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RESEARCH ARTICLE

STUDY ON OCCURRENCE OF BOVINE DERMATOPHILOSIS AND ITS POTENTIAL RISK FACTORS IN AND AROUND HORRO GUDURU ANIMAL PRODUCTION AND RESEARCH CENTER, HORRO GUDURU ZONE, OROMIA, ETHIOPIA

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ABSTRACT

A cross-sectional study of dermatophilosis was undertaken from December 2016 to February 2017 on 770 cattle (693 local and 77 cross) with the aim of determining prevalence and associated risk factors in and around Horro guduru animal production and research center of wollega university, Horro guduru zone, western Ethiopia. Culturing of *D.congolensis* and Giemsa staining were the techniques used. Twenty eight of 770 examined animals (3.63%) had dermatophilosis. Prevalence was higher in indigenous zebu (2.83%) than in cross bred (0.94%) cattle, in female cattle (2.43 %) than in male (1.35%), in > 3 years old than in< 3 years old, in wet (2.02%) than in dry season (1.75%), and in cattle with no tick infestation (1.62%) than in cattle infested with tick (2.16%). Statistically significant difference ($p<0.05$) was observed in breed of cattle, age, season of the year and tick infestation ($p<0.05$). The study indicated dermatophilosis is a potential determinant factor for the dairy development. Therefore, factors that bring mechanical injury to the skin and management practices that promote transmission should be avoided.

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INTRODUCTION

Ethiopia is a leading country in the number of animals in African with livestock population of about 53.99 million cattle, 25.5 million sheep and 24.06 million goats (CSA, 2013). Among livestock, Cattle play a significant role in the socio economic aspects of Ethiopia through provision of products like meat, milk hide and draught power for cultivation of the agricultural lands (Tamiru *et al*, 2010). The output in terms of contribution to the improvement of the livelihood of animals' owners and for the national economy is at a lower stage compared to the vast resources on hand. Skin diseases impose economic losses as a result of reduction of wool quality, meat and milk yield losses, culling, mortalities and, losses associated with treatment and prevention of the disease (Chalachew, 2001). Among the skin diseases, bovine dermatophilosis is one of the common economically important diseases of cattle (Awed, 2008). It is a contagious zoonotic skin disease caused by members of aerobic actinomycete (Dalis *et al*., 2010). The exact causative agent of Dermatophilosis is *D. congolensis* which is aerobic, actinomycete, a gram positive bacterium that produces motile zoospores (Hirsh *et al*., 2004). The disease was first reported by vonsoceghem (1915) in cattle in the Belgian Congo (Shoorijeh *et al.,* 2008). The disease affects a wide variety of animals and occasionally humans (Radostits *et al.,* 2007). It is a cause for reduction of milk production down grading of hides quality, skin and wool and affecting weight gain and reproductive performance (Dejene *et al*., 2012). Even though the disease in cattle and sheep is commonly called cutaneous streptotrichosis and mycotic dermatitis respectively, and in horse rain scald, although other local names exist including senkobo skin disease in central Africa, kirchi in nigeria, and saria in malawi. Dermatophilosis is a name common to the disease in all species (Radostits *et al.,* 2007). The disease is non pruritic, and is characterized by exudative, proliferative or hyperkeratotic dermatitis, accompanied by the production of crusts and follicullitis. It invades the skin and causes skin disease (Yeruham *et al*., 2003). The disease had been reported to be more severe in ruminants with particular importance in tropical and subtropical regions (Andrew *et al.,* 2003). The organism can exist in quiescent form with in the epidermis until infection is exacerbated by climatic condition. The disease is transmitted by direct contact with infected animals or indirectly via contaminated objects or flies (Quinn *et al*., 2003). Diagnosis made based on clinical appearance of the lesion on the

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affected animal and demonstrating the causal organism from the lesions beneath the scabs (Kahn, 2005).The outcome of treatment is influenced by the severity and extent of lesions. Parenterally administered antibiotics such as long acting oxy tetracycline are usually effective (Awed *et al*., 2008). Control and prevention measures are based on minimizing the effect of predisposing factors and early treatment of clinical cases (Quinn *et al.,* 2003). In Ethiopia, the disease is one of the economically significance in decreasing the productivity of the animals (Seifer, 1996). Although the presence of the disease was confirmed by (Enquebaher *et al*., 2003) the attention accorded is limited and the epidemiology has not been fully investigated (Radostits *et al*., 2007). In and around Horo Guduru animal production and research center has large population of cattle but, the prevalence extent of the dermatophilosis was not studied. Therefore, the objectives of the study were:

- To determine the prevalence of bovine dermatophilosis in the study area
- To point out the common risk factors associated with the disease in the study area

MATERIAL AND METHODS

Description of the study area

This study was conducted in and around wollega University Horo Guduru animal production and research center, which is located in Horo Guduru wollega Zone of Oromia national regional state at the distance of 275 km west of Addis Ababa. Horro Guduru Wollega zone is located between 09º29´N and 37º26´E, at an altitude of 2,296 m.a.s.l, with a uni-modal rainfall ranging between 1200mm-1800mm (Olana, 2006). The rainy season occurs from April to mid-October. Maximum temperature of 23-27 ^{0}C are reached from January to March, and temperature range of 7^{0}C -15^{0}C is normal from October to November (CSA, 2013).

