PREVALENCE OF BOVINE DERMATOPHILOSIS INFECTION AND THE ASSOCIATED RISK FACTORS IN THE COMMUNAL AREA OF MUREHWA; ZIMBABWE

BY

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Abstract

A study to investigate the prevalence and associated risk factors was done in Murehwa district; Zimbabwe. The research was aimed at determining the prevalence of the disease and also determining the associated risk factors as determinants of the disease. The study was done by using questioners to randomly selected farmers who had reported the disease to the Veterinary Services. A total of 378 cattle were examined in the dry and the wet season. Statistical analysis was performed using SPSS version 20 software and Epi-info version 3 software. The findings reviewed no significant association of age (p=0.42); sex (p=0.863); presence of *Amblyomma hebraeum* (p=0.275)*;* presence of the Rhepicaphalus tick species (p=0.834); dipping frequency and tick load whereas *Amblyomma variegatum* and season were statistically significantly associated with dermatophilosis with p values of p=0.000($p<0.05$) and p=0.01($p<0.05$) respectively. These results add to a growing body of evidence that, suggest the Amblyomma *variegatum* and season are strongly associated in the pathogenesis of dermatophilosis as highlighted by higher prevalence of dermatophilosis in the wet season (65.44%)95% CI(56.81-73.8) as compared to the dry season (34.56%)95%CI (26.60-43.19). It is therefore strongly recommended that farmers use acaricides in controlling problematic ticks and also seasonal precautions to certain diseases should be done in order to control diseases which are more prevalent in wet seasons compared to dry seasons.

Key words: *dermatophilosis, prevalence, risk factors, Murehwa, Zimbabwe.*

Declaration of Thesis

I hereby declare that this thesis is composed of work carried out by myself unless otherwise acknowledged and that this thesis is of my own composition. The research was carried out during the period of September 2016 to June 2017 . This thesis has not in whole or in part been previously submitted for any other degree or professional qualification.

Nyasha Munyanyi

…….

DATE

14 / 05 / 2018

Certification of Thesis

I the undersigned, certify that Nyasha Munyanyi, a candidate for the degree of Bachelor of Science (Honours) Animal and Wildlife Sciences has presented this thesis with title:

Prevalence of bovine dermatophilosis and the associated risk factors in the communal area of Murehwa, Zimbabwe

That this thesis is accepted in form and content and that a satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate through an oral examination held on the 27th of April 2018

Date: ____/____/_____.

Signed: _____

Mr J.V Muzvondiwa (Academic Supervisor)

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Last but not least to God from whom I drew my inspiration

Dedication

This thesis is dedicated to the Munyanyi family

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CHAPTER 1: INTRODUCTION

1.0 Introduction

Dermatophilosis, also called mycotic dermatitis or streptothricosis, is a contagious zoonotic skin disease. It can either be an acute or chronic exudative epidermatitis caused by a pleomorphic Gram-positive, aerobic *Actinomyces* bacterium called *Dermatophilus congolensis.* The local names that exist include senkobo skin disease in Central Africa, kirsch in Nigeria, and saria in Malawi. In Zimbabwe many farmers refer the disease as Chikundura (Shona), Senkobo and isikwekwe(isiNdebele) (Ndhlovu and Masika, 2016). Dermatophilosis is a common name of the disease in all species (Radostits *et al*., 2007).

Dermatophilosis has been reported mostly on domesticated animals such as cattle, sheep, goats, and horses most frequently while in pigs, dogs, cats there have been rare cases. The disease has been reported worldwide. Evidence based on previous researches indicates that the disease was first diagnosed in Zimbabwe in the early 1920s, and for many years thereafter, disease outbreaks were confined to the northwestern parts of the country, bordering with Zambia. However, over the last years an increase in the reported outbreaks in other areas has increased indicating a cause of concern of the disease to farmers (Chatikobo *et al.*, 2004).

Several risk factors are associated with the occurrence of the disease, among them include presence of ticks, breed, season, dipping frequency amongst others. In Zimbabwe the disease has affected animal production amongst farmers. Infected animals may be sick for more than 2 months, before succumbing to the disease or heal, but chronic infections usually do not heal (Chatikobo *et al.*, 2009; Dalis *et al.*, 2009). It also may lead to reduction of milk yield, down grading of hides. The diseases adversely affects mating and fertility. In this view it is important to research on this disease as there is a gap of knowledge the prevalence of the disease and its associated risk factors(Ndhlovu and Masika, 2016).

