

Epidemiological Study on Bovine Dermatophilosis in and Around Adigrat and Mekelle Cities, Tigray Region Ethiopia

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Abstract: A total of 1,350 local zebu and cross breed animals were examined for bovine Dermatophilosis in around Mekelle and Adigrat cities. The objectives of the study were to know the distribution and the major risk factor associated with Bovine Dermatophilosis. Clinical examination was made and skins scraping from suspected cases were examined for *Dermatophilus congolensis* using Giemsa staining technique. The overall prevalence of the disease was 4.96%. Statistically significant difference ($P < 0.05$) was observed between local zebu (4.26%) and cross breed animals (9.66%). The result also indicated that there was an association between tick infestation and Dermatophilosis. Sex and age were not influence the disease occurrence ($P > 0.05$). This study also indicated severity of skin lesion is one the predisposing factor that had significant effect on the disease prevalence ($P < 0.05$). In this study agro ecology variation between two study areas were assessed but it had no significant influence on the disease ($P > 0.05$). This result showed that ticks infestation, breed and severity of skin lesion are important risk factors influencing the disease pattern in the study area. Improved animal husbandry, decrease injury of skin and tick control strategy is recommended for effective control of the disease.

Key words: Dermatophilosis • Prevalence • Mekelle • Adigrat • Bovine

INTRODUCTION

Dermatophilosis is an acute, sub-acute or chronic skin disease that affects a wide range of domestic and wild animal's species as well as humans and is characterized by development of an exudative epidermatitis followed by scab formation, alopecia and thickening of skin [1].

The disease was first reported in 1915 in the annual report of the Veterinary Department of the Belgian Congo (Now Democratic Congo) by Vansaceghem [2]. Since then, it has been diagnosed in many tropical, subtropical and temperate parts of the world. When the disease was first reported, the causative agent was named as *D. congolensis* and *Actinomyces dermatonomus* [3]. *Actinomyces congolensis* [4] and *streptothrix bovis*. It is now classified as *Dermatophilus congolensis* [5].

Dermatophilus congolensis is the only species belonging to the family dermatophilacea of the order actinomycetales [6]. It is a gram-positive microorganism

having characteristics in common with both fungi and bacteria. Its size and chemical composition distinguish it as a bacterium but it forms a branched mycelium that fragments in to motile coccooid elements resembling the spores of fungus. It has not yet been shown to live as a saprophyte apart from the animal and it is assumed that it lives without causing disease on the skin of the animal during unfavorable periods, becoming pathogenic when the environment become favorable [7].

Dermatophilus congolensis itself is not highly pathogenic but combinational of factors predispose animals to infection, for example malnutrition at the start of the rainy season can affect the course of infection [8].

The disease is an exudative epidermis, it's primarily activity is confined to the living epidermis. Access to this is limited by hair, sebaceous secretions and stratum corneum infection depends on their distribution by soaking or trauma, moisture induces release of infective, motile, flagellated zoospores. These organisms are attracted to low concentration of CO_2 . As the organism

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multiply and inflammatory cells migrate in to the area the CO_2 concentration in the skin increase and zoospores migrate towards the surface of the skin in search for some suitable environment. These scabs are easily lifted by the hair, which protrudes from both surfaces. The primary lesions are painless and non-pruritic [9].

Dermatophilosis has a worldwide distribution but is most prevalent in humid, tropical and subtropical region predisposing factors such as rainfall, humidity and ambient temperature skin lesion due to fore example ectoparasitethony and other trauma, skin pigmentation management practices, intercurrent disease, malnutrition stress and hereditary play an important role in the epidomological features of dermatophilosis [1].

The disease occurs in all areas of the world but can be epizootic in tropical and subtropical areas of the world where it can result in considerable economic loss. The climate is the most risk factor in tropical regions. The disease has its highest incidence and severity during high rainfall season [10].

Dermatophilus congolensis normally affects the epidermis, causing the formation of scabs. It may be demonstrated in smears made scabs emulsified of softened in water or in impression smears from the base of freshly removed adherent scabs. The organism is gram positive but its morphology is more readily appreciated in smears stayed with Giemsa. In stained smears, the organism is seen as branching filaments containing multiple rows of cocci. This characteristics appearance is diagnostic [9].

