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Prevalence, clinical and haemato-biochemical studies on mange in cattle

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Abstract

The aim of the present study was to find out the prevalence of mange in cattle and determine Clinico-haemato-biochemical alterations associated with it. Total 308 cattle were screened during the period of 1 year from October 2021 to September 2022. The overall prevalence of mange was found 7.14 percent and the percent distribution of sarcoptic mange was higher (68.18 percent) as compared to psoroptic mange (31.82 percent). Age group-wise prevalence of mange was recorded highest in cattle below 6 months age, followed by 6 months to 3 years age group and lowest in adult cattle (above 3 years of age). The prevalence of mange was higher in crossbred cattle as compared to indigenous cattle. Female animals were more affected with mange than the male animals. Season-wise prevalence of mange was highest during winter season, followed by rainy and summer season. Clinical examination revealed alopecia, itching, discoloration of skin, scab/ crust formation, thickening of skin, erythema of skin and wrinkling of skin. Analysis of haematological parameters showed that haemoglobin, packed cell volume, total erythrocyte count and lymphocytes were significantly ($p < 0.01$) reduced in mange affected cattle, whereas total leukocyte count and eosinophils were significantly ($p < 0.01$) increased. Among biochemical parameters, serum total protein, serum albumin and serum globulin were significantly ($p < 0.01$) decreased in mange affected cattle.

Keywords: cattle, haemato-biochemical, mange, psoroptes, sarcoptes

Introduction

Across the Indian subcontinent, domestic animals are usually infested with several ectoparasites, among which mite infestation posed a great threat to livestock (Singh *et al.*, 2018) [13, 14]. Mange remains the most prevalent, endemic and neglected ectoparasitic infestation in cattle globally and can cause recurrent outbreaks. Burrowing and feeding activities of mite causes mechanical damage, secretion of irritant substances or immunological hypersensitivity to foreign antigen of mite resulting in inflammation and severe itching (Nazir *et al.*, 2014) [18]. Infestations by mange mites not only leads to deterioration in the quality of skin from aesthetic point of view but also lead to economic losses in the form of reduced grazing time resulting in fall in milk production and poor weight gain. Mange also has zoonotic importance as the infection can be transmitted to human beings (Sharma *et al.*, 2021) [12]. Even though, no systemic epidemiological and clinical investigation was carried out in Udaipur region of Rajasthan. The present study was therefore undertaken to find out prevalence, clinical and haemato-biochemical alterations in mange affected cattle.

Materials and Methods

Study population

In this study, total 308 cattle were screened from various organized and unorganized farms of Udaipur district as well as animals presented in Veterinary Clinic Complex, CVAS Navania, irrespective of age, breed and sex. The current investigation was carried out for a period of 1 year from 2021 to 2022, in the Department of Veterinary Medicine, College of Veterinary and Animal Science, Navania, Udaipur (RAJUVAS, Bikaner).

Collection and examination of skin scrapings

Each cattle was subjected to thorough physical and clinical examination as per the methods described by Radostitis *et al.* (2007)^[9]. Entire skin coat of all the animals was examined thoroughly for the presence of skin lesions and relevant clinical data were recorded. Skin scrapings were collected from cattle showing skin lesions and examined under microscope for presence of mites, after treating with 10% KOH as per the procedure described by Soulsby (1982)^[16]. Identification of mites was done on the basis of characteristic morphological features as described by Lapage (1962)^[17].

Collection and evaluation of blood samples

Blood samples were drawn from mange affected cattle along with control animals in order to assess haemato-biochemical parameters. Ten apparently healthy cattle were selected to have base line data on basic clinical and haemato-biochemical parameters for the comparison and analysis. Haemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), Platelet Count and Differential Leukocytes Count (DLC) were determined using the techniques stated by Feldman *et al.* (2000)^[2]. Biochemical parameters *viz.* serum glucose, serum total protein (TP), serum albumin, serum globulin, aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALKP), creatinine, blood urea nitrogen (BUN) and total bilirubin were estimated by using automated serum biochemistry analyzer (IDEXX Vet test chemistry analyzer).

Statistical analysis

The data obtained in the research work were statistically analyzed and compared using standard formula given for mean and standard error as per statistical methods described by Snedecor and Cochran (1996)^[15].

Results and Discussion

Prevalence

Out of total 308 cattle, 22 cattle were found affected with mange. Thus the overall prevalence of mange in cattle was found to be 7.14 percent. Almost similar prevalence in cattle has also been noted by Ramesh (2014)^[10] and Thakar (2004)^[17].

Under present investigation, *Sarcoptes scabiei* var *bovis* and *Psoroptes bovis* mites were observed during examination of skin scrapings of cattle. The prevalence of sarcoptic and psoroptic mange was 4.87 (15/308) and 2.27 (7/308) percent, respectively. The findings of present study closely correlated with that of Ramesh (2014)^[10], Agumas *et al.* (2015)^[11] and Nazir *et al.* (2014)^[18].

