Global Veterinaria 11 (1): 30-35, 2013
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2013.11.1.7442

Prevalence of Bovine Demodicosisin Gondar Zuria District, Amhara Region, Northwest Ethiopia

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Abstract: A cross-sectional study was conducted commencing from September 2011 to April, 2012in Gondar Zuria District, Amhara Regional State, Ethiopia to determine the effect and the prevalence of bovine demodicosis. A total of 206 cattle were examined and skin scrapings were used for samples. SPSS version 19 was used for chi-square test and P-values < 0.05 was taken as statistically significant. There was statistically significant difference observed between the two categories of breeds (x^2=0.002; p < 0.05) although the higher prevalence was observed in cross breed, 20 (15.6%) than local breeds, 12(15.4 %). Correspondingly, there was statistically insignificant difference observed among three categories of age (x^2= 4.518; p > 0.05) even though the highest prevalence was observed from those greater than 3 years old, 26 (18.43 %) while the lowest, 5 (10 %) in those 1 up to 3 years old cattle. However, there was a statistically insignificant variation detected between sexes (x^2=3.372; p >0.05) even if it was higher in female, 23 (17.82%) than male, 9 (11.68 %). Likewise, there was statistically insignificant variation detected among the different sites of infestation (x^2=1.398; p >0.05). However, the highest prevalence were found on shoulder and neck, 14 (6.79 %), 6(2.91) respectively while the lowest on the back and forelimb (0.48 %). Higher prevalence was observed on cattle taken from semi-intensive 12 (22.22%) than extensive 20 (13.15%) management systems. In conclusion the highest overall prevalence (15.5%) of *Demodexbovis* infestation was recorded. This indicates that despite many eff9.orts were tried to study infectious diseases prevalence in the study area, demodicosis has been given lesser attention to be treated as a separate health problem. Therefore, preventive measures should be undertaken rather than treating demodicosis.

Key words: Cattle · *Demodex Bovis* · Gondar Zuria District · Prevalence · Skin Scraping

INTRODUCTION

The demodicidae is a family of prostigmatid mites [1]. The prostigmata is a polyphyletic amalgamation including free living species and such diverse obligate parasites as pilosebaceaus mites [2] containing a single genus of veterinary interest. *Demodex* species of the genus *Demodex*are highly specialized mites that live in the follicles and sebaceous glands of a wide range of wild and domestic animals; including human. They form a group of closely related species, different species being highly specific to particular hosts: *Demodexphylloids* (pig), *Demodexcanis* (dog), *Demodexbovis* (cattle), *Demodexequi* (horse), *Demodexmusculi* (mouse), *Demodexratti* (rat), *Demodexcaviae* (guinea pig), *Demodexcati* (cat) and *Demodexfollicularum* and *Demodexbrevis* on human [1]. The injury they inflict, confined to the skin, is of primary concern only to the hide and leather industry and in show ring competition [3].

Transmission usually occurs by direct contact from the dam to her offspring during nursing in the neonatal period [4] and never between host animals of different spp. (Mondal, 1990). *Demodex*mites are part of the normal fauna of the skin in most. This implies that the small numbers of mites exist in harmony with the host and it is only when the equilibrium between the host and parasite is altered in favor of the mite that excessive proliferation occurs and lesions demodectic mange are produced. Multiple lesions occur commonly in cattle, less commonly in pigs and goats, but no systemic consequences. The demodecticmites of sheep rarely

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assume pathogenicity [4]. Damages to skin may affect the production of leather. Demodectic mange is not considered to be a major parasite of cattle but it may open the skin for secondary problems (bacterial and fungal infectionmastitis [5].

There are inadequate researches undertaken to address livestock demodicosis separately. This also holds true in Gondar Zuria District except some efforts were done to assess its prevalence in Sheep and goat. Studying the existing problems of bovine demodicosisis very crucial for improving skin and hides quality. Therefore, the major objective of this study is to know the effect and to determine the prevalence of *D. bovis* in Gondar Zuria District.

MATERIALS AND METHODS

Study Area: The study was conducted in Gondar Zuria District starting from September2011 to April, 2012. Gondar is located 730kms.Northwest of Addis Ababa in Amhara Regional State. The livestock population of Gondar Zuria District is estimated to be 200,135 cattle (exotic, cross and local), 70,000 sheep, 81,000 goats, 9,000 horses, 5,000 mules, 12,000donkeys and 45,000 poultry [6]. The region receives a bimodal rainfall, the average annual precipitation rate being 1000 mm that comes from the long and short rainy seasons.