Dermatophilosis is of economic importance because it can cause great losses to the livestock and leather industries. These are mainly attributed to poor quality of hides and skin and to low meat production as affected animal may lose height and become emaciated other losses are the result of decreased milk production, decrease working capacity of draught cattle, forced culling of infected animal before they reach market value and death in severe cases [1].

In Africa the disease in cattle causes great losses and many deaths and the disease ranks as one of the four major bacteriology diseases which equivalent importance to Contagious Bovine Pleuropneumonia and brucellosis. Losses are from direct animal losses less of animal meat milk production and down grading of hides. In temperate climate deaths are uncommon but cows that fail to respond to treatment and have to be culled are not infrequent. Reproductive in efficiency is a common accompaniment in severe cases [10].

In Africa the disease has been reported in many countries of the continent and its Islands bovine dermatophilosis is one among the major animal disease, which has economic importance in Ethiopia as well as in other parts of Africa. It causes severe economic loss through reduced weight gain, damage to hides and outright death [11].

Dermatophilosis become very important disease in Ethiopia with introduction of exotic cattle for purpose of high milk production [12].

In Ethiopia reports from tanneries show only 30% of the processed skin exported, the remaining being rejected due to poor quality because of disease in reasons for the decrease in quality and quantity of hides is dermatophilosis an infection caused by *Dermatophilus congolensis* [13].

The site most frequently affected is the back of the animal which is one of the valuable parts of the hide if processed in to leather; pin point depressions and disappearance of the grain will be noted [2].

Hides from animals with dermatophilosis are severely downgraded and are not accepted for export. Lightly affected hides might in some cases be sold locally after the scabs have been scraped off. Invasion by *Dermatophilus congolensis* causes exaggeration of the dermal papillae, which can be seen as rounded blemished in the tanned hide. The strength of the leather as a whole decrease and gain cracks appears when the leather is subjected to strain and the hides are therefore rejected [12].

There is a study and published report on the disease in cattle in northern Ethiopia this study showed that season of the year, breed, management, infestation with *Amblyommavriegatum* and agro climatic difference are important risk factors influencing the disease pattern in the region (Northern Ethiopia) [11].

Preventive measures, if at all attainable should aim at interrupting the chain of epidemiological events required for outbreaks of Dermatophilosis. These measures therefore mainly involve methods of husbandry. Tick control, when tick infestations are the most important management factors influencing the prevalence dermatophilosis in cattle. The culling of animals with advanced chronic lesion should also be considered [1].

The principal approach to control the disease the avoidance of predisposing factors the disease usually disappears in dry weather isolation of infected animal and avoidance of contact by clean animal with infected materials such as grooming tools is desirable [10].

Although it has been proved that protection of livestock against excessive wetting is highly successful in the prevention of dermatophilosis, this prophylactic measure is generally impractical when livestock are maintained under extensive system of husbandry. The most effective method of controlling dermatophilosis in cattle is probably tick control and reduction in the number of the other ectoparasite, especially flies [1].

A study and reports showed that the disease common in northern Ethiopia. Although dermatophilosis has become a progressively important disease in this region further survey should be under taken in order to predict the precise control method.

This study emphasized on epidemiological study of bovine dermatophilosis in and around Mekelle and Adigrat cities. The objectives of this paper are:-

- To assess the prevalence of the disease and associated risk factors in the study areas.
- To forward recommendation this may be of value in control of the diseases.

MATERIALS AND METHODES

Study Area: The study was conducted in and around Mekelle and Adigrat veterinary city clinics from December 2008 to May 2009.

Mekelle city is located at an altitude 2000-2200 meter above sea level 39°28E and 13° 32N. Mekelle has rainfall 50-250mm and mean temperature 19°C. Mekelle is 780 Km far from Addis Ababa. The total surface area of the city is 53 km square. The major agro ecology of the area is medium altitude.

Adigrat city is located altitude 2332 meter above sea level it is located 2023 latitude 3929 longitudinal. Adigrat has rainfall 400-600mm and temperature range 4°C – 22°C the total surface of the town is about 896.95 hectare. Adigrat is 903 km far from Addis Ababa, it is North East with about 120 km from the state capital (Mekelle). The major agro ecology of the region is highland and medium altitude.

