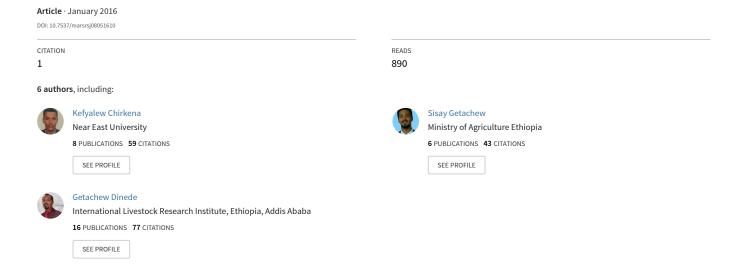# Epidemiology of Cattle Mange Mite in Mekelle and Adigrat Districts: Prevalence and Associated Risk Factors

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# Epidemiology of Cattle Mange Mite in Mekelle and Adigrat Districts: Prevalence and Associated Risk Factors

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**Abstract:** A cross-sectional study was conducted from November, 2008 to April, 2009 to determine the prevalence of cattle mange mite infestation, mange mite's species and associated risk factors for its prevalence in Mekelle and Adgirat districts of Tigray Regional State, Northern Ethiopia. A total of 384 animals comprising of 280 and 104 cattle from Mekelle and Adigrat were sampled respectively. The samples collected, skins scrapings, were subjected to laboratory examination to determine the presence of mange mite infestation. The apparent prevalence of mange mite infestation was found to be 19.6% in Mekelle and 20.2% in Adigrat whereas its overall prevalence in the study areas was 19.8%. *Demodex bovis (*80.3%*)* and *Sarcoptes scabies var bovis (*19.7%*)* were the mite species detected in the study areas. The distribution of mange mite was observed statistically different between Mekelle and Adigrat districts. Similarly, statistically significant mange mite prevalence discrepancy was found in association with body conditions and predilection sites. The highest prevalence was recorded in animals having poor body condition (40%) whilst the least in medium (10%) body conditions. Likewise, the highest prevalence was obtained on the neck (43.42 %), followed by body (38.16%) and head (18.42%), however, the shoulder was found non- infested. Further; age groups, sex categories, breeds and management systems were not found statistically significant risk factors. In conclusion, cattle mange mites are highly prevalent in the study areas warranting integrated control measures to alleviate its impact on the productivity and health of animals.

**Key words**: Adigrat district, Cattle, Mange mite species, Mekelle district, prevalence, Risk factors

## 1. Introduction

Livestock serve as an important source of income for the agrarian community and are one of the Ethiopia's major sources of foreign currency through exportation of skins and hides (Ayele, 2003). However, skin diseases have been the stumbling block against the full utilization of this resource for foreign currency through export of live animals, skin and hides (Ayele, 2003; Bansal, 2005).

Mange is the one among the different parasitic skin disease that affects all species of animals (Blood *et al*., 1983). The typical distribution and manner of spread of mange lesions vary with the host and parasite species (Bowmann, 2003). There are four main genera of manges, which are responsible to cause disease in ruminants; namely, *Sarcoptic* mange (Burn itch), *Demodectic* mange (Follicular mange),

*Psoroptic* mange (body mange, Sheep scab, Ear mange) and *Chorioptic* mange (Tail mange, Leg mange, Scrotal mange) (Urquhart *et al.,* 1996).

The mange mites have a worldwide geographical distribution and occur very seasonally in temperate zones (late winter). The seasonal occurrence of mange on cattle is thought to be influenced by temperature, relative humidity and wetting of the host by rain rather than physiological changes in the host. High temperature, humidity and sun light favor mange mite infestations (Pangui, 1994). Problems with mite infestation are more common in animals with poor body condition. The disease affects all age groups and runs a more chronic course in adults than younger animals (Roberts, 1971; Urquhart *et al*., 1996).

The most recognition characters of *Sarcoptes* are the numerous transverse ridges and triangular scales

on the dorsum, features possessed by no other mite of domestic mammals. *Demodex* is quite different in form and behavior from *Sarcoptes* and it has an elongated tapering body with four pairs of stumpy legs anteriorly. *Psoroptes* have pointed mouth parts and long, three-jointed pedicels bearing funnel-shaped suckers on most of the legs while *chorioptes* have rounded mouth parts and short, un-jointed pedicels bearing cup-shaped suckers (Urquhart *et al*., 1996).

Female mites produce relatively large eggs, from which a small, six-legged larva hatches. A few species are ovoviviparous, producing live offspring. The life cycle is typical for mites; the entire period of development is spent on the host. *Demodex* species are being selective for particular skin sites, namely the hair follicle and sebaceous glands. The *Sarcoptes* mite prefers areas of thin hair, but the lesions may spread to other parts while *Psoroptes* and *Chorioptes* prefer regions covered with hair (Sloss *et al*., 1994; Urquhart *et al*., 1996).

The disease is contagious from exposure to infested animals, humans or contaminated objects and environments. As some of the mange species can affect humans, there is public health significance (Urquhart *et al*., 1996).