Study Design

Cross-sectional study was conducted on local and cross breed cattle. The variable of interest considered as an output variable versus risk factors was skin scrapings status for *D. congolensis*. Breed, sex and age of studied cattle, and season of the year and tick infestation were considered explanatory variables. Study animals were selected randomly and examined for any skin lesion by visual inspections and palpations. Skin scrapings were collected in dry sterile test tubes for direct microscopic examination and cultural isolation. Giemsa stain smears were examined from freshly removed skin scrapings and presence of *D.congolensis* is confirmed by demonstration of typical organisms showing transverse and longitudinal septation. Skin scrapings which are negative by Giemsa were cultured by Haalstra's method as described by (Quinn *et al.*, 1999). Colonies of *D. congolensis* was identified by rough, wrinkle and golden-yellow characteristic colonies. Ticks was collected in 70% alcohol and identified as described by (Walker *et al.,* 2003).

Study population

During the study, animals were categorized into two groups based on their age as young if less than three years old and adult if they are above this age according to (Samui and Jones, 1990) sex (Male and Female), breed (Local and Cross), tick infestation presence or absence and finally season of the year in which animals are examined (wet and dry season).

Sampling method and sample size determination

Simple random sampling method was used for sampling and 95% confidence interval was applied. The sample size was determined by the formula given by (Thrusfield, 2005). Based on these formula, the total sample size was calculated on the basis of the 50% expected prevalence by using a 95% confidence interval (CI) and 5% level of precision as follows:

$n= (1.96^2(P_{exp} (1- P_{exp}))/d^2$.

Where: n=required sample size P_{exp} = expected prevalence and d^2 = desired absolute precision (5%). Accordingly, a total of 384 samples were considered for collection. However, 770 animals were sampled to increase precision.

Data Analysis

Data collected from the field was coded and entered in to Microsoft excel spreed sheet 2007 and analyzed using chi square and logistic regression statistical tools using SpSS and SAS Soft ware's.

Table 1. Prevalence of dermatophilosis in cattle with skin lesions in wet and dry seasons examined by Giemsa and culturing techiniques

Season	No. of animals examined	With skin lesion(%)	ByGiemsa(%)	By culture(%)	Total positive(%)
Dry	311	96(30.36	8(2.57)	3(0.96)	11(3.5)
Wet	459	97(21.13)	12(2.61)	5(1.09)	17(3.7)

Table 2. Prevalence of bovine dermatophilosis and tick infestation

Species	No of animal examined	No of positive case	Prevalence (%)
Amblyomma	54	6	0.78
Bophilus	86	4	0.52
Hyalomas	34	2	0.26
Total	174	12	1.56

The presence of statistical association between risk factors like: sex, age, tick, skin lesion, breed, body condition score and season. Odds ratio is used to calculate degree of association. The significant level is determined at $P< 0.05$ for all statistically analyzed tests.

RESULTS

The present study result showed that from a total of 770 cattle examined, 28 were found positive with an overall prevalence of 3.63%; of these animals, 20 (71.4%) were positive by Giemsa staining technique while the rest 8 (28.57%) were confirmed by biochemical tests after bacterial culture (Table

1). Skin lesions observed in3.51% (27 of 770) animals. Prevalence of dermatophilosis in indigenous zebu cattle (2.83%) was statistically significant ($p<0.05$) than the prevalence in cross bred cattle (0.94%). Higher prevalence was recorded in wet season and in *A. variegatum* infested cattle. Of the seven different risk factors considered, breed, season, body condition, lesion on skin and tick were significantly associated ($p<0.05$) with dermatophilosis by univariate logistic regression analysis, while sex and age were no significant association ($p>0.05$) with dermatophilosis by univariate logistic regression analysis (Table 2-5).

than cross breed might be due to the extensive management system for local breed.This study is not conclusive as only a few cross breed animals (77) were examined during the study. It is similar with the work of Woldemeskel and Taye (2002) who reported that higher level of dermatophilosis in indigenous zebu cattle. But, it contradicts, with the report of (Koney and Marrow, 1990) from Ghana; higher prevalence of dermatophilosis was reported in crosses than in local cattle. Even though, higher prevalence of dermatophilosis is recorded in female cattle than male, there is no statistically significant difference ($P>0.05$).