The total population of animals in and around Mekelle and Adigrat cities was 33,177 and 56,341 respectively.

Study Population: The study animals were cattle came to Mekelle and Adigrat veterinary clinics, the farms found in and around the cities and cattle examined during field work around the cities. A total of 1350 animals were taken from two study areas. From Mekelle 574 indigenous cattle and 76 cross were taken. From Adigrat 600 indigenous

breed and 100 cross breeds were taken. Cross breeds were managed in extensive, semi intensive and intensive management system. Animals were subjectively grouped according to Age, Breed, study area, Agro ecology of tick infestations, severity of skin lesion and sex.

Study Design: Cross sectional study was performed in the Mekelle and Adigrat cities.

Study Methodology

Laboratory and Clinical Examination: Animals were inspected visually and through palpation for skin lesion. Smears were made from skin scrapings collected in sterile dry containers from suspected cases. These were stained with Giemsa solution and examined for morphological characteristics of *Dermatophilus congolensis* following the procedures given by Buxton and Fraster [14]. Ticks were collated from dermatophilus infected and non-infected cattle to assess the association of the tick with the disease.

Questionnaire Survey: Structured questionnaire was prepared and administered to generate information on season, agro ecology, breed, sex, age, tick infestation, severity of skin lesion and to know the owners (Farmers) control measure about the disease of bovine dermatophilosis.

Based on the Associated Risk Factors: The prevalence bovine Dermatophilosis was assessed on the associated risk factor such as age, breed, sex, tick infestation and severity of skin lesion. The examined cattle were subjectively grouped in to three age groups (< 1 year, 1 – 3 years, > 3 years of age). Age was determined by dental structure or teeth number.

The animals were classified in to three groups based on the degree of tick infestation and categorized as no, light and heavy. The level of tick infestation was determined by the burden of the tick and the total number of tick that were found on the animal body and the clinical sign that were observed due during tick infestation. The most common clinical sign that were observed during tick infestation were wound, emaciation, anemic, hair loss (Alopecia) and lameness. If the total number of tick was greater than 20 it was considering as heavy infested.

Severity of skin lesion was determined by extent of the lesion. If the lesion was located only the back of the animal it was consider as light. If the lesion observed different part of the animal body, it was considering as moderate.

Data Analysis: Data was analyzed using a chi square in order to determine the prevalence of bovine dermatophilosis with associated risk factor. 95% confidence interval and P value less than 0.05 was consider as statically significant.

RESULTS

From the total 1350 cattle examine for bovine dermatophilosis 67 (4.96%) for disease.

Breed: Prevalence of 4.26% and 9.66% were observed in local and cross breed animals respectively. The data analyzed show that there was a significance difference between the two breeds ($P=0.0021$ and $X^2=9.463$).

Table 1: The prevalence bovine dermatophilosis in indigenous and indigenous and and cross breeds of cattle in and around Mekelle and Adigrat cities.

Breed	Positive	Negative	Total	Percent
Local	50	1124	1174	4.26
Cross	17	159	159	9.66
Total	67	1283	1283	4.96

Sex: According to this study the prevalence of bovine dermatophilosis was 5.38% in males and 4.7% females (Table 2). The difference was not statically significant ($\chi^2 = 0.329$ and $P = 0.5723$).

Age: Age is considered as one parameter the animals were grouped in three age groups (1 year, 1-3 year, >3 year). The prevalence of the disease for the <1 year, 1-3 year and >3 year were 3.48%, 4.9% and 5.4% respectively.

There was no significant between age group ($P = 0.4964$ and $\chi^2 = 1.401$).

Tick Infestation: An assessment was done on the degree of infestation of tick with no, light and heavy infestation and a prevalence of 1.03%, 3.33% and 11.8% a total number of 383, 580 and 320 respectively this result show that the tick infestation has an association with dermatophilosis ($P = 0.0001$ and $\chi^2 = 52.505$).

Study Areas: The result show that there was no association between the disease and the study areas (Agro ecological variation) ($P = 0.4918$ and $\chi^2 = 0.473$). The prevalence of bovine dermatophilosis in and around Mekelle was 5.38% and 4.57% in Adigrat. The difference is not statically significance.