Therefore the objectives of this study were to determine the prevalence of cattle mange mite infestation, mange mite's species and associated risk factors for its prevalence in the study areas.

## 2. Materials and Methods
**Study areas**:

The study was conducted in Mekelle and Adgirat districts; the former town is the capital city of Tigray regional state. It is located in between $33^0 24' 30''$ to $13^0 36'52''$ N latitude and $39^0 25'30''$ to $39^0 38'33''$ E longitude and lies in altitudinal range of 2150-2270 m above sea level. Its mean annual rain fall ranges from 280-910mm with the average annual temperature of $11.11^o$c to $24.1^o$c, but some studies show there is high temperature fluctuation. Adigrat is another town located in the Eastern part of Tigray. It lies at an altitude of 2497m above sea level. Its mean annual rainfall is 600mm and located between $14^o16'$N latitude and $39^o26.86'$E longitude with the temperature ranges from $4^o$c to $22^o$c.

**Study animals:**

The study animals were diseased cattle, which have clinical conditions of skin disease, being presented to the veterinary clinics of Mekelle and Adigrat districts. They include cattle of all age groups, both sexes, different breeds of different body conditions. They are kept either under extensive or intensive farming systems.

**Sampling strategy:**

The study cattle were sampled with purposively depending on clinical signs on the skins. Age estimation was done using the dentition as described by Aiello and Mays (1998) whereby they were categorized into four groups (<2 year old, 2-7 year old, 7-12 year old and >12 year old). Body condition scoring was performed in line with Nicholson and Butterworth (1986) standards. A total of 384 and 280 cattle were sampled from Mekelle and Adigrat respectively using Thrusfield (2007) principles. The sample size was determined based on the expected prevalence of 50%, confidence level of 95% and 5% desired absolute precision.

**Study procedures**
*Clinical sign examination and sample collection:*

Thorough clinical examination of cattle with skin disease (crusts and scale, pea-sized nodules, pruritis) was conducted from head to tail covering head parts (ear, face), neck, dewlap, shoulder, back, tail, scrotum, thighs and legs. The hair was clipped around the affected area and then the lesion edge was scrapped using scalpel blade until the capillaries bled (Chauhan *et al*., 2006). The scrapings were preserved in 10% formalin.

*Laboratory examination:*

The scraped material was transferred to a clean universal bottle and a few drop of 10% potassium hydroxide solution was added and allowed to stand for 30 minutes. Next, the sediment was dropped on a clean slide and examined under a microscope of low power magnification to detect mites and their eggs. The collected samples were examined under stereomicroscope and identification was performed as Wall and Shearer (1997), and OIE (2004).

**Data analysis:**

All data were fed into Microsoft excel spread sheets with subsequent transfer to SPSS version 20. Mange mite prevalence was worked out as the proportion of positive animals to the total number of animals examined. Association of the study variables with mange mite prevalence were analyzed using Pearson's chi-square ($\chi^2$). During statistical analysis, a confidence level of 95% was used and P-value of less than 0.05 (at 5% level of significance) was considered statistically significant.

## 3. Results
**Mange mite infestation:**

Out of 384 cattle examined in the study areas 76/384(19.8%) were found mange mite infested. Of 280 cattle examined in Mekelle, 55/280(19.6%) were positive while 21/104(20.2%) cattle were infested in Adigrat. Its prevalence was statistically significant (p<0.05) between the study areas (Table 1). *Demodex bovis 61/76(80.3%)* and *Sarcoptes scabies var bovis*

*15/76(*19.7%*)* were the mange mite species identified in the study areas (Table 2).

**Mange mite distribution association with sex, age, body conditions, breeds, management systems and predilection sites:**

Higher (20.4%) infestation was observed in females than males (19.2%). However, there was no significant statistical association between sex groups in mange mite's infestation. In addition, no statistical significance was found in mite's infestation amongst age categories. Nevertheless, the highest (20.2%) was registered in ages between 7 and 12 years whereas the lowest (14.3%) in cattle of ages less than 2 years. Highest (40%) prevalence was recorded in poor body conditions while the least in medium body conditions (10%). Body conditions were found statistically significant risk factor for mange mite distribution. Higher (19.9%) infestation rate was detected in local breeds than cross-breeds (18.9%), though, statistical association was not observed between breeds in infestation. Moreover, management types were observed non-significant for mite's distribution. Nonetheless, higher (22.8%) distribution was detected in intensive farming system than extensive farming system (19.3%). The effects of sex, age, body conditions, breeds and management systems is summarized in Table 3.Furthermore, the highest (43.42%) infestation was observed on neck parts and nothing was observed (0.0%) on the shoulder; whereas 38.16 % and 18.42% was detected on body and head respectively. Predilection sites were found statistically significant (Table 4).