Study Animals: The sampling units of the study were cattle of different breed, age and sex that are found in Gondar Zuria District. The origins of these animals were Ambachera, Meredo, Yimada, Shewana, Tachteda, Bahare-genb, Menzro, Zengaj, Sihursarwuha, Lemba, Macha and Denkez sites. The cattle which are found in this area are kept mainly under extensive traditional management system but fewer in semi intensive.

Study Design and Procedures: A cross-sectional study has been conducted on cattle which were found in Gondar Zuria District. Simple random sampling was used to select the study animals. History was taken on previous occurrence of skin diseases, treatment, managementand feeding. Samples of skin scrapings were collected and proper labeling of every necessary information were recorded and then transported to the laboratory. After adding of 10% KOH and then a direct smear of skin scraping were examined under low power microscope.

Sample Size Determination: The sample size required for this study was determined based on expected the formula given by Thrus field [7].Therefore, using 16% previous prevalence the number of cattle needed to demonstrate the prevalence of bovine demodex in Gondar Zuria district was calculated to be 206.

Data Analysis: The data were first entered and managed in to Microsoft Excel worksheet and analyzed using Statistical Package for Social Sciences (SPSS) software version 19. The prevalence of demodecosis was expressed as percentage with 95% confidence interval by dividing the total number of cattle positive to demodecosis to the total number of cattle examined. The prevalence rate of demodecosis was calculated for different risk factors as the number of demodecosis positive animals examined dividing by the total number of cattle investigated at the particular time. The significant difference between the prevalence of demodecosis was determined using Descriptive statistics; Chi-Square test (x^2) and $P< 0.05$ is considered as statistically significant.

RESULTS

Out of the 206 cattle examined in Gondar Zuria District, 32(15.5%) were found positive for *Demodexbovis*. Of these, 128 (62.0%) were local breed and 38 (38.0 %) were cross breed, 15 (7.28 %) were less than one year, 50 (24.27 %) were 1 to 3 years old and 141 (68.44 %) were greater than 3 years old, 77 (37.37 %) were male and 129(62.62 %) were female.

There was statistically significant difference observed (x^2 =0.002; $p <0.05$) between the two categories of breeds although the higher prevalence of demodecosis was observed in cross breed cattle, 12(15.4 %) than local breeds, 20 (15.6 %) (Table 1).

Out of the total 206 cattle examined under different age categories, the highest prevalence of demodecosis was observed from those greater than 3 years old, 26(18.43%) while the lowest, 5(10%) was observed in those 1 up to 3 years old (Table 2) although there was no statistically significant difference observed among the three categories of age ($x^2 = 4.518$; $P > 0.05$).

There was a statistically insignificant variation detected between sexes ($x^2 = 3.372$; $P >0.05$) even if the prevalence of bovine demodicosis was higher in female (Table 3), 23 (17.82%) than male, 9 (11.68 %).

There was also a statistically insignificant difference observed ($x^2$1.39; $p <0.05$) among the sites of infestation. However, the highest prevalence was observed on shoulder and neck, 14(6.79 %), 6 (2.91) respectively while the lowest on back, forelimb and all parts of the body, 1 (0.48 %).

Table 1: Prevalence of bovine demodicosis based on breed.

Breed	Number of cattle examined	Number of cattle found positive (%)
Local	128	20(15.6)
Cross	78	12 (15.4)
Total	206	32(15.5)

x^2=0.002; P<0.05

Table 2: Prevalence of bovine demodicosis based on age

Age	Number of cattle examined	Number of cattle found positive (%)
Less than 1 year	15	1 (6.6)
1 up to 3 years	50	5 (10)
Greater than 3 years	141	26.(18.43)
Total	206	32 (15.5)

x^2=4.518; P>0.05

Table 3: Prevalence of bovine demodicosis based on sex.

Sex	Number of cattle examined	Number of cattle found positive (%)
Male	77	9(11.68)
Female	129	23 (17.82)
Total	206	32(15.5)

x^2=3.372; P>0.05

Table 4: Prevalence of bovine demodicosisbased on site of infestation

Site of infestation	Number of cattle found positive (%)
Shoulder	14 (6.79)
Neck	6 (2.91)
Back	4 (1.94)
Dew lap	2 (0.97)
Ear	1(0.48)
Hind limb	2 (0.97)
Fore limb	1 (0.48)
All parts of the body	1 (0.48)
Ribs	1 (0.48)
Total	32 (15.5)

x^2= 1.39; P <0.05

Table 5: Prevalence of bovine demodicosisbased on management systems.

