

## RESEARCH ARTICLE

# Epidemiology and Haemato-Biochemical Changes in Mange Infested Camels

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### ABSTRACT

Mange in camel, also named as sarcopticosis is defined as an extremely contagious skin disease characterized by scab formation, pruritic dermatitis, thickening and corrugation of skin and hair loss. A total of 21 positive cases of mange infestation were selected from those presented at the Veterinary Clinical Complex of the College, in Anand and from surrounding villages. The affected camels were divided into 3 groups, viz., B, C, D each group comprised of 7 camels, while seven healthy camels in group A served as control. The maximum prevalence of sarcoptic mange among infected animals was found in the age group of >6 years (52.38%), followed by 4-6 years (38.09%) and in <3 years age groups (9.52%), and also in females than the males (85.71 vs 14.29%). The levels of haematological values, viz., haemoglobin, total erythrocytes count, packed cell volume, neutrophils, basophils, MCV and MCH were found to be significantly ( $p < 0.05$ ) decreased, whereas the total leukocytes count, lymphocytes and eosinophils were increased significantly ( $p < 0.05$ ) in mange affected camel as compared to healthy ones. The biochemical constituents, viz., total serum protein, alanine aminotransferase and zinc concentrations were found significantly ( $p < 0.05$ ) lower. In contrast, serum creatinine, aspartate aminotransferase and copper concentrations were increased significantly ( $p < 0.05$ ) in mange affected camels. The changes reflected that the mange infestation causes hepatocellular and renal damage, apart from general stress to the camel.

**Keywords:** Camel, Haemato-biochemical alterations, Mange infestation.

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### INTRODUCTION

Camel is an important animal as it is well adapted in unique manners in the hot, arid, and semi-arid environments (Schwartz, 1992). It survives without water and food for several days, and this distinctive ability of artiodactyl mammal makes it perfect for such harsh conditions that's why it is traditionally referred to as "The ship of the desert" (Schwartz and Dioli, 1992; Werney, 2003). The skin surface acts as an anatomic and physiologic barrier between the animal and the environment. Camels are exposed and affected by a range of ectoparasites, causing a loss in body condition, health, and productivity. The sarcoptic mange is economically one of the important diseases and is considered as one of the foremost prevailing and chronic debilitating artiodactyl mammalian diseases with high morbidity and low mortality. Animals in poor condition are more prone to infection (Higgins, 1986). The single or a combination of several species of mite causes the camel mange. Some species of mange and mites are more commonly spread worldwide than others. Camel mange is a highly contagious and debilitating skin disease of camels, which can spread to herdsmen, or others associated with infected animals. The camels affected with mange show general distress, generalized skin damage and also the vital organs damage like liver and kidneys, which is reflected by altered haemato-biochemical profile (Gorakh *et al.*, 2000; Singh *et al.*, 2003; Dixit *et al.*, 2009; Varia *et al.*, 2018; Jain *et al.* 2019). This investigation was planned to study and compare the haemato-biochemical changes among mange infected and healthy camel under the middle Gujarat climate.

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### MATERIALS AND METHODS

The present investigation was undertaken from August 2019 to March 2020, during which initial sampling was done from the 54 camels suffering from skin afflictions and presented at the Veterinary Clinical Complex (VCC), Veterinary College, Anand, and nearby villages of Anand district. Skin scrapping of all these animals was done, which revealed mange infestation of varying grades in 21 camels. The affected camels were divided into 3 groups, viz., B, C, D each group comprising of 7 camels in each, for the purpose of different treatment approaches, while seven healthy camels served as control group A. The information on an epidemiological

parameter such as age and sex were also collected in the present study. All animals were grouped as per their age into following class <3 years, 4-6 years, and >6 years. Blood samples (4 ml) were collected from the jugular vein in sterile plastic K<sub>3</sub>EDTA vials from all 7 healthy, and 21 affected animals before the initiation of treatment for haematological analysis by Automatic Whole Blood Analyzer (Abacus Junior Vet-5) and 8 ml blood was collected in clot activator vials for serum. The serum biochemical parameters studied included, total protein (g/dl), creatinine (mg/dL), Alanine amino transferase-ALT (U/L), and Aspartate aminotransferase - AST (U/L) by using standard assay kits with the help of Clinical Serum Biochemistry Auto-analyser (CKK 300). The data was analyzed by using a completely randomized design as per Snedecor and Cochran (1980).

