all the five areas (right and left paralumbar fossa, right and left flank region and anterior mid line). Per-rectum palpation was also conducted.

### Haemato-biochemical parameters

Blood was collected from jugular vein in clean tubes containing anticoagulant and without anticoagulant for the estimation of haemato-biochemical parameters. The haematological parameters *viz*. packed cell volume (PCV), haemoglobin (Hb), total erythrocyte count (TEC), total platelet count (TPC), total leukocyte count (TLC), differential leukocyte count (DLC) were estimated as per Feldman *et al.* (2000). Biochemical parameters *viz*. serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), blood urea nitrogen (BUN), serum creatinine (CREA), serum glucose (GLU), serum albumin (ALB), serum total protein (TP), serum alkaline phosphate (ALKP) and blood lactate (LAC) were estimated using Auto-Biochemistry Analyser-Idexx VetTest, Mfg by IDEXX Laboratories, Maine, U.S.A.

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### Examination of faecal samples

Faecal samples were subjected to gross examination and microscopic examination. Direct faecal smear examination and concentration techniques were used as described by Schalm *et al*. (1986) for identification of parasitic ova/ oocyst.

### Statistical analysis

The statistical analysis of the data was done using statistical methods described by Snedecor and Cochran (1994).

## RESULTS AND DISCUSSION

### Prevalence and associated risk factors

The overall prevalence of colic in horses was found to be 11.42 per cent. Out of the total cases of colic, spasmodic and impactive colic was observed in 75 per cent and 25 per cent cases, respectively. Higher occurrence of colic was observed in horses between 5 to 10 years of age (58.33 per cent), followed by horses below 5 years of age (33.33 per cent) and above 10 years of age (8.33 per cent). The occurrence of colic was found higher in males (66.66 per cent) than female horses (33.33 per cent). The case fatality rate of colic was found to be 16.66 per cent. Almost similar findings were reported by Hillyer *et al*. (2002); Enbavelan *et al*. (2015) and Worku *et al*. (2017). The incidence of colic in horses was dependent upon location, nutritional status and management practices (Enbavelan *et al*., 2015).

Risk factors associated with colic included living indoor without access to pasture (100 per cent cases), followed by parasitic infestation (58.33 per cent), poor body condition (41.67 per cent), improper exercise (33.33 per cent), excessive concentrate feeding, feeding of poor-quality feed and lack of drinking water (25 per cent each), recent diet change (16.67 per cent) and older age (8.33 per cent). More than one risk factor was found associated with colic. Parasitic infestation *viz*. *Strongylus vulgaris* and *Oxyuris equi* were observed in 16.66 per cent and 41.66 per cent cases, respectively. Horses maintained on pasture are less subjected to colic than horses living indoors (Cohen *et al*., 2006). Certain feed types and feeding practices have been identified as cause of colic in horses (Singh *et al*., 2021). Water deprivation was also associated with increased risk of large colon impaction (White and Dabareiner, 1997).

### Clinical indices

Clinical signs associated with GI colic in horses included depression and change in the colour of mucous membrane (light pink to red) (100 per cent each), followed by lack of appetite, sweating, frequent laying down and stretching out the body along with legs, frequent pawing with fore legs and abnormal posture in standing position (75 per cent each), looking towards flank region and kicking at the belly region (66.66 per cent each), lip curling and dry mucous membrane (58.33 per cent each), reduced water intake and poor body condition (50 per cent cases) and rolling on ground, cool extremities and constipation (41.67 per cent each). Diarrhoea and dysuria was observed in 25 per cent and 8.33 per cent cases, respectively. Similar findings were also reported by Azizunnesa *et al*. (2008), Alsaad and Abid (2009), Langdon *et al*. (2009) and Behonegn and Bekele (2018). The clinical signs of colic in horses vary with the severity of abdominal pain (Radostits *et al*., 2009).

Nasogastric reflux was observd in 25 per cent cases. Rectal examination mainly revealed empty rectum (25 per cent) and hard and mucoid type faeces (41.6 per cent). Auscultation of the abdomen revealed normal to decreased or absent intestinal gut sounds. Ping Sound, fluid splashing sound and tinkling sound were heard during auscultation of abdomen in colic. Similar findings were also reported by Langdon *et al*. (2009).

