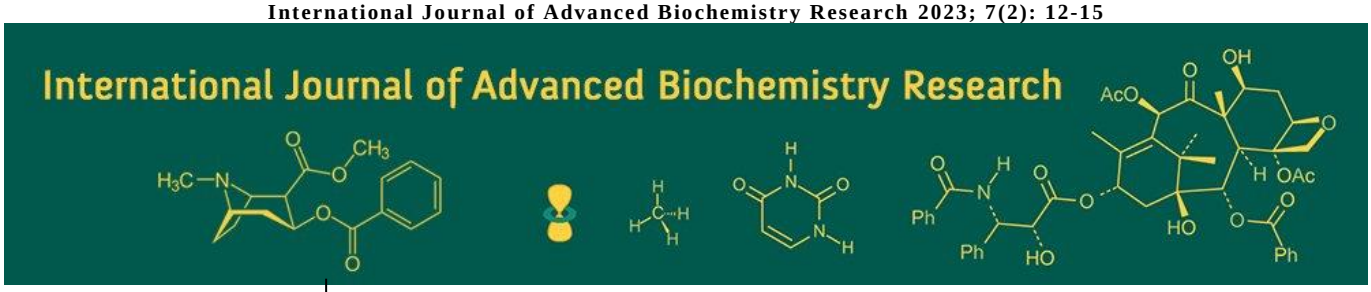

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Biochemical and electrolytes analysis of colic in indigenous breeds of horses

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Abstract
Colic is most important clinical problem in horses. Role of biochemical and electrolyte analysis in the diagnosis and prognosis clinical problems is very important. Present study was carried out to see the biochemical and electrolyte changes with different types of colic in indigenous horses belonging to Marwari, Zanskari and Manipuri breed of horses kept at an organised farm at Bikaner. Data of clinical cases were recorded for 8 months. Serum biochemical analyses were carried out using commercially available kits. On biochemical and electrolyte analysis no significant change was observed except few parameters. All the cases of spasmodic cases responded well to the primary treatment for colic.

Keywords: Colic, indigenous breed, biochemical, electrolytes, horses

Introduction
Equine colic caused by gastro-intestinal disorder may lead to severe clinical illness and death. Non-gastrointestinal colic can usually be excluded based on physical examination, these include signs of abdominal discomfort due to urolithiasis and disorder of reproductive organs, respiratory system or musculoskeletal system. Causes of gastrointestinal colic are gut distension, tension of the root of mesentery, ischemia, deep ulcers in the stomach or bowel and peritoneal pain (Abutarbush *et al.* 2005) [1].

Colic is considered as the universally experienced health malady and remains as the single most common caused of death in horses. Therefore It becomes a continual concern for horse's owners and equine practitioners. It was a frightening concept when horse owners exhibited colic because it was often unpredictable and frequently not preventable (Kaneene *et al*.1997) [6]. colic was considered as the most frequently emergency conditions encountered by the equine practioners (Zimmel, 2003) [15].

The etiological agents to this clinical syndrome are several, including disease base system that classifies the causes of colic as obstructive and strangulation, non-strangulation infective and inflammatory such as peritonitis and enteritis (Radostits *et al.* 2007) [9]. Disorders of large intestine are frequent causes of equine colic. About 50 per cent of deaths in horses are caused by or related to condition in large intestine, colic related to the small colon is usually caused by strangulation and obstruction (Bernard, 2004) [3]. The most common abnormality involving the small colon in the mature horses is intraluminal obstruction with faecolith.

It is the most common emergency in equine practice. It is a multifactorial disorder which is induced by several environmental factors. Some horses have a genetic predisposition to colic (Shirazi-Beechey, 2010) [11]. Epidemiological study of colic revealed an overall prevalence rate as 6.47 per cent and case fatality rate as 1.31 per cent (Varshney and uppal, 1995) [12]. Differentiation between strangulation and non-strangulation obstruction is necessary because the prognosis varies greatly with each and the choice of treatment used depends, on the nature of the lesions. Most cases of impaction have a positive response to medical treatment while cases of intestinal strangulation always require surgical correction (Groschr *et al.* 2003) [4].