Severity of Skin Lesion: Analyzed was done based on the severity of skin lesion. The lesions classified as high, moderate and sever depending on the extent of skin lesion. The prevalence is 2.75%, 4.56% and 8.86% respectively. A total number 524 from light, 440 from moderate and 319 sever animal were examined. It show a significance difference ($p = 0.0002$ $\chi^2 = 16.846$).

Questionnaire Survey Result: The main objectives of the questionnaire survey were to know the attitude of owners towards the disease of bovine dermatophilosis.

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Table 2: The relation between sex and bovine dermatophilosis

Sex	Positive	Negative	Total	Percent
Male	28	492	520	5.38
Female	39	791	830	4.7
Total	67	1283	1350	4.96

Table 3: The prevalence of bovine dermatophilosis in different age group

Age	Positive	Negative	Total	Percent
< year	8	222	230	3.48
1-3 year	16	308	324	4.94
> 3 year	43	753	796	5.4
Total	67	1283	1350	4.96

Table 4: The prevalence of bovine dermatophilosis in different degree of tick infestation

Tick	Positive	Negative	Total	Percent
No	4	383	387	1.03
Light	20	580	600	3.33
Heavy	43	320	363	11.85
Total	67	1283	1350	4.96

Table 5: The distribution of bovine dermatophilosis in two study areas

Site	Positive	Negative	Total	Percent
Mekelle	35	615	650	5.38
Adigrat	32	668	700	4.57
Total	67	1283	1350	4.96

Table 6: Prevalence of bovine dermatophilosis in different level of skin lesion

Severity of skin lesion	Positive	Negative	Total	Percent
Light	23	516	539	4.27
Moderate	21	440	461	4.57
Heavy	23	327	350	6.57
Total	67	1283	1350	4.96

Table 7: Owner response towards question

Questions to the owner	No. of respond
1) Local name	20 (50%) said shuhur 20 (50%) said Haffew
2) Familiarity of the disease	36 (90%) are familiar with the disease. 4 (10%) are not familiarized.
3) Pre disposing factor	
I) Age	18 (45%) said adults are more susceptible 22 (55%) said young are more susceptible.
II) Sex	19 (47.5%) said male 21 (47%) said female
III) Breed	12 (30%) said local breeds are affected.
IV) Agro climate	28 (70%) said exotic breed are affected
V) Tick	3 (7.5%) said the disease is common on the high land. 25 (62.5%) said the disease is common in low land. 12 (30%) said the disease is common in middle altitude.
VI) Severity of skin lesion	26 (65%) said is a predisposing factor. 10 (25%) said tick has not influence on the disease. 4 (10%) no respond.
VII) Seasonality	
4) The owner (farmers) control method about the disease of	
- Following up appropriate animal husbandry. Such as feeding, housing and management. dermatophilosis.	22 (55%) said disruption of skin barrier may increase the disease condition. 8 (20%) said has not influence. 10 (25%) no response. 30 (75%) said the disease is common in wet season. 10 (25%) said the disease is common in dry season.
- Avoiding of skin damage factor.	
- Decrease tick infestation (tick control program).	38 (95%) said one of control aid on the disease. 2 (5%) said is not a control method.
- Using traditional treatment	17 (42.5%) said one of control method. 23 (57.5%) said not control method.
- Using of modern medical treatment and its effectives.	20 (50%) said is a control measure. 20 (50%) said they don't use tick control program. 30 (75%) said they can apply to control the disease. 10 (25%) not use. 36 (90%) they can use modern medical treatment. 4 (10%) they didn't use.

DISCUSSION

The prevalence of bovine dermatophilosis was diagnosed in and around Mekelle and Adigrat cities with associated risk factors. The prevalence of bovine dermatophilosis in and around Mekelle city was (5.38%) but in Adigrat city was (4.75%). An overall prevalence was (4.95%).

However, it is considerably lower prevalence as compared to the report of Enquebahe *et al.* [11] the report showed that the prevalence of bovine dermatophilosis in northern Ethiopia was (5.2%) and also lower than the report from Tesfaye [15] his report showed that the prevalence bovine dermatophilosis in and around Mekelle was (5%).