Table 3. Prevalence of bovine dermatophilosis based on sex and skin lesion of animal level risk factors

Parameter	No of tested animals	Number of positive	Prevalence	(95% CI)	Chi-square	P-Value
Skin lesion						0.001
Yes	193	27	3.51	3.38-3.91		
No	577	1	0.13	0.126-0.14		
Sex						0.001
Male	356	10	1.35	1.25-1.45		
Female	414	18	2.43	2.25-2.6		
Breed			0		20.71	0.001
Cross	77	7	0.94	0.88-1.01		
Local	693	21	2.83	2.63-3.04		
Body condition					15.7	0.017
Good	299	10	1.35	1.25-1.45		
Medium	390	15	2.02	1.87-2.17		
Poor	80	3	0.4	0.38-0.43		
Total	770	28	3.78	3.5-4.0		

Table 4. Prevalence of bovine dermatophilosis based on season and tick of Herd level risk factors

Parameter	No of tested animals	Number of positive	Prevalence	(95% CI)	Chi-square	P-Value
Season						0.003
Wet	459	15	2.02	1.88-2.17	15.73	
Dry	311	13	1.75	1.63-1.88		
Presence of Tick on Animals					21.12	0.001
Yes	174	12	1.62	15-1.74		
No	596	16	2.16	2.00-2.31		

Table 5. Prevalence of bovine dermatophilosis based on breed, sex, age, body condition and lesion on skin by Univariable logistic regression of Individual animal risk factors

Parameters	B	S.E.	Wald	P-values
Breeds	3.460	.222	244.373	.000
Sex	.450	.401	1.288	.256
Age	0.22	0.39	0.003	0.96
Body Condition	3.250	.588	30.409	.001
Lesion on skin	1.180	.208	76.024	0.001

Table 6. Prevalence of bovine dermatophilosis based on tick and season Univariable Logistic Regression for Extrinsic risk Factors

Parameter	B	S.E.	Wald	P-Values
Tick	2.600	.299	75.682	.000
Season	3.130	.283	121.924	.000

DISCUSSION

In this study an overall prevalence of 3.63% was recorded. This is a lower prevalence than the report of 5% (in Adama), Tesfaye (1994), 15.2% Degu (1998), 5.1% Berhanu and Woldemeskel (1999) and 5.22%, Kassaye *et al*. (2003) and 5.12% Dejene (2012), but it is higher than the report of Meseret and Safinew (2011) which was 1.04%. This difference in prevalence may be attributed to the existence of favorable factors believed to be involved in the initiation and transmission of the disease in the area. In the current study, there was statistically significant difference ($p<0.05$) between the cross and local breeds cattle. The high prevalence in local

This confesses work of Samui and Hugh-Jones (1990). However, it disagrees with the work of Woldemeskel and Taye (2002). The prevalence of the disease was lower in young animals (< 3 years old) when compared to that of adults (>3 years old) which may probably due to the reason that they were mostly kept in doors with less chance of exposure to the various predisposing factors such as thorny plants, ox-pecker birds and rain fall than the older cattle. This is in agreement with the record of Woldemeskel and Taye (2002), bovine dermatophilosis is more prevalent in adult (>3 years old) animals than that of youngs' (< 3 years old). In the current study, there was a significant ($p<0.05$) variation between season of the year and bovine dermatophilosis which is highly

prevalent during wet season than the dry season. The prevalence of the disease was 1.75 (13/311) and 2.02 % (15/459) during the dry and wet season, respectively. The higher prevalence of the disease during the mentioned season is due to activation of the motile zoospores by rain and increased insect population (ticks) so that they may contribute for the occurrence of the disease. Degu (1998) explained that intense or prolonged wetting of the skin apparently results in emulsification and disruption of sebaceous film as well as of the stratum corneum, which then become more permeable to irritant substances and probably more susceptible to disturbances by mechanical objects. In addition to this, water help to discharge of the zoospores from the scabs and to carry them from one part of the body to another. Higher prevalence of the disease recorded in wet season also associated with rain and insect population density which cause flare-up of dermatophilosis as described by Shoorijeh *et al*. (2008). The study indicated that there is a significant ($p<0.05$) prevalence in cattle infested with ticks than those which are not infested with ticks. This may be due to the fact that toxins present in saliva of ticks result in immune-suppression of the animals. Among the tick species identified to assess their effect for the occurrence of the disease; *A. variegatum* and *B. annulatus*, were the common ones. From 174 tick infested animals 12 (6.89%) were also affected with dermatophilosis which is lower than the report of Woldemeskel and Taye (2002). Prevalence of dermatophilosis in cattle infested with *A. variegatum* (1.9%) was significantly higher ($p<0.05$) than in animals free of tick infestation (0.8%). Similar findings had been reported by Kassaye *et al*. (2003). This finding confessed by report of Msami *et al*. (2001); who reported mechanical injury to the skin and tick infestation exacerbate the pathogenesis of the disease.

Conclusion and Recommendations

In this current study, the prevalence of bovine dermatophilosis was determined after different predisposing factors were taken into consideration. Among the risk factors; breed of cattle, age, season of the year and tick infestation were statistically significant risk factors. The study also indicated dermatophilosis is a potential determinant factor for the dairy development in the study area. Therefore, tick control especially on local breed cattle is suggested to reduce the risk of dermatophilosis. Therefore, based on the finding of the study the following points are forwarded as recommendation:

Factors that bring mechanical injury to the skin should be avoided and management practices that promote transmission should be avoided. More investigations on the immunology and genetically determined susceptibility or resistance to diseases transmission were recommended. Different epidemiological studies and researches should be undertaken.

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