1.1 Problem statement

There has been increasing reports on dermatophilosis in the district of Murehwa and farmers are failing to understand the causes of the disease due to lack of knowledge on the disease. Lower awareness levels have contributed to the spread of a disease. Low production in cattle

farming has been caused by factors such as infertility, reduced milk yields in dairy cattle, failure to mount due to lameness.

The treatment of dermatophilosis still remains a matter of great concern owing to the recurrence of the disease and the difficulties to cure it using antibiotics as most under privileged do not have access to such. Terramycin long-acting was described to be the only drug effective in parenteral treatment of dermatophilosis(Nath, *et al,* 2010).

1.2 Justification

Dermatophilosis is a zoonotic disease that also affects humans. It is therefore important to consider its effects. Overall decrease in animal productivity, hide depreciation, in severe cases mortality in susceptible weak animals maybe as high as 50% (Chatikobo *et al*. 2009). Its effects on the utilization of draught animals since most communal farmers practice mixed faming is also a cause of concern. Therefore it has a major impact on the income and food security of many farmers.

The study seeks to ascertain the extent of the spread of the disease so as to provide facts on the disease to farmers. When farmers have precise knowledge of the present disease in the area they are able to treat the disease.It is ideal to raise awareness to the farmers so that in any cases of an outbreak they know how to work with confirmed cases rather than suspected cases, because of differential diagnosis (infections exhibiting similar clinical signs). Gaining knowledge about this will eventually enable farmers to use and breed more productive breeds of cattle. This would allow increased beef and dairy production from indigenous cattle, increased use of more productive exotic breeds and enhanced work output from draught oxen. This would have a dramatic effect on the livelihoods of both livestock owners and those using draught animals to cultivate crops.

1.3 Objectives

1.3.1 Broad Objective

To determine the prevalence and identify the risk factors of dermatophilosis

1.3.2 Specific objectives

- ❖ To determine the prevalence of the disease in Murehwa communal area
- ❖ To determine the risk factors associated with dermatophilosis infection in Murehwa

1.4 Research Questions

- What is the prevalence of dermatophilosis in the communal area of Murehwa?
- What are the determinants of dermatophilosis infection?

CHAPTER 2: Literature Review

2.1 Introduction

Dermatophilosis is also known as cutaneous streptothricosis and it is usually more prevalent in the tropics. The disease affects a wide variety of animals, and humans occasionally (Larrasa *et al*., 2004; Radostits *et al*., 2007). The disease occurs in sporadic and epidemic form, its incidence and severity vary in different geographical regions and in different species of animals, but the disease is recognized to be of greatest severity in the humid tropics (Pal, 2008). It is a cause for reduction of milk production (Dalis et al., 2007) down grading of hides quality, skin and wool (Woldemeskel, 2000) and affecting weight gain and reproductive performance (Admassu and Alemu, 2011).

2.1.1 Characterization

Dermatophilosis, (sometimes called mycotic dermatitis) is due to an actiynomyces bacterium, *Dermatophilus congolensis.* It causes an exudative, pustular dermatitis that affects a wide range of animals and is particularly severe in ruminants when associated with infestation by the tick *Amblyomma variegatum*. (Arnott *et al*, 1993)

2.1.2 Etiology and occurrence

Dermatophilosis is caused *by Dermatophilus congolensis*, a gram positive, non-acid fast facultative anaerobic actinomycete (Arnott *et al*., 1993; Ndhlovu and Masika, 2012). It has two morphologic forms which are the motile zoospore and the filamentous hyphae. The hyphae are characterized by branching filaments that ultimately fragment by both transverse and longitudinal septation in to pockets of coccoid cells. The coccoid cells mature in to flagellated ovoid zoospores (Gebreyohannes *et al*., 2013). Moist environmental conditions and long hair coats predispose to contagious infection by *D. congolensis*. Rain causes matting in the moist environments allowing the greatest opportunity for infection. In addition to moisture and long hair, physical damage to the skin causes the best environment but the bacteria is thought not to be able to invade healthy skin (Scott, 2008).

The disease can occur in tick-free animals, but it is more severe in those that are infested by *Amblyomma variegatum* ticks. Many scholars have stated that the role of *A. variegatum* in the

development of dermatophilosis was through immunosuppression. The tick is said to secrete an immunosuppressive agent in its saliva or waste metabolites that are toxic to the host. Other factors that predispose to the disease are wetting of the skin and trauma(Arnott *et al*, 1993; Ndhlovu and Masika, 2012).