The lower occurrence of the disease in the study area is due to the improved management of herds and familiarity of the owners to the disease. The attitude of the farmers (Owners) change towards modern medical treatment they bring their animal to treat with medical treatment when the animals are infected. Intensive and semi intensive management system is developed in and around cities especially with related to cross breeds. The earlier study mostly conducted in Mekelle and southern part of Tigray. The farmers (Owners) kept their animal in

doors by feeding concentrate feed and they due to short age of grazing land this decrease the prevalence of the disease by reducing their exposure to the fact or that are believed to favor transmission of the disease. There is increasing tick control program and exposure factors by using regular spraying with acaricide.

In addition to the above information the seasonal variation was not considerable in this study because the major working time covers the long dry season from December up to May. This makes difficult to predict the exact prevalence of the disease in the study area. With relation to the predisposing factors the questionnaire survey result show 30 (75%) farmer (Owner) think that the disease occurs in the wet season. The rest 10 (25%) respond that the disease occurs in the dry season. Most researchers agree the disease mostly occur in wet season [11, 16].

With relation to the predisposing factor of breed there was association between breed difference and bovine dermatophilosis. Mostly exotic breed were more susceptible to disease and its prevalence was (9.65%) and the prevalence of local breed (4.25%). There was significance difference ($P < 0.05$) between the two breeds. This agrees with previous report from north Ethiopia [11] from Ethiopia [2, 17] and elsewhere [6, 18].

Other reports indicate that there is a breed difference for susceptibility of bovine dermatophilosis mostly European breeds is more susceptible than indigenous breed this supported by many workers such as [19-22].

Similarity, Seufert [8] explained that there are significantly genetically differences in resistance in cattle, the highly productive European cattle being highly susceptible N. Damas which are well adapted to the environment of the Africa humid savannah only little.

According to questionnaire survey result 28 (70%) the owners respond that exotic breed are more susceptible than local breed but 12 (30%) owner said that local breeds are more susceptible than cross breed.

In this study, female 4.6% and male 5.38% found to be infected with dermatophilosis there was no significance influence of gender on the disease could not be demonstrated ($P > 0.05$) although higher prevalence were recorded in males. This is in agreement with that of Abu-samara [6] and Enquebahe *et al.* [11].

Reported that there is no susceptibility to bovine dermatophilosis due to sex. Contradict the above idea [23,24] started that the disease more prevalent in male than female. Samul and Hugh-Jones [25] however, reported females as more susceptible than males except in younger age, where both sexes appeared to be equally susceptible.

The prevalence of the disease between successive age groups <1 year, 1-3 years and >3 years were 3.47%, 4.93% and 5.4% respectively.

There was no significance difference between age group ($P > 0.05$ and $\chi^2 = 1.401$) this agree with reports of Stewart [26] no age dependent susceptibility to dermatophilosis [11] reported that there was no significant difference between prevalence in different age groups [27]. Reported adult cattle are more susceptible to dermatophilosis than young from Ethiopia [17] reported that adult Ethiopian cattle in extensive grazing were reported to have higher prevalence than young, most of which were kept indoors.

Age and sex difference on the disease 18 (55%) and 21 (52.5%) owner claimed that young and female respectively susceptible for dermatophilosis. The rest oppose this idea they think that adults 18 (45%) and male 19 (47.5%) susceptible for the disease respectively.

Tick had a significant ($P < 0.05$ and $\chi^2 = 52.505$) influence on the disease. The prevalence of the disease depending on different level of infestation such as non-infested, light infested and heavy infested was 1.03%, 3.33% and 11.85% respectively. In agreement with this report a close association between tick and clinical dermatophilosis has been reported [18].

Besides to this [11] explained that there was a significance difference between amblyoma variegatum infected and non-infected cattle for the disease of dermatophilosis.

Skin lesions were reported to occur predominantly at the feeding sites of amblyoma variegatum [28, 29]. In agreement with [17, 24, 30, 31] there is no significance association between tick attachment sites and skin lesion [32,33]. Reported that ticks induce hyper sensitivity reaction and skin lesions there by facilitating transmission. However, later on, an amblyoma variegatum was reported to suppress host immunity and to facilitate clinical disease [31].