Management	Number of cattle examined	Number of cattle found positive (%)
Semi-intensive	54	12 (22.22)
Extensive	152	20 (13.15)
Total	206	32(15.5)

x^2=0.05; P$\geq$0.05

There was statistically insignificant difference observed (x^2=0.05; p $\geq$0.05) between the two management systems. Furthermore, relatively higher prevalence was observed on cattle taken from semi-intensive 12 (22.22) than those from extensive 20 (13.15%) management system (Table 6).

DISCUSSION

The present study revealed that the overall prevalence of bovine demodicosis was 15.5%. This was higher than the reports of the previous studies which were conducted by Chalachew [8], 1.63% in Wolayita Sodo, Yacob *et al.* [9], 1.88% in Adama, Regasa [10], 0.42% in Nekemte, Bogale[11], 4.19% in Debre-Zeit, Eydal and Richter [12], 1.8% in Iceland, Izdebska[3], 1% in Poland and Yacob *et al*. [13], 5.9%, in and around Mekelle. But this result is nearest to the previous study of Tewodros *et al.* [14] who reported 16% in and around Gondar town. The current study indicated as if it was one of thehighest prevalences which were conducted in Ethiopia earlier. Therefore, it can suggest that the study area was too conducive for the survival, multiplication and development of *Demodexbovis* which can influence the level of immunity to be infested by *D. bovis* implying that there was a problem on animal management like poor housing, lack of supplement feeding, stress condition and lack of control measures and awareness about the effect of the disease by the owners which can aggravate the disease in the study area.

In the current study, the prevalence rate of *D. bovis* was 15.6% in local breed cattle and 15.4% in cross breed cattle. The result agrees with the previous work of Yacob *et al*. [9] who reported higher prevalence of *D. bovis*in local breed (8.8%) and lower in cross breeds (2.2%) in and around Mekelle. In addition, Yacob *et al.* [13] also reported a lower prevalence of *D. bovis*on cross breeds in Adama. This higher prevalence (15.6%) on local breed of cattle in the current study might be due to the fact that local breeds are more susceptible than the cross breeds to *D. bovis*. Stress condition might be a factor that can lead to this susceptibility. Since local breeds of cattle are mostly reared in Gondar Zuria District while cross breeds of cattle are reared in rural areas; this area might create conducive environment for cross breeds of cattle due to good management than local breed of cattle that are kept under free range of land.

The prevalence rate of *D. bovis* was 22.22% on cattle which were managed under semi-intensive system while 13.15% on extensive system. This is lower than the result which was reported by Yacob *et al*. [9], 23.7% and 76.2% for semi-intensive and extensive systems respectively in and around Mekelle. This difference might be due to a variation in climatic condition, management and feed accessibility between the two study areas. Furthermore, the lower prevalence (13.15%) on cattle which was managed under extensive production system might be

due to the number of cattle that had been taken in this production system were higher (152) than that of the cattle that were kept under semi-intensive production system (54) during the study period.

The prevalence rate of demodicosiswas 11.68% in male and 17.82% in female cattle. This can indicate that demodicosis was encountered in both sexes of cattle (Table 4). This is correlated with the report of Andrews *et al*. [15] and Radostits *et al*. [16] who stated that *D. bovis* occur in both sexes. But, the current report disagree with the previous works of Yacob *et al*. [13] who reported 2.22% in male and 1.67% in female cattle respectively in Adama and the report of Bogale[11] who indicated 4.57% and 3.17% in male and female respectively in Debre-Zeit. This might be due to the stress condition during pregnancy and lactation and the less emphasis of the owners on feeding of female animal and a higher emphasis on feeding of male animals since they used them for ploughing, fattening and for higher financial gain in the market.