Materials and methods
Animals
The present study "Biochemical and Electrolyte Analysis of colic in indigenous breeds of horses" was carried out at the National research center of Equine, Bikaner and College of

Veterinary and animal science, Bikaner and around Bikaner. 18 apparently healthy horses were also selected to find out the values of biochemical and electrolyte parameters. Blood samples were also collected from healthy control and diseased horses for the same biochemical and electrolyte parameters as that of horses affected with colic. In order to have comparable base line data for biochemical parameters as well as to evaluate the therapeutic trial.

Clinical parameters

Physical examination includes temperature (˚F), pulse rate per minute, respiratory rate per minute, colour of mucosa, capillary refilling time in seconds, heart beat per minute, skin pinch test, rolling on ground, stretching of body, flank watching, kicking at belly. Sweating, faeces passing in last 12 hours after occurrence of colic, urine passes in last 12 hours after occurrence of colic and appetite.

Biochemical analysis

Biochemical analysis of serum samples were done to estimate Alkaline phosphatase (ALP), Serum glutamic-oxaloacetic Transaminase (SGOT), Serum glutamic pyruvic Transaminase (SGPT), serum Gamma-glutamyl transferase (GGT), serum Bilirubin Direct, serum Bilirubin Total, serum Total protein, Albumin, serum Glucose, serum Triglycerides (TG), serum Cholesterol, serum Urea, serum Creatinine, serum Magnesium, serum calcium, serum Phosphorus. The determination principle, reagents required, procedure, calculation and precautions used for each of them were described below. All test performed by semi auto biochemical analyser. blood serum sample were analyzed by using standard kits supplied by SPINREACT,S.A.- Ctra. Santa Coloma, 7-E-17176 SANT ESTEVE-(Girona) SPAIN and ERBA diagnostics Mannheim GmbH, Mallustr., 69-73, D- 68219, Mannheim/Germany.

Electrolyte analysis

Electrolyte analysis of serum samples were done to estinate serum levels of sodium, potassium, chloride, calcium and phosphorus between horses suffering from spasmodic colic and control horses by using HDC lyte version 24SW5, Japan.

Results and Discussions

Study was carried out at an organised farm of National Research Center on Equines situated at Bikaner, that have Marwari, Zanskari and Manipuri breed of horses. Out of these breeds only Marwari breed qualify for horses (Berber *et al*.2014) [2], while rest of these 2 breed are pony breeds. At start of the study we have comparatively analyzed biochemical and electrolyte parameters in the collected blood samples of all these three breeds and found no significant difference in any parameter (Table 1).

Table 1: Breed wise comparative analysis of serum biochemical parameters in normal healthy adult animals of Zanskari, Marwari and Manipuri Breeds.

	Zanskari Mean ±SE (N=7)	Marwari Mean± SE (N=11)	Manipuri Mean ±SE (N=8)
Alkaline phosphatase (IU)	308.56± 22.28	367.04±16.15	342.13±10.86
Serum glutamic-oxaloacetic Transaminase (IU)	268.27±18.87	305.73±34.69	305.38±15.77
Gamma-glutamyl transferase (IU)	14.48± 3.09	20.15±4.49	15.86±3.62
Bilirubin Direct (mg/dl)	1.08±0.06	0.98±0.04	2.04±0.94
Bilirubin Total (mg/dl)	1.83±0.08	1.87±0.07	1.76±0.08
Total protein g/dl	6.28±0.26	5.97±0.33	6.44±0.13
Albumin g/dl	3.76±0.19	3.83±0.15	3.70±0.12
Glucose mg/dl	105.02±2.41	103.82±1.03	106.13±1.68
Triglyceride mg/dl	84.03±4.72	82.66±6.84	86.75±3.98
Cholesterol mg/dl	89.99±9.05	82.52±3.11	78.75±2.79
UREA (mg/dl)	27.43±0.99	26.91±1.31	27.00±1.19
Creatinine mg/dl	1.77±0.17	1.36±0.13	1.47±0.12
Magnesium mg/dl	2.18±0.16	1.96±0.13	1.86±0.11
Calcium mg/dl	9.27±0.65	10.88±0.48	11.18±0.46
Phosphorus mg/dl	4.48±0.13	4.38±0.09	4.51±0.09

Biochemical parameters in spasmodic colic: Serum biochemical parameters of horses suffering from spasmodic colic and control healthy horses are depicted in table 2.