Table 1: Mange mite's distribution in the study areas

| Study area | Total | Positive | Prevalence (%) | p-value | χ2 |
|---|---|---|---|---|---|
| Mekelle | 280 | 55 | 19.6 | | **14.434** |
| Adigrat | 104 | 21 | 20.2 | | |
| **Total** | **384** | **76** | **19.8** | | |

Table 2: The prevalence of mange mite species identified in the study areas

| Species | Total | Positive | Prevalence (%) |
|---|---|---|---|
| *Demodex bovis* | 384 | 61 | 15.9 |
| *Sarcoptes scabies var bovis* | 384 | 15 | 3.9 |
| **Total** | **384** | **76** | **19.8** |

Table 3: Mange mite distribution association with sex, age, body conditions, breeds and management systems

| Risk factors | Total | positive | Prevalence(%) | p-value | χ2 |
|---|---|---|---|---|---|
| *Sex* | | | | | |
| Male | 193 | 37 | 19.2 | | |
| Female | 191 | 39 | 20.4 | 0.305 | 1.051 |
| **Total** | **384** | **76** | **19.8** | | |
| *Age(years)* | | | | | |
| <2 | 77 | 11 | 14.3 | | |
| 2-7 | 198 | 43 | 21.7 | | |
| 7-12 | 104 | 21 | 20.2 | 0.384 | 3.05 |
| >12 | 5 | 1 | 20 | | |
| **Total** | **384** | **76** | **19.8** | | |
| *Body conditions* | | | | | |
| Poor | 115 | 46 | 40 | | |
| Medium | 151 | 15 | 10 | 0.000 | 52.451 |
| Good | 118 | 15 | 12.7 | | |
| **Total** | **384** | **76** | **19.8** | | |
| *Breeds* | | | | | |
| Local | 331 | 66 | 19.9 | | |
| Cross | 53 | 10 | 18.9 | 0.404 | 0.695 |
| **Total** | **384** | **76** | **19.8** | | |
| **Management systems** | | | | | |
| Intensive | 57 | 13 | 22.8 | | |
| Extensive | 327 | 63 | 19.3 | 0.440 | 0.594 |
| **Total** | **384** | **76** | **19.8** | | |

Table 4: Spatial distribution of mites on host's parts

| Predilection Site | Total | No Positive | Prevalence (%) | p- value | χ2 |
|---|---|---|---|---|---|
| Head | | 14 | 18.42 | | |
| Neck | | 33 | 43.42 | | |
| Shoulder | | 0 | 0 | 0.00001 | 41.690 |
| Body | | 29 | 38.16 | | |
| total | | 76 | | | |

## 4. Discussions

The apparent prevalence of mange mite infestation was found to be 19.6% in Mekelle and 20.2% in Adigrat; whereas its overall prevalence in the study areas was 19.8%. Relatively compared, *Demodex bovis (*80.3%*)* and *Sarcoptes scabies var bovis (*19.7%*)* were the mite species detected in the study areas. The distribution of mange mite was observed statistically different between Mekelle and Adigrat districts. Similar reports were generated in different parts of the country, Ethiopia. Fentahun, *et al.* (2012) reported an overall mange mite's prevalence of 13.79% which is slightly similar to the present result while studying cattle mange mites at Gondor town. He also indicated higher *Demodex* (68.3%) prevalence than sarcoptic (31.7%) types of mange mite's distribution as seen in the current finding.

During this study, the association of cattle mange mite distribution with body conditions, age groups, sex categories, breeds and management systems were tried to be assessed. The finding of the study revealed that age groups, sex categories, breeds and management systems were not found statistically significant risk factors. These findings were similar with works of Fentahun, *et al.* (2012) who identified these parameters to be non-significant during his study. On the other hand, the present work demonstrated body condition to be significant risk factor. Similarly, Meseret *et al*. (2014) showed that body condition was significant risk factor (χ2=7.7; P=0.021), though, his report was in disagreement with the current finding in that age was found significant risk. Also, Semie *et al.* (2015) discovered slightly lower overall prevalence of mange mites which was 10.7% while surveying the prevalence of mange mite infestation on cattle in Achefer District, Northwest Ethiopia. He further pointed out Demodex to be the most dominant (61.0%) mite species followed by psoroptes (24.6%) and Sarcoptes (14.4%) as revealed in the present result.

Regarding mite's predilection sites, the highest prevalence of mange mite infestation were obtained on the neck (43.42 %), followed by body (38.16%) and head (18.42%), however, the shoulder was found non- infested. This finding was in consistent with the report of Urquhart (1996) who indicated that the sparsely haired parts of the host such as neck and head to be the commonest site of infestation.

## 5. Conclusions

The present study revealed the widespread of cattle mange mite infestation in the study areas with an overall prevalence of 19.8%, showing that *Demodex bovis* and *Sarcoptes scabies var bovis* were the major mites species identified in the areas. The study also showed the existence of significant variation in the mite prevalence among cattle of different body conditions and predilection sites. Moreover, it demonstrated that cattle of all age groups, sex categories, breeds and management systems were equally likely affected by the mites. To sum up, the study finding showed that the cattle mange mites were prevailing in the area pointing the necessities of drawing proper control measures.

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