*Demodexbovis*were recorded 6.6%, 10% and 18.43% for cattle that were less than 1 year, 1 up to 3 years and greater than 3 years old respectively. This can imply that demodicosis was occurred in all age categories (Table 3). This report correlates with the report of Andrews *et al*. [15] and Radostits *et al*. [16] who stated that *D. bovis* occur in all age categories because it is clear that an organism living as a commensal should suddenly become a pathogen by its rapid unpredicted multiplication; immunodeficiency has been suggested as one cause for this phenomenon to occur. In addition to this, the result is in agreement with the previous work which was done by Yacob *et al*. [13] who reported 1.06% and 2.04% in young and adult cattle respectively. But, the present study disagrees with the previous work of Bogale [11] who reported that higher prevalencewas recorded in young (7.95%) than adult (2.40%) in Debre-Zeit. The record of higher prevalence rate (18.0%) on cattle which were greater than 3 years old might be due to the fact that the number of cattle in this rate age categories were higher (141) than that of the cattle that were less than 1 year (15) and 1 up to 3 years (50).

The current study revealed that the prevalence of *D. bovis* was 6.79% on the shoulder region followed by neck (2.91%), back (1.94 %), hind limb (0.97 %), dew lap (0.97 %), ear (0.48 %), ribs (0.48 %), fore limb (0.48 %) and all parts of the body (0.48 %). So that, the most frequently affected site or the area in which the nodules of *D. bovis* found were on the shoulder and neck while the less frequently encountered part were all parts of the body, forelimb and back (Table 5). This indicates that *D. bovis* might need less haired area and it was responsible for high loss of skin and hide since its infestation varies from site to site. Furthermore, the shoulder and neck regions were vulnerable for different stress conditions like yoke pad and these areas were easy for the Cattle to rub the affected part with permanent objects to avoid itching which might facilitate the infestation, progress and spread of this *Demodex* species. However, the current study had a variation on site the of infestation when compared with the previous report of Kahn *et al*. [17], Ademe *et al*. [18], Schulz *et al*. [19] and Bukva *et al*. [20]. Kahn *et al*. [17] and Ademe *et al*. [18] reported that the common site of infestation were wither, neck, back and flanks. Furthermore, Schulz *et al*. [19] and Bukva *et al*. [20] in Czechoslovakia reported that the distribution of nodules of *D. bovis* on the host's body has typical pattern; whereas the predilection areas were the shoulder, brisket, neck and the adjoining body part.

The current study agree with the reports of Kahn *et al*. [17], Ademe *et al*. [18], Bukva *et al*. [20] and Tewodros *et al.* [14], on similar sites of infestation like shoulder, neck, back, entire body. But, disagree with that of Baker and Fisher [21] and Oppong [22] who reported the prevalence of demodicosis on cattle eyelids was found 11.4% in the Southwestern U.S.A. and 40.2% in Ghana respectively. The variations on various site of infestation might be due to the living style of the parasite as commensals that leads for suddenly pathogenic states or due to the frequent exposure of neck and shoulder for various stress conditions like yoke sore, traumatic injury and kick by ploughing instruments which facilitate the mite to feed easily by puncturing the host cell and sucking out the cell contents of the injured area.

CONCLUSSIONS

In Ethiopia, despite many efforts tried to study infectious diseases prevalence in the country, demodicosis has been given lesser attention to be treated as a separate health problem. There are inadequate researches undertaken to address livestock demodicosis separately. This also holds true in Gondar Zuria District except some efforts were done to assess small ruminants (sheep and goat) mengemites. In this cross-sectional study of bovine demodicosis, high overall prevalence (15.5%) of *D. bovis* infestation was recorded. This can imply that it can be responsible for the great economic losses of hides even at a national level. The female cattle, cattle which were above 3 years old, cross breed of cattle

and cattle found under semi-intensive production system were observed as the most susceptible to *D. bovis*. The shoulder and neck area were the most exposed sites for *D. bovis*. Generally, *D. bovis* was the species of *Demodex* which is highly devastating cattle in the study area.

Recommendations:

- Studying the existing problems of bovine demodicosis is very crucial for improving livestock health, especially for skin and hide quality.
- Awareness should be taken during early spring and end of winter or during summer because during these seasons, the spread of the disease is high.
- The farmers should be advised in order to avoid the risk factors like stress condition and poor nutrition which can aggravate the disease.
- Preventive measures should be taken rather than treating demodicosis which can affect the depth part of the skin where the drug does not reach adequately to the depth part of the skin,
- Tanners should trace back to the origin of hides and skins so that regions with high prevalence of skin defects due to demodicosis should be identified and become a basis for control measure in these particular region.

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