Table 2: Serum biochemical changes in horses with spasmodic colic vs control horses

	Spasmodic colic Mean ±SE (n=18)	Control horses Mean ±SE (n=18)
Alkaline phosphatase (IU)	406.70±38.25	344.30±14.87
Serum glutamic-oxaloacetic Transaminase (IU)	259.30±29.56	291.16±22.57
Serum glutamic pyruvic Transaminase (IU)	20.52±5.21	30.94±3.37
Gamma-glutamyl transferase (IU)	24.22±2.33	17.95±3.03
Bilirubin Direct (mg/dl)	0.99±0.04	1.02±0.04
Bilirubin Total (mg/dl)	1.88±0.06	1.85±0.05
Total protein (g/dl)	5.70±0.35	6.09±0.23
Albumin (gm/dl)	3.72±0.22	3.80±0.12
Glucose (mg/dl)	115.14±3.72*	104.28±1.15
Triglycerides (mg/dl)	124.04±14	83.19±4.52
Cholesterol (mg/dl)	93.92±14.43	85.42±4.17
Urea (mg/dl)	36.80±2.27*	27.11±0.88
Creatinine (mg/dl)	10.38±8.92	1.52±0.12

Table- ˣsignificant, p value <0.05.

Alkaline phophatage (ALP), aspartate aminotransferase (SGOT), serum glutamic-pyruvic transaminase (SGPT), serum gamma-glutamyl transferase (GGT), serum direct bilirubin, serum total bilirubin, total protein, albumin, cholesterol, creatinine, calcium and phosphorus were found within normal range and no significant difference was observed between spasmodic colic and control healthy horses. Increase in the level of enzymes like SGPT, SGOT, ALP, GGT, are associated with damage to different organs like liver, bone remodelling and muscles damage. Normal level of these enzymes suggested that there was no tissue or organ damage was associated in the clinical cases of spasmodic colic in present study. Serum glucose level was found significantly increased in the horses suffering from spasmodic colic. Serum glucose level might have increased due to increased activity and increased cortisol levels due to colic (Hinchcliff *et al*. 2005; Latson *et al*.2005) [5, 7]. Serum triglyceride levels were also found significant increase in the horses suffering from spasmodic colic. That may also be associated with increased physical activity (Piccione *et al*. 2010) [8]. Triglyceride levels may increase due to mobilization of stored fat due to increased demand of energy due to over activity.

Serum electrolytes and minerals

Serum electrolytes and mineral levels are presented in table 3

Table 3: Serum electrolyte levels in horses suffering from spasmodic colic

	Spasmodic colic Mean ±SE (n=18)	Control horses Mean ±SE (n=18)
Sodium mmol/L	151±1.83	149±1.52
Potassium mmol/L	4.92±0.09	4.62±0.18
Chloride mmol/L	101±1.53	98±1.49
Calcium (mg/dl)	10.95±0.45	10.26±0.43
Phosphorus (mg/dl)	4.23±0.12	4.42±0.08
Magnesium (mg/dl)	1.76±0.07*	2.04±0.11

Table- *significant, p value <0.05.

No significant change was observed in the serum levels of sodium, potassium, chloride, calcium and phosphorus between horses suffering from spasmodic colic and control horses. Serum sodium and potassium levels are the prognostic indicators of colic in horses (Youssef *et al*. 2009) [14]. Normal levels of these electrolytes suggest that there was no significant loss of these electrolytes in spasmodic colic. Results are also in agreement with the previous studies (Rani *et al.* 2018) [10]. Level of serum magnesium was also found decreased suffering from spasmodic colic. Decrease in magnesium level is usually found associated with prolonged cases of in appetite or anorexia (Weaver *et al*.1998) [13]. Reason for significant decrease in magnesium levels could not be explained in present study and require further study.

Conclusion

Spasmodic colic cases are the most common clinical cases in horses and responds well to the primary treatment with pain killers and antispasmodic drugs. Biochemical analysis and Pulse rate is most significant parameter, pulse rate < 60 per minute usually indicates favourable prognosis.

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