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Clinical, haematological, biochemical and epidemiological characterization of equine colic in an organized equine population in North-Western Rajasthan

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Abstract

Equine colic is a major emergency syndrome associated with gastrointestinal dysfunction, and early recognition of potentially severe disease is essential for appropriate management and prognosis.

Methods: A prospective clinical evaluation was conducted over eight months in an organized equine population in Bikaner, Rajasthan, yielding 19 colic cases (18 spasmodic colic and 1 colitis). Clinical, haematological, serum biochemical and electrolyte variables were compared with healthy controls. Retrospective records from 2014–2019 were also analysed for the occurrence and distribution of colic forms.

Results: Spasmodic colic predominated. Repeated lying down/getting up and circling were the most frequent clinical signs. Heart rate was higher in affected horses than controls (46.50 ± 1.04 vs 38.83 ± 0.41 beats/min; $P \leq 0.05$), whereas capillary refill time, respiratory rate and rectal temperature were comparable. Neutrophil and monocyte percentages increased and lymphocyte percentage decreased. Serum glucose and triglycerides were higher, while magnesium was lower in spasmodic colic. Retrospectively, 243 colic incidences were recorded, of which 88.0% were spasmodic; annual incidence was higher in ponies than horses (1.14 vs 0.58 cases/animal-year). Colitis was associated with severe leukopenia, haemoconcentration and marked biochemical disturbances and had a poor outcome.

Conclusion: Integrated clinical, haematological and biochemical assessment can support early categorization of equine colic. Spasmodic colic was the predominant and generally favourable form, whereas colitis was associated with severe systemic alterations and poor prognosis.

Keywords: Equine colic; spasmodic colic; colitis; haematology; serum biochemistry; electrolytes; prognosis

1. Introduction

Equine colic is a clinical syndrome encompassing a broad spectrum of gastrointestinal disorders, from transient intestinal hypermotility and spasmodic pain to impaction, obstruction and intestinal inflammation. Because clinical severity can change rapidly, early differentiation of uncomplicated medical colic from potentially life-threatening disease remains a major challenge in equine practice.

Colic occurrence is influenced by host, dietary, management and environmental factors. Clinical examination—including heart rate, respiratory rate, mucous membranes, capillary refill time, gastrointestinal sounds, faecal output and pain-related behaviour—remains central to initial assessment. Haematological and biochemical changes may provide additional information on stress, inflammation, dehydration and systemic disturbance.

Region-specific data are valuable because equine populations may be maintained under distinctive climatic and management conditions. Therefore, the present study characterized the clinical presentation of equine colic and associated haematological, biochemical and electrolyte changes, together with retrospective assessment of colic occurrence in an organized equine population in north-western Rajasthan.

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2. Materials and Methods

2.1 Study design and population

The study combined a prospective clinical evaluation over eight months with retrospective analysis of colic records from 2014–2019. The study population was an organized equine farm at Bikaner, Rajasthan, with an average population of approximately 69±4.74 horses and ponies during the retrospective period.

2.2 Clinical evaluation

Nineteen prospective colic cases were recorded: 18 spasmodic colic and one colitis. Eighteen horses with spasmodic colic survived, whereas the recorded colitis case was fatal. Clinical assessment included capillary refill time, heart rate, respiratory rate, rectal temperature, pain-related behaviour, faecal consistency, sweating, rolling and frequency of lying down/getting up.

2.3 Laboratory evaluation

Haematological assessment included total and differential leukocyte counts, erythrocyte count, haemoglobin, haematocrit, MCV, MCH and MCHC. Serum biochemical variables included ALP, AST, ALT, GGT, direct and total bilirubin, total protein, albumin, glucose, triglycerides, cholesterol, urea and creatinine. Sodium, potassium, chloride, calcium, phosphorus and magnesium were assessed as electrolytes/minerals.

2.4 Retrospective analysis and statistics

Farm records from 2014–2019 were reviewed for the occurrence and distribution of spasmodic, impactive,

obstructive, enteritis-related colic and colitis. Data were expressed as mean±SE. Statistical significance was interpreted at $P \leq 0.05$ according to the original dataset.