Variations in temperature, geography and management practices may be contributing factors for differences in the prevalence of mange (Singh *et al.*, 2018)^[13, 14].

Age group-wise prevalence

Age wise prevalence of mange in cattle was 9.83 percent in 0-6 months age group, 6.66 percent in 6 months to 3 years age group and 6.38 percent in animals above 3 years of age. Highest prevalence of mange was observed in cattle below 6 months age group, followed by 6 months to 3 years age group. The lowest prevalence of mange was seen in cattle above 3 years of age. Thus, it was revealed that prevalence of mange decreased with advancement of age in cattle.

Similar findings have also been reported by Thakar (2004)^[17], Vishe *et al.* (2012)^[18] and Singh *et al.* (2018)^[13, 14].

The higher prevalence of mange in young animals could be attributed to huddling tendency of calves leading to close contact with carriers, overcrowding and poor hygiene, soft tender skin and relatively low levels of immunity.

Breed-wise prevalence

Breed-wise prevalence of mange in cattle was 4.83 percent in indigenous cattle and 10.65 percent in crossbred cattle. Higher prevalence of mange was observed in crossbred cattle as compared to indigenous cattle breeds (Gir and non-descript). The findings of present study are in agreement with that of Gebreselama *et al.* (2014)^[3].

Sex-wise prevalence

Sex-wise prevalence of mange was 7.17 percent in female cattle and 7.07 percent in male cattle. Slightly higher prevalence of mange was recorded in female cattle as compared to male cattle. Similar findings were obtained by Singh (2018)^[13, 14] and Nazir *et al.* (2014)^[18].

Season-wise prevalence

Season-wise prevalence of mange in cattle was 9.52, 4.05 and 6.48 percent in winter, summer and rainy season, respectively. Highest prevalence of mange in cattle was observed in winter season, followed by rainy season and lowest in summer season. The present findings are in support with that of Nazir *et al.* (2014)^[18]. Kazmi *et al.* (2009)^[5] and Vishe *et al.* (2012)^[18] also reported higher prevalence of mange in winters.

The higher prevalence of mange was recorded during winter season which might be attributed to close confinement of animals during winters leading to easier transmission of disease between susceptible hosts. The availability of vector population in a particular season also enhances the prevalence of diseases in winter season as compared to summer (Vishe *et al.*, 2012)^[18].

Clinical characterization of mange

Among sarcoptic mite infested cattle, all animals showed alopecia and itching (100 percent), followed by discoloration of skin in 80 percent cases. Formation of scab or crust over the skin and thickening of skin each was recorded in 53.33 percent cattle. Erythema was exhibited by 46.66 percent animals. Wrinkling of skin was recorded in 40 percent cases. Anorexia was also found in 26.66 percent cattle having sarcoptic mange (Table 1).

Out of 7 psoroptic mange affected cattle, 100 percent cases showed alopecia. Clinical symptom of itching was recorded in 71.43 percent cattle. Discoloration of skin was found in 57.14 percent mite infested cattle. Formation of scab or crust was recorded in 42.86 percent animals. Similarly thickening of skin was also seen in 42.85 percent cattle. Wrinkling of skin and erythema of skin each was seen in 28.57 percent cases. Only 14.28 percent cattle exhibited anorexia among psoroptic mange affected cattle (Table 1).

Thus, it was revealed that alopecia was the common clinical finding that was recorded in all mange affected cattle (100 percent), followed by itching (90.90 percent) and discoloration of skin (72.72 percent). Scab/ crust formation and thickening of skin each was found in 50 percent cases of mange in cattle. Other clinical findings of mange recorded in cattle included erythema of skin (40.90 percent) and

wrinkling of skin (36.36 percent). Anorexia was least frequently recorded clinical finding in mange affected cattle (22.72 percent).

Similar findings have been also reported by Kazmi *et al.* (2009)^[5], Ramesh (2014)^[10] and Singh (2018)^[13, 14].

The present clinical findings and skin lesions of mange could be attributed to immune reaction in response to mite infestation. The mite penetrates deeper into stratum corneum of host and causes lysis of the tissues. Later on, mites feed on lysed tissues and leads to formation of deep burrow. During burrowing process, body secretions, saliva, fecal material etc. get deposited which stimulates the host immune system. Therefore, characteristic lesions of mange *viz.* inflammation, erythema and itching causing scratches and rubbing on hard objects resulting in alopecia were seen (Gorakh *et al.*, 2000 and Thakar 2004)^[4, 17].

Haematological parameters

Haematological investigations revealed that haemoglobin (Hb), packed cell volume (PCV) and total erythrocyte count (TEC) were significantly ($p<0.01$) decreased in mange affected cattle (Table 2). The present findings are similar with that of Vishe *et al.* (2012)^[18] and Kumar *et al.* (2022)^[6]. The reduction in mean value of packed cell volume, haemoglobin and total erythrocyte count in mange might be due to decreased feed intake in cattle because of continuous itching sensation, which further leads to deficiency of essential nutrients required for haematopoiesis. It may be

attributed to blood consumption ability of mites from host body (Jain, 1986 and Thakar, 2004)^[17].