There was slight decrease in the mean rectal temperature (RT) of the horses affected with colic but statistically, there was non-significant difference in the mean rectal temperature of the horses affected with colic and healthy control horses (Table 1). Similar findings have also been reported by Azizunnesa *et al*. (2008). There was significant increase in the mean respiration rate (RR), mean pulse rate (PR) and mean capillary refill time (CRT) in the horses affected with colic than the apparently healthy control horses ($P<0.05$) (Table 1). Similar findings have also been reported by Azizunnesa *et al*. (2008), Alsaad and Abid (2009), Langdon *et al*. (2009) and Khosa *et al*. (2021).

Slightly decreased rectal temperature in colic might be due to shock condition resulting from severe pain (Radostitis *et al*., 2009). The increased respiration rate in colic might be due to pain and metabolic acidosis whereas increase pulse rate was associated with pain, haemo-concentration, decreased venous return, vascular volume, cardiovascular response and toxaemia (White and Dabareiner, 1997). The capillary refill time is usually prolonged due to vascular stasis (Susan and Asa, 1998).

### Haematological indices

There was significant increase in the mean value of packed cell volume in colic affected horses as compared to healthy control ($P<0.05$) (Table 1). Further, there was significant decrease in the mean value of total lymphocyte count and total platelet count in colic affected horses ($P<0.05$) (Table 1). Similar findings were reported by Brett and Pamela (2002); Alssad and Abid (2009) and Yadav *et al*. (2014). Statistically, there was non-significant difference in the values of haemoglobin, TEC, TLC, neutrophil, eosinophil and monocyte count in colicky and healthy control horses (Table 1). Similar findings were also reported by Orsini *et al*. (2008) and Yadav *et al*. (2014).

Increase in packed cell volume in colic was probably due to stress or excitement leading to splenic contraction (Robinson, 1992), dehydration and hypovolaemia leading to reduced plasma (Senturk, 2003). Packed cell volume may also be used as prognostic indicator in colic. In general, probability of survival decreased as the packed cell volume increased.

Thrombocytopenia was reflected in the form of petecheial hemorrhages seen in mucous membranes of colicky horses and prolongation of capillary refilling time (Edwards, 1998). Depression of platelets number may also occur due to depression of bone marrow (Rebar *et al*., 2005). Moreover, this might be attributed to the release of endogenous mediators such as platelet activating factor in disorders (Zbanyszek *et al*., 2004).

**Biochemical indices**

There was significant increase in the serum aspartate amino transferase (AST), serum alanine amino transferase (ALT), blood urea nitrogen (BUN), serum creatinine (CREA), serum glucose (GLU), serum albumin (ALB), serum total protein (TP), serum alkaline phosphate (ALKP) and blood lactate (LAC) levels in the horses affected with colic than control animals (P<0.05) (Table 2). Similar findings were reported by Orsini *et al.* (2008), Alsaad and Abid (2009), Langdon *et al.* (2009), Yadav *et al*. (2014) and Khosa *et al*. (2021).

Significant increase in serum AST was probably due to muscular activity, pain and stress. Though statistically, there was significant increase in the activity of serum ALT but since its activity is comparatively low in horses, so its value is not of much importance for any conclusion in equines (Kaneko, 2008).

Blood urea nitrogen and serum creatinine level are useful indicators of hydration status and renal function (Radostits *et al*., 2009). Prerenal azotemia is common in horses with colic and may progress to acute renal failure in severe cases of colic. Blood urea nitrogen and serum creatinine concentration might increase due to decrease in renal flow in hypovolaemia (Senturk, 2003). Higher serum creatinine concentration in the colic group could be due to reduced renal blood flow because of dehydration, endotoxaemia and NSAID administration. Serum creatinine is an important indicator of organ and tissue perfusion as level of serum creatinine decreases when organ and tissue perfusion increase (Robinson and Sprayberry, 2009). Blood