## RESULTS AND DISCUSSION

In this study, the overall prevalence rate of mange in camel was 38.89 (21/54) %. The camels were distributed based on their age into three groups, viz., < 3 year, 4 to 6 years and > 6 years. The results of a camel with mange infestation found, and their frequency based on total and manage affected

camels for three age categories are presented in Table 1. The maximum prevalence of sarcoptic mange was found in camels with age group of >6 years (47.83 %), followed by 4-6 years (42.00 %) and in <3 years age groups (14.66 %). Among the total positive cases, also the prevalence was more in the age group of >6 years, followed by 4-6 years and in <3 years age groups (Table 1). Parmar *et al.* (2005) and Jain *et al.* (2019) also reported the highest incidence of mange in camels of 5-10 years of age group.

The mange infestation was more in male (43.90 %; 18/41) than in female (23.07 %; 3/13) camel. Among the total positive cases, also the prevalence was more in male than a female camel (85.71 vs. 14.29%). The details of the results are presented in Table 2, which indicates that more males were affected than females. Jain *et al.* (2019) and Parmar *et al.* (2005) reported a similar higher incidence of mange in the males as compared to females, and the difference was non-significant.

### Haematological Findings

The results of haematological values (Table 3) reveal that the levels of haemoglobin (Hb), total erythrocytes count (TEC), packed cell volume (PCV), neutrophils, basophils, mean corpuscular volume (MCV) and mean corpuscular

**Table 1:** Age wise prevalence of sarcoptic mange infestation in camels (n=21)

Age	Total No. screened	No. found positive	Percent of total	Percent among infected
< 3 years	12	02	16.66	9.52
4 – 6 years	19	08	42.10	38.09
> 6 years	23	11	47.83	52.38
Total	54	21	38.89	100.00

**Table 2:** Sex wise prevalence of sarcoptic mange infestation in camels (n=21)

Age	Total No. screened	No. found positive	Percent of total	Percent among infected
Male	41	18	43.90	85.71
Female	13	03	23.07	14.29
Total	54	21	38.89	100.00

**Table 3:** Haematological findings of healthy and mange infested camels put under different treatment groups on day '0' (Mean ± SE)

Haematological Parameters	Healthy group	Treatment groups		
		Group B	Group C	Group D
Hb (g/dL)	11.99 <sup>c</sup> ± 0.15	7.68 <sup>b</sup> ± 0.26	6.52 <sup>a</sup> ± 0.11	6.55 <sup>a</sup> ± 0.11
TEC (x10 <sup>6</sup> /cmm)	7.58 <sup>c</sup> ± 0.27	5.60 <sup>b</sup> ± 0.13	4.89 <sup>a</sup> ± 0.78	5.03 <sup>ab</sup> ± 0.26
TLC (x10 <sup>3</sup> /cmm)	14.32 <sup>a</sup> ± 0.26	19.88 <sup>b</sup> ± 0.52	22.56 <sup>c</sup> ± 0.28	23.78 <sup>d</sup> ± 0.30
PCV (%)	30.62 <sup>c</sup> ± 0.76	19.95 <sup>b</sup> ± 0.63	17.90 <sup>a</sup> ± 0.39	17.21 <sup>a</sup> ± 0.30
Lymphocytes (%)	43.61 <sup>a</sup> ± 0.52	57.41 <sup>c</sup> ± 0.33	53.68 <sup>b</sup> ± 0.14	56.50 <sup>c</sup> ± 0.55
Neutrophils (%)	50.04 <sup>c</sup> ± 0.70	34.54 <sup>a</sup> ± 0.52	38.14 <sup>b</sup> ± 0.28	34.75 <sup>a</sup> ± 0.48
Eosinophils (%)	5.91 <sup>a</sup> ± 0.29	7.58 <sup>b</sup> ± 0.24	7.80 <sup>bc</sup> ± 0.19	8.33 <sup>c</sup> ± 0.18
Basophils (%)	0.16 <sup>b</sup> ± 0.05	0.06 <sup>a</sup> ± 0.02	0.05 <sup>a</sup> ± 0.00	0.03 <sup>a</sup> ± 0.00
Monocytes (%)	0.27 ± 0.05	0.38 ± 0.07	0.32 ± 0.07	0.38 ± 0.06
MCV (fl)	40.55 <sup>b</sup> ± 1.08	35.69 <sup>a</sup> ± 1.33	36.55 <sup>a</sup> ± 0.62	34.68 <sup>a</sup> ± 1.63
MCH (pg)	15.90 <sup>b</sup> ± 0.39	13.72 <sup>a</sup> ± 0.50	13.32 <sup>a</sup> ± 0.26	13.19 <sup>a</sup> ± 0.57
MCHC (%)	39.27 ± 0.77	38.62 ± 0.45	36.50 ± 0.92	38.14 ± 0.96

Means with uncommon superscripts within the row (a,b,c) differ significantly (p < 0.05).