Total leukocyte count (TLC) and eosinophils were significantly ($p<0.01$) increased in affected cattle. These changes are in agreement with that of Ramprabhu *et al.* (2001)^[11] and Kumar *et al.* (2022)^[6]. Increased leukocyte count in cattle affected with mange might be attributed to inflammatory and allergic response of host immune system in response to invasion by mites.

Although lymphocytes were significantly ($p<0.01$) reduced, which could be relative in nature with neutrophils and eosinophils that were increased in mite infested cattle (Thakar, 2004)^[17].

Changes in the mean value of platelet count, neutrophil, basophil and monocytes were statistically non-significant in cattle affected with mange as compared to control animals.

Biochemical parameters: Among biochemical parameters, serum total protein, serum albumin and serum globulin were significantly ($p<0.01$) reduced in cattle affected with mange. Non-significant differences were observed in other parameters *i.e.*, ALT, AST, ALKP, serum creatinine, BUN, total bilirubin and serum glucose (Table 2). Vishe *et al.* (2012)^[18] found reduction in serum total protein level in mange. The lower serum total protein, albumin and globulin level in cattle with mite infestation might be due to poor nutritional status as a consequence of reduced feed intake and anorectic condition in diseased animal.

Table 1: Clinical characterization of sarcoptic and psoroptic mange in cattle

Clinical finding	Sarcoptic Mange (n=15)		Psoroptic Mange (n=7)		Overall percentage (%) (n=22)
	Number of affected cattle	Percentage (%)	Number of affected cattle	Percentage (%)	
Alopecia	15	100	7	100	100
Itching	15	100	5	71.42	90.90
Discoloration of skin	12	80	4	57.14	72.72
Scab or crust formation	8	53.33	3	42.85	50
Thickening of skin	8	53.33	3	42.85	50
Erythema	7	46.66	2	28.57	40.90
Wrinkling of skin	6	40	2	28.57	36.36
Anorexia	4	26.66	1	14.28	22.72

Table 2: Mean \pm SE values of various haemato-biochemical parameters in cattle affected with mange and control animals

Parameter	Control group (n=10)	Mange affected cattle (n=22)
Packed cell volume (PCV)* (%)	35.96 \pm 1.21	26.74 \pm 0.76
Haemoglobin (Hb)* (gm/dl)	11.12 \pm 0.40	7.83 \pm 0.22
Total erythrocyte count (TEC)* ($10^6/\mu$ l)	7.45 \pm 0.20	5.64 \pm 0.14
Platelet count ($10^3/\mu$ l)	348 \pm 19.39	341.82 \pm 10.97
Total leucocyte count (TLC)* ($10^3/\mu$ l)	9.73 \pm 0.48	12.93 \pm 0.39
Lymphocytes* (%)	59.40 \pm 1.70	52.05 \pm 1.19
Neutrophils (%)	33.30 \pm 1.36	37.50 \pm 1.21
Monocytes (%)	3.20 \pm 0.32	3.55 \pm 0.22
Eosinophils* (%)	4.10 \pm 0.52	7.14 \pm 0.28
Basophils (%)	0.10 \pm 0.10	0.09 \pm 0.6
Serum total protein* (gm/dl)	7.15 \pm 0.23	5.27 \pm 0.15
Serum albumin* (gm/dl)	3.01 \pm 0.09	2.28 \pm 0.07
Serum globulin* (gm/dl)	4.14 \pm 0.28	2.99 \pm 0.11
Alanine transaminase (ALT) (U/L)	27.60 \pm 1.68	29.36 \pm 1.44
Aspartate transaminase (AST) (U/L)	67.90 \pm 2.73	78.05 \pm 1.91
Alkaline phosphatase (ALKP) (U/L)	41.50 \pm 2.01	45.95 \pm 1.89
Serum creatinine (mg/dl)	0.95 \pm 0.08	0.99 \pm 0.06
Blood urea Nitrogen (BUN) (mg/dl)	17.42 \pm 1.14	15.77 \pm 1.04
Total bilirubin (mg/dl)	0.30 \pm 0.05	0.37 \pm 0.03
Serum glucose (mg/dl)	64 \pm 2.91	54.63 \pm 2.60

* Significant at 1% level ($p<0.01$)

Conclusion

It was concluded that, there was considerable prevalence of mange in cattle in Udaipur district of Rajasthan. Most of cases were due to *Sarcoptes scabiei* followed by *Psoroptes bovis*. Prevalence of mange was affected by age of animal, sex, breed and season. Further alterations in haemato-biochemical parameters were observed in cattle affected with mange, particularly with reference to with packed cell volume, haemoglobin, total erythrocyte count, Mange not only results in skin-related clinical manifestations but also significantly alters haemato-biochemical markers. The determination of clinico-haemato-biochemical characteristics will facilitate the selection of an appropriate therapeutic approach.

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