3. Results

3.1 Clinical findings

Spasmodic colic accounted for 18 of 19 prospective cases. Repeated lying down/getting up and circling were the predominant behavioural manifestations. Soft faeces occurred in six cases (approximately 33%), whereas severe rolling and sweating were reported in two cases. Heart rate was significantly higher in affected horses, while other recorded vital parameters did not differ significantly.

Parameter	Spasmodic colic (n=18)	Healthy controls (n=18)
Capillary refill time (sec)	1.50±0.12	1.44±0.12
Heart rate (beats/min)	46.50±1.04*	38.83±0.41
Respiratory rate (/min)	18.28±0.87	17.33±0.23
Rectal temperature	100.80±0.089	101.22±0.41

* $P \leq 0.05$.

3.2 Haematological findings

Total leukocyte count and erythrocyte-related variables were comparable between groups. However, neutrophil and monocyte percentages were significantly higher, while lymphocyte percentage was significantly lower in spasmodic colic horses.

Parameter	Colic (n=18)	Control (n=18)
WBC ($10^3/\mu\text{l}$)	8.61±0.39	8.84±0.44
Neutrophils (%)	51.95±2.79*	45.25±0.04
Lymphocytes (%)	40.09±3.14*	48.17±1.39
Monocytes (%)	5.00±0.60*	3.17±0.36
RBC ($10^6/\mu\text{l}$)	7.55±0.45	7.46±0.42
Haemoglobin (g/dl)	10.76±0.66	10.33±0.63
Haematocrit (%)	34.66±2.50	35.74±2.14
MCV (fL)	47.28±1.38	37.34±1.04
MCH (pg)	14.61±0.58	13.33±0.47
MCHC (g/dl)	31.45±1.20	29.18±0.64

* $P \leq 0.05$.

3.3 Serum biochemical and electrolyte findings

The biochemical response was selective. Glucose and triglycerides were significantly increased, whereas

magnesium was significantly decreased in spasmodic colic. Other measured biochemical and electrolyte variables were not significantly different from controls.

Parameter	Spasmodic colic	Healthy control
ALP (IU)	406.70±38.25	344.30±14.87
AST (IU)	259.30±29.56	291.16±22.57
ALT (IU)	20.52±5.21	30.94±3.37
GGT (IU)	24.22±2.33	17.95±3.03
Direct bilirubin (mg/dl)	0.99±0.04	1.02±0.04
Total bilirubin (mg/dl)	1.88±0.06	1.85±0.05
Total protein (g/dl)	5.70±0.35	6.09±0.23
Albumin (g/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±14.00*	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

* $P \leq 0.05$. The creatinine value showed high variability in the original dataset and should be interpreted cautiously.

Parameter	Spasmodic colic	Control
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

* $P \leq 0.05$.

3.4 Retrospective epidemiological findings

A total of 243 colic incidences were documented during 2014–2019, corresponding to an overall occurrence of approximately 0.77 cases per animal-year. Incidence was higher in ponies than horses (1.14 vs 0.58 cases/animal-year). Spasmodic colic constituted 88.0% of recorded cases.

Type of colic	Prevalence (%)
Spasmodic colic	88.0
Impactive colic	5.8
Enteritis-related colic	2.9
Colitis	1.7
Obstructive colic	0.8

3.5 Colitis-associated changes

Five colitis cases with laboratory data showed marked leukopenia and haemoconcentration, reflected by increased RBC count, haemoglobin and haematocrit. Significant biochemical abnormalities involved AST, GGT, triglycerides, albumin, total protein, creatinine, magnesium, calcium and bilirubin fractions. The prospective colitis case had a poor outcome.

Parameter	Colitis (n=5)	Controls (n=5)
WBC ($10^3/\mu\text{l}$)	2.9 $\pm$ 0.17*	8.2 $\pm$ 0.71
RBC ($10^6/\mu\text{l}$)	11.2 $\pm$ 0.42*	8.4 $\pm$ 1.26
Hb (g/dl)	20.1 $\pm$ 0.59*	11.6 $\pm$ 2.19
Hct (%)	59.2 $\pm$ 1.59*	38.6 $\pm$ 7.18
MCV (fL)	53.2 $\pm$ 3.28*	45.4 $\pm$ 2.11
MCH (pg)	18.1 $\pm$ 1.13*	13.5 $\pm$ 0.64
MCHC (g/dl)	37.7 $\pm$ 1.70*	29.8 $\pm$ 0.19
Neutrophils (%)	40.4 $\pm$ 0.53*	35.20 $\pm$ 2.29
Lymphocytes (%)	54.2 $\pm$ 1.56	59.2 $\pm$ 2.35
Monocytes (%)	3.2 $\pm$ 0.58	3.0 $\pm$ 0.37
Eosinophils (%)	2.2 $\pm$ 0.58*	2.8 $\pm$ 0.66

* $P \leq 0.05$.

