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Comprehensive evaluation of haemato-biochemical profiles and gastrointestinal parasitism in equine of nomadic Gaddi tribe

Jagvir Singh[1*], Ajay Katoch[1], Ankur Sharma[1] and Adarsh Kumar[2]
DGCN College of Veterinary and Animal Sciences,
Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, 176062

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Abstract

Equines play an integral role in the lives of Gaddi tribe, a pastoral community found in Himalayan regions of northern India. Horses integral to the Gaddi tribe in northern India's Himalayan regions, are renowned for their endurance, agility, and adaptability to harsh terrains. Studying haemato-biochemical parameters and gastrointestinal (GIT) parasitism is crucial for assessing the health and physiological adaptation of these equines of the nomadic Gaddi tribe. Fifteen blood and faecal samples collected from these ponies at a mid-hill altitude revealed high prevalence of GIT parasitism (80%). All the equines were infected with Strongyle nematodes. The haemato-biochemical profile showed leucocytosis, elevated levels of blood lactate, LDH, and alkaline phosphatase, while serum electrolyte analysis indicated increased ionic calcium. Based on high parasitic load during migration, regular deworming is recommended to maintain the health and body condition of these migratory equines.

Keywords: Equine, Gaddi, Parasitism, Haematobiochemical profile

Pastoralism is a sophisticated natural resource management system characterized by a dynamic and symbiotic relationship among ecosystems, domesticated livestock, and human communities. It represents the complex relationship between pastures, livestock, and humans, ensuring the sustainable use of available resources in challenging ecological settings (Thakur *et al*. 2025). India is predominantly an agricultural country and animal husbandry is an integral part of its economy. Himachal Pradesh has about 91 per cent population that depends directly or indirectly on animal husbandry, agriculture, and horticulture (Vatsa 2013). Pastoralism significantly helps reduce unemployment among uneducated rural youth by providing them with sustainable livelihoods (Pathak and Rajput 2015).Equines play a vital role in the lives of Gaddi tribe, a pastoral community found in Himalayan regions of northern India. These horses owned by Gaddi tribe are known for their remarkable endurance, agility and adaptability to the harsh terrains of the Himalayas. Gaddi horses are typically small to medium-sized, sturdy, and well-adapted in traversing steep and rugged trails (Fig. 1).

Fig. 1 Equines in their migratory tract along with flock

They possess strong hooves, dense coats, and a hardy constitution. The Gaddi people have traditionally kept horses to carry their belongings, relying on their strength and endurance for travel through rugged terrains (Pathania and Dev 2015). Haemato-biochemical values mentioned in literature may not be fully applicable to these equines because these values are influenced by multiple factors including breed, environment and management differences. Studying the haemato-biochemical parameters is crucial for assessing the health,

[1]Department of Veterinary Medicine; [2] Department of Veterinary Surgery and Radiology
[*]Corresponding Author e-mail- Jagvir.619@gmail.com

nutritional status, and physiological adaptation to high-altitude environments. Gastrointestinal (GIT) parasitism is a significant health concern in these horses due to their migratory lifestyle, these horses are exposed to varied environmental conditions, increasing their susceptibility to parasitic infestations. Considering that no detailed study regarding haemato-biochemical profiles and GIT parasitism, has been conducted the present study was designed with the objective to evaluate haemato-biochemical profile and GIT parasitism in migratory equines.

Materials and Methods

The study was conducted on a total of 15 male horses, aged between 2-6 years, during their downward migration, when they were temporarily stationed in the vicinity of Palampur (approximately 1,350 m above mean sea level) in the sub-humid mid-hill zone. Faecal samples from migratory horses were collected and screened for the presence of eggs of the gastrointestinal parasites. Five grams of faecal sample was collected directly from the rectum of each equine in a clean polythene bag. The faecal samples were analysed by direct smear method for detecting eggs of GIT parasites. About 2 mL of blood was collected from the jugular vein in sterile vials containing EDTA for complete blood count (CBC). Another 5 mL blood was collected in clot activator for serum separation. A fresh drop of blood was used immediately to measure blood lactate levels. These serum samples were then subjected to further biochemical, electrolyte and mineral estimations.

The haematological parameters were studied using Mindray BC-5000 Vet auto-haematology analyser. Parameters assessed were Haemoglobin (Hb) (g%), Packed cell volume (PCV) (%), Total erythrocyte count (TEC) ($x10^{12}$/L), Total leucocyte count (TLC) ($x10^{9}$ /L), Mean corpuscular volume (MCV) (fL), Mean corpuscular haemoglobin (MCH) (pg), mean corpuscular haemoglobin concentration (MCHC) (%) and platelet count(10^{9}/L). Biochemical parameters studied were Alanine aminotransferase (ALT)(U/L), Alkaline phosphatase (ALP)(U/L), Gamma glutamyl transaminase (GGT)(U/L), Aspartate aminotransferase (AST) (U/L), Total bilirubin (mg/dL), Blood glucose(mg/dL), Total plasma protein (g/dL), Blood urea nitrogen (mg/dL) and creatinine (mg/dL) using Agappe Mispa CXL Pro Plus (Agappe Diagnostics Ltd).Electrolytes were also examined using Microlyte electrolyte analyser (Microlab Ltd.). Parameters included Sodium, Potassium, Chloride, Ionic calcium and Total calcium. Lactate dehydrogenase (LDH) in serum was estimated (U/L) using the Lactate dehydrogenase kit manufactured by Chemelex S.A. Industria, Barcelona, Spain. Measurement was done using Semi-Automatic Blood Chemistry Analyser Microlab 300 using photometry method. In addition, blood lactate levels were measured using hand held B-Arm Lacto spark lactate meter (Sensacore Ltd.).