**Table 1:** Mean±S.E. value of clinico-haematological parameters in colicky and healthy control horses.

| Parameters | | Affected with colic (N=12) | | Healthy control (N=6) | |
|---|---|---|---|---|---|
| | | Mean±S.E. | Range | Mean±S.E. | Range |
| Rectal temperature (°F) | | 100.70±0.32 | 99-102.1 | 100.91±0.18 | 100-101.2 |
| Respiration rate (per minute)* | | 35.25±2.91 | 19-47 | 18±0.88 | 12-19 |
| Pulse rate (per minute)* | | 50.16±2.99 | 41-70 | 34±1.27 | 30-39 |
| Capillary refill time (per sSecond)* | | 2.66±0.25 | 2-5 | 1.83±0.18 | 1-2 |
| PCV (%)* | | 65±2.22 | 29.6-78.4 | 37.13±1.45 | 32.5-40.3 |
| Haemoglobin (g/dl) | | 15.2±1.04 | 11.5-17 | 12.85±0.6 | 11.5-15.4 |
| Total erythrocyte count ($10^6$/L) | | 9.46±0.7 | 5-13.3 | 7.58±0.28 | 7.1-9 |
| Total platelet count ($10^3$/L)* | | 162.25±10.94 | 120-245 | 264.5±34.06 | 170-365 |
| Total leukocyte count ($10^3$/L) | | 8.2±0.82 | 4.7-12 | 9.25±0.61 | 7.6-11.3 |
| Differential leucocyte count | Neutrophils ($10^3$/L) | 4.01±0.29 | 2.8-6.2 | 6.21±0.54 | 4.7-8.3 |
| | Eosinophils ($10^3$/L) | 0.13±0.01 | 0.08-0.23 | 0.15±0.03 | 0.01-0.3 |
| | Basophils ($10^3$/L) | 0.0±0.0 | 0-0 | 0.00±0.00 | 0.0-0.0 |
| | Lymphocytes ($10^{3/L}$)* | 2.81±0.16 | 2.1-4.1 | 3.96±0.22 | 3.4-4.8 |
| | Monocyte ($10^3$/L) | 0.18±0.02 | 0.11-0.34 | 0.2±0.02 | 0.1-0.3 |

*Significant difference (P<0.05).

**Table 2:** Mean±S.E. value of biochemical parameters in colicky and healthy control group.

| Parameters | Colicky horses (N=12) | | Healthy control horses (N=6) | |
|---|---|---|---|---|
| | Mean±S.E. | Range | Mean±S.E. | Range |
| Serum aspartate amino transferase (µ/L)* | 314.75±35.12 | 215-468 | 173.56±12.16 | 122.3-212 |
| Serum alanine amino transferase (µ/L)* | 34.58±3.27 | 16-50 | 8.08±1.48 | 3.5-10.4 |
| Blood urea nitrozen (mg/dl)* | 28.91±2.54 | 17-45 | 18.58±1.22 | 15.7-23.6 |
| Serum creatinine (mg/dl)* | 1.55±0.18 | 1-3 | 1.33±0.1 | 1-1.6 |
| Serum glucose (mg/dl)* | 131.91±5.26 | 111-182 | 81.16±4.4 | 68-95 |
| Serum albumin (g/dl)* | 3.21±0.14 | 2.3-3.8 | 2.98±0.13 | 2.6-3.6 |
| Serum total protein (g/dl)* | 8.16±0.35 | 6.4-9 | 6.23±0.25 | 5.8-7.5 |
| Serum alkaline phosphate (µ/L)* | 521.25±47.99 | 420-1032 | 198.5±11.11 | 162-222 |
| Blood lactate (mmol/L)* | 2.36±0.12 | 1.5-3 | 1.01±0.04 | 0.9-1.2 |

*Significant difference (P<0.05).

urea nitrogen concentration may also be used as a prognostic indicator in equine colic (Yadav *et al*., 2014).

Hyperglycemia was due to both glucocorticoids and adrenaline release during pain (Kerr, 2002). It also appears to be because of an increase in the rate of muscle and hepatic glycogenolysis, triggered by catecholamines secreted in response to circulating endotoxin and stress in colic (Bayly and Reed, 1980). The increase in serum total protein is attributed to haemo-concentration, dehydration and hypovolemia due to uncompensated loss of plasma water (Langdon *et al*., 2009). Probability of survival decreased as the serum total protein level increased (Sharma *et al*., 2008). It is also an important indicator of tissue perfusion. It also determines the success of fluid therapy (Robinson and Sprayberry, 2009). Serum alkaline phosphate activities are enhanced in horses with colic (Radostits *et al.,* 2009). Blood lactate level increased due to increase in oxygen demand during muscular activity, systemic inflammation and catecholamines (DiBartola, 2006).

## CONCLUSION

It was concluded that overall prevalence of GI colic in horses was found to be 11.42 per cent. Risk factors associated with colic mainly included feeding, nutrition, parasitic infestation and exercise. There were non-significant differences in the values of haematological parameters in colicky and healthy horses except PCV, total platelet count and lymphocyte count. Serum biochemical parameters *viz*. AST, ALT, BUN, CREA, GLU, ALB, TP, ALKP and LAC were significantly increased in horses in colic.

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