Out of the total respondents 26 (65%) considered as a predisposing factor for the disease, where as a 10 (25%) opposite the idea and 4 (10%) they don't have knowledge on the relation between ticks and dermatophilosis.

In this study the result shows that there was no significance difference between study areas. The prevalence of the disease in and around Mekelle was 5.38% and the prevalence of the disease in and around Adigrat city was 4.69%. This result indicates that there was not a significance difference between the two selective sites of the study area ($P > 0.05$ and $\chi^2 = 0.4763$). The major agro ecological in and around Mekelle is middle altitude (2000-2200 meter above sea level) and the major agro ecology of Adigrat is middle altitude and high land (2332 meter above sea level). This agro ecological difference was not show significance for this study but earlier report [11] reported that there was a significance difference in low, medium and high altitude from those cattle that were examined from bovine dermatophilosis from this 3 agro ecological region.

Most of the owner believed the disease was common in low land area 25 (62.5%), 3(7.5%) the disease is common high land area and 12 (30%) said that the disease common in middle altitude.

In this report severity of the skin lesion was considered as one of associate risk factor for bovine dermatophilosis. The result showed that there was significance different between different level of severity os skin lesion it was categorized as light, moderate and sever the prevalence was 2.78%, 4.56% and 8.86% respectively ($P < 0.05$ and $\chi^2 = 16.489$) [6]. Reported that the skin barriers can damaged by various agents which help in the establishment of the disease. These agents are amplified by ox-pecker bird, injuries, trauma associated with concrete floors sharp stones, branches of tree and spines of thorny bushes.

With relation to severity of skin lesion in 22(55%) owner think that disruptions natural skin barrier by different factors may expose for the disease. 8(20%) owner oppose this idea. 10(25%) not give response.

According to questionnaire survey result, bovine Dermatophilosis is important disease in and around Mekelle and Adigrat cities. The majority of the farmers and dairy farm owner 36(90%) are familiar with the disease and locally they call shuhur and Hffew but 4(10%) are not familiar with the disease.

Questionnaire survey result show that the owner control measures about the disease of bovine dermatophilosis all farmers (Owners) use appropriate animal husbandry such as feeding, housing and management.

17(42.5%) avoiding of skin damage factors in order to prevent the disease the remaining oppose this idea 23(57.5%)

20(50%) owner practice tick control program 20(50%) didn't practice tick control program most owner 30 (75%) use traditional treatment but 10(50%) 10(25%) didn't practice traditional treatment 36(90%) of the owner use modern antibiotic treatment and ointment and the remaining 4(10%) didn't use.

CONCLUSION

The prevalence of bovine dermatophilosis in and around Mekelle and Adigrat cities was 4.96%. The predispose factor which was consider as risk factor and its influence on the disease was assessed. The data analyzed showed sex, age and agro ecology of the study areas has not a significance effect on the disease prevalence on the region. According to this study breed was considered as risk factor on the disease of dermatophilosis. It had a significance difference and cross cattle breeds were more susceptible than indigenous breed. The animals infested with tick were more susceptible to the disease than non-infested and there was a significance difference between different levels of tick infestation. The skin barrier of the animal may be disrupting by different factor this may facilitate for dermatophilosis infection. Severity of skin lesion revealed difference on the disease occurrence.

Based on the above conclusion the following points are recommended:

- To predict the exact prevalence of the disease seasonal variation should be considered and studies further

- Prevention should be aimed on to break epidemiological trial.
- Appropriate animal management should be practice in order to decrease the associated risk factor.
- Tick control strategy should be performed with regular spraying and dipping to decrease tick infestation.
- Avoiding skin injuries or prevent these factors which may help to control the disease.
- Chronically infected carrier animals should be culled, as they are the main source of infection to the healthy animals.
- The infected animals should be isolated, disinfect the house and materials in order to prevent further contamination
- Increase the attitude of peoples toward the disease and its control measures.
- Strengthen of the extension package for the treatment, control and prevention of animal disease by veterinary personal and other is pas amount important.
- Further improvement the veterinary infrastructure and facilities with private and governmental efforts are necessary.

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