Results and Discussions

Equines of the nomadic Gaddi tribe hold significant importance due to their integral role in the community's livelihood. These horses are highly adapted to their native agro-climatic conditions and are valued for their hardiness and unique genetic traits.

However, a little information is available on various haemato-biochemical indices and GIT parasitism of these equids. Prevalence of GIT parasites was found to be 80% (12/15) on direct smear examination. All the equines were infected with Strongyle (Fig. 2).

Fig.2 Strongyle Egg

Interestingly, no gastrointestinal (GI) parasites other than Strongyle nematodes were observed in this study. While the exact reason for this remains unclear, Strongyle nematodes are considered the most significant internal GI parasites in equines. Their

infection is prevalent worldwide and poses a serious threat to equine health (Postoli *et al*. 2010). High prevalence of GI parasites in the study may be due to the difference in the region's agro-ecology and equines population, and the tradition of not using equines anthelmintic therapy in the study population. The overall prevalence of GI helminths recorded in the present study was in close proximity with the observations of Katoch *et al*. (2006), who reported 75% prevalence from Spiti horses in Himachal Pradesh. However, a lower prevalence (61.62%) of GIT helminths was reported by Sengupta and Yadav (2003) in equines in western Himalayan region.

The mean value of the total leucocyte count was found elevated, exceeding the reference range and it might be because of physiological leucocytosis resulting from catecholamine release due to excitement, fear, or vigorous exercise (Walton et al. 2021). Other reason of leucocytosis may be due to the heavy infestation of strongyle in these horses (Radostits *et al*. 2007). All the other parameters remained within the normal range (Table 1). Biochemically, the levels of alkaline phosphatase, blood lactate, and lactate dehydrogenase were higher than the reference range, while all other parameters remained within the normal range (Table 1).

Intense exercise leads to muscle fatigue manifested by increased enzyme activity, resulted in significant differences in ALP activity in the intensively used horses (Padalino *et al*. 2007). Increased blood lactate and LDH in horses is a sign of anaerobic metabolism, typically occurring when oxygen supply to the muscles is insufficient to meet energy demands. This often happens during intense or prolonged workload. The LDH activities are considered to be the main indicators of myocyte stability. The elevated level of lactate dehydrogenase is the result of more anaerobic energy supply in the body (Vrankovic *et al*. 2015).

The electrolyte profile revealed increase in ionic calcium levels, while all other parameters remained within the normal range (Table 2). This suggested a selective elevation in ionic calcium without significant changes in other electrolytes. Strenuous physical activity elevates bone resorption leading to increased bone turnover. This process releases calcium from bones into the bloodstream, raising serum ionic calcium levels (Senda *et al*. 2021).

Table 1. Haematological and Biochemicalprofile of Migratory Horses

Haematological profile				Biochemical profile			
Sr. No.	**Parameters**	**Mean Value (n=15)**	**Normal Range (MSD Vet Manual)**	**Sr.No.**	**Parameters**	**Mean Value (N=15)**	**Normal Range (MSD Vet Manual)**
1.	Total Leucocyte Count (10^9/L)	13.31±1.34	5.6-12.1	1.	Glucose (mg/dL)	129.32 ± 11.35	62-134
2.	Neutrophil (%)	50.83±4.01	52-70	2.	Bilirubin (mg/dL)	1.50 ± 0.11	0-3.2
3.	Lymphocyte (%)	42.03±4.54	21-42	3.	AST (U/L)	402.08 ± 30.2	160-412
4.	Monocyte (%)	2.93±0.48	0-6	4.	ALT (U/L)	21.49 ± 2.09	5- 43
5.	Eosinophil (%)	3.18±0.74	0-7	5.	ALP (U/L)	374.70 ± 41.90	88-261
6.	Total Erythrocyte Count (10^{12}/L)	7.22±0.39	6.0-10.4	6.	GGT (U/L)	24.90 ± 2.77	6-32
7.	Haemoglobin (g/dl)	11.21±0.37	10.1-16.1	7.	Total Protein (g/dL)	7.69 ± 0.179	5.6-7.6
8.	Packed Cell volume (%)	30.54±1.21	27-43	8.	BUN (mg/dL)	36.62 ± 5.22	11-27
9.	Mean Corpuscular Volume (fL)	43.09±2.41	37-49	9.	Creatinine (mg/dL)	1.10 ± 0.04	0.4-2.2
10.	Mean Corpuscular Haemoglobin (pg)	15.82±0.55	13.7-18.2	10.	Blood lactate (mmol/L)	3.96 ± 0.12	0.5 – 2
11.	Mean Corpuscular Haemoglobin Concentration(g/dL)	34.84±3.22	35.3-39.3	11.	LDH (U/L)	722 ± 44.06	112-456
12.	Platelet (10^9/L)	214.18±19.1	117-256				

Table 2. Electrolyte profile of Migratory Horses

Sr. No.	Parameters	Mean Value(n=15)	Normal Range (MSD Vet Manual)
1.	Sodium (mmol/l)	137.46 ± 0.79	128-142
2.	Potassium(mmol/l)	3.81 ± 0.43	2.9-4.6
3.	Chloride (mmol/l)	101.96 ± 0.75	98-109
4.	Ionic Calcium (mmol/l)	1.81 ± 0.06	1.45 – 1.75
5.	Total Calcium (mg/dl)	11.97 ± 0.33	10.2-13.4

Conclusion

The prevalence of GIT parasitism in these horses was high when assessed at mid-hills altitude with increased total leucocyte count and increased level of blood lactate, lactate dehydrogenase and ionic calcium. Considering the high parasitic load during migration regular deworming of these equines is advised to keep them healthy and in good body condition.

Conflict of interest: The authors declare that there is no conflict of interest among the authors in this research paper.

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