4. Discussion

Spasmodic colic was the dominant form in both the prospective and retrospective observations, accounting for 88% of historical cases. This pattern supports the clinical importance of functional intestinal hypermotility and spasm in organized equine populations. The higher annual incidence in ponies may reflect differences in population characteristics or management, although the present dataset does not permit causal attribution.

Heart rate was the principal clinical variable showing a significant difference between spasmodic colic and healthy horses. Its increase is consistent with pain- and stress-associated sympathetic activation. The absence of significant differences in respiratory rate, rectal temperature and capillary refill time suggests that the prospective spasmodic cases were comparatively uncomplicated.

Changes in the differential leukocyte profile, with increased neutrophil and monocyte proportions and reduced lymphocyte proportion, are compatible with a stress/inflammatory response. The absence of significant changes in erythrocyte count, haemoglobin and haematocrit further suggests that marked haemoconcentration was not a prominent feature of these cases.

Increased glucose and triglycerides may reflect acute stress-associated metabolic responses. The lower magnesium concentration is potentially relevant but should be interpreted cautiously, particularly in view of the limited sample size. The colitis cases displayed a distinctly more severe laboratory profile, characterized by leukopenia and haemoconcentration together with multiple biochemical disturbances, supporting the value of laboratory assessment in recognizing systemic compromise.

Overall, the findings support a pragmatic approach in which clinical examination provides the first-line assessment and laboratory parameters are used to strengthen categorization and prognostic evaluation. However, the small prospective

sample and limited number of colitis cases restrict the strength of inference.

5. Clinical Implications

Heart rate should be recorded systematically in horses presenting with abdominal pain.

Repeated lying down/getting up and circling are useful behavioural indicators of spasmodic colic.

Normal temperature, respiration and capillary refill time do not exclude colic.

Differential leukocyte changes, glucose, triglycerides and magnesium may provide supportive laboratory information.

Marked leukopenia and haemoconcentration, particularly when accompanied by multiple biochemical abnormalities, should increase concern for severe gastrointestinal disease.

Clinical and laboratory findings should be interpreted together rather than in isolation.

6. Limitations

The prospective sample was small, particularly for colitis. The retrospective analysis depended on the completeness and consistency of historical farm records. Advanced diagnostic modalities—including abdominal ultrasonography, peritoneal fluid analysis, blood lactate, coagulation profiling and surgical confirmation—were not available for all cases. Future multicentre prospective studies incorporating these measures would strengthen diagnostic and prognostic assessment.

7. Conclusion

Equine colic in the investigated organized population was predominantly spasmodic in nature. Spasmodic colic was associated with increased heart rate, selective differential leukocyte changes, increased glucose and triglycerides, and reduced magnesium, while most other measured variables remained comparable with healthy controls. Retrospective records showed that spasmodic colic accounted for 88% of cases and that ponies had a higher annual incidence than horses. In contrast, colitis was associated with severe leukopenia, haemoconcentration, multiple biochemical abnormalities and poor outcome. These findings indicate that systematic clinical examination supported by targeted haematological and biochemical evaluation can improve early categorization and prognostic assessment of equine colic.

8. Declarations

- **Ethical statement:** The manuscript is based on previously recorded clinical and retrospective observations. Institutional ethical approval or animal-use approval should be stated according to the documentation available for the original study.
- **Conflict of interest:** The authors declare no conflict of interest.
- **Funding:** No specific external funding was reported.
- **Author contributions:** Dr. Gagan Deep Singh—conceptualization, clinical interpretation and manuscript preparation; Dr. Nilam—literature review and scientific interpretation; Dr. Prachi—data interpretation and manuscript review.

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