**Table 4:** Serum biochemical findings in healthy and mange infested camels put under different treatment groups on the day '0' Mean ( $\pm$ SE)

Biochemical findings	Healthy group	Treatment groups		
		Group B	Group C	Group D
Total Protein (g/dl)	7.59 <sup>b</sup> $\pm$ 0.13	6.21 <sup>a</sup> $\pm$ 0.18	5.88 <sup>a</sup> $\pm$ 0.73	5.88 <sup>a</sup> $\pm$ 0.62
Creatinine (mg/dl)	0.94 <sup>a</sup> $\pm$ 0.51	2.59 <sup>b</sup> $\pm$ 0.14	2.59 <sup>b</sup> $\pm$ 0.11	2.48 <sup>b</sup> $\pm$ 0.70
AST (U/L)	64.03 <sup>a</sup> $\pm$ 0.97	79.84 <sup>b</sup> $\pm$ 1.01	81.11 <sup>b</sup> $\pm$ 0.74	80.55 <sup>b</sup> $\pm$ 0.68
ALT (U/L)	22.39 <sup>b</sup> $\pm$ 0.33	20.20 <sup>a</sup> $\pm$ 0.13	20.16 <sup>a</sup> $\pm$ 0.47	20.03 <sup>a</sup> $\pm$ 0.66
CU ( $\mu$ g/dL)	89.74 <sup>a</sup> $\pm$ 2.19	118.47 <sup>b</sup> $\pm$ 3.32	111.70 <sup>b</sup> $\pm$ 1.40	115.98 <sup>b</sup> $\pm$ 4.19
Zn ( $\mu$ g/dL)	112.09 <sup>c</sup> $\pm$ 1.65	81.38 <sup>b</sup> $\pm$ 2.06	74.95 <sup>a</sup> $\pm$ 1.17	78.50 <sup>ab</sup> $\pm$ 1.13

Means with uncommon superscripts within the row (a,b,c) differ significantly ( $p < 0.05$ ).

haemoglobin (MCH) were decreased significantly, whereas those of total leucocytes count (TLC), lymphocytes and eosinophils were increased significantly ( $p < 0.05$ ) in all three groups of mange affected camels as compared to healthy control group (Table 3). These findings concurred well with the earlier reports of Gorakh *et al.* (2000), Singh and Gahlot (2000), and Mathur (2004). The decreased value of Hb, PCV, and TEC in mange affected camels indicate the anaemia in comparison with healthy camels. Mange mites scrape the skin surface and feed on exudates and oozing of blood from small surface haemorrhages leading to decrease in haemoglobin concentration and RBC value. The decrease in total erythrocyte counts might cause decrease in Hb concentration. The damage to skin also causes stress to the animal and secondary bacterial infections leading to elevated TLC.

### Biochemical Findings

The results of biochemical values presented in Table 4 revealed that the serum total protein, ALT and zinc concentrations were decreased significantly ( $p < 0.05$ ), while serum creatinine, AST and copper concentrations were increased significantly ( $p < 0.05$ ) in mange affected camels than in the healthy control group. These findings concurred well with the earlier reports of Dongre (2000), Singh *et al.* (2003), Dixit *et al.* (2009) and Varia *et al.* (2018). The reduction in total protein value is attributed to seepage of protein through exudation, extravasation of fluids to interstitial tissues and tunnels made by mites. The values of AST and ALT varies according to the liver function which is associated with the physiological and health conditions of the animal. In cases of liver damage both serum AST and ALT levels are found elevated (Dongre, 2000; Dixit *et al.*, 2009). However, Varia *et al.* (2018) noted non-significant variation in both AST and ALT concentration in mange affected and healthy camels, while Gorakh *et al.* (2000) reported decrease in alanine aminotransaminase in the camels suffering from sarcoptes mange infestation as we found, but the clarification for this decline was difficult.

The elevated serum copper and decreased serum zinc concentration found in mange affected camels as compared to healthy ones concurred well with the observations of

Dixit *et al.* (2009). This could be attributed to alopecia and keratinization of skin in mange affected camels since copper and sulfur are important in hair follicle/growth and in absence of hair coat, the copper is probably retained at an elevated level in circulation. Similarly, keratinization of the skin involves zinc. Hence there could be depletion in circulatory zinc concentration.

From the study, it was concluded that mange infestation in camels causes a significant decrease in haemoglobin, TEC, PCV, serum total protein, serum ALT and serum zinc, and increase in total leucocyte count, lymphocytes, eosinophils, creatinine, serum AST and copper levels indicating hepatocellular and renal damage.

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