2.1.3 Transmission and Pathogenesis

Environmental and host factors must be considered in order to understand the pathogenesis of dermatophilosis. A sequence of events involves physical damage to the skin that causes bacterial multiplication in the epidermis, invasion by hyphae, infiltration by neutrophils and exudate, regeneration of epidermis and reinvasion causes occurrence of dermatophilosis (Chatikobo *et al.*, 2004; Tarazi and Al-ani, 2013). When the zoospore reach the skin site, where there are weak protective barriers, the pathogen initiates infection. Low concentration of carbon dioxide attracts the zoospores to generate in the skin (Yeruham, Elad and Perl, 2003). The zoospore then germinate to produce a hyphae which enters into the layers of the living cells of the skin. It is stated that once infection establishes there is no immunity. In a period of about two to three weeks the inflamentous transmission occurs by direct contact with infected animals, although contaminated environments and biting insects are also suspected indirect methods of transmission (Tarazi and Al-ani, 2013). Development of disease may be influenced by factors such as prolonged wetness, high humidity, high temperatures, and ectoparasites such as ticks and lice which serve to reduce the natural barriers of the skin (Kahn and Line, 2010).

2.1.4 Clinical signs and diagnosis

Dermatophilosis occurs in chronic, subacute and acute form. If the scabs are detached inflammed bleeding of the deep layers of the skin occurs. Lesions are usually small or large. They are mostly found on moist areas like the flank and the shoulders. When viewed from a distance it appears as if the animal has been immersed in the mud when the disease reached an advanced stage (Chatikobo *et al.*, 2009). Oozing crusty lesions on the perineum scrotal region and the belly can also be seen. Vulval and infection of the limbs are also visible preventing mounting. Animals of all ages are susceptible to the disease and a few exhibit prurituses and most heal spontaneously within three to four weeks of the initial infection with some animals healing after a period of two months (Newman *et al.*, 2015).

Dermatophilosis is diagnosed by isolating the bacteria from skin lesions. Hair, crusts, and scabs submitted to the laboratory for isolation of Dermatophilus should be kept dry and submitted in paper envelopes to prevent growth of saprophytic organisms (Awad *et al*, 2008). In smears from moistened skin crusts, short lengths of narrow branching and divided hyphae, as well as numerous cocci, may be seen with Gram or Giemsa stain. A definitive diagnosis is made by culture and identification. An indirect inflorescent antibody technique has been developed for large serologic and epidemiologic surveys (Awad et al. 2008; Amor et al. 2011). Giemsa staining technique is also useful for identifying the causative agent of the disease.

2.1.5 Treatment and control

Animals can be treated with antibiotics such as penicillin and oxytetracycline as the organism is susceptible to a wide range of antibiotics. Usually chronic infections can be rapidly and effectively cured with a single intramuscular of any of the mentioned drugs (Merck, 2011).

External treatment with disinfectants that contain a cresol or copper sulphate can decrease the spread of the disease. In addition insecticides used externally control biting insects (Merck, 2011) No vaccine has been created for this bacterial infection.

2.2 Risk factors

Risk factors are those attributes, characteristics that increase the likelihood of an individual developing the disease. In temperate zones, outbreak in herds and severe disease in individuals are uncommon but can occur associated with high rainfall with attack rate of 50%. The use of periodic showers or continual misting to cool cattle during hot periods is a risk factor for infection in dairy herds(Gebreyohannes *et al*, 2013).

In tropical zone, climate is the most important risk factor in tropical and subtropical regions. Rainfall has caused an increase in the range of anthropod vectors such as ticks which are more prevalent in the wet season. The disease has highest incidence and severity during the humid and high rainfall season. The seasonal occurrence is associated with concomitant increase in tick and insect infestation(Radostits, *et al* 2007).

Tick infestation, particularly with *Amblyomma variagatum, Hyaloma asticum*, and Rhepicaphalus (*Boophilus) microplus*, is strongly associated with the occurrence of extensive

lesions of Dermatophilosis, which can be minimized by the use of acaricides (Walker and Lloyd, 1993). The lesions of Dermatophilosis on the body does not occur at the predilection sites for ticks and it is thought that the importance of tick infestation relates to immune suppression in the host rather than mechanical or biological transmission (Kahn and Line, 2010).

There is breed differences in susceptibility to Dermatophilosis. Within breed differences in susceptibility are also apparent and genetic markers have been identified in Zebu. Susceptibility in cattle can be influenced by genetic selection (Radostis *et al*, 2007).

High incidence of Dermatophilosis in young cattle has also been noticed which clearly highlights age as a risk factor. Susceptibility of young animals could be related to low immune status and the habit of not providing sufficient milk and feed supplements to calves and young animals(Nath and Nath, 2010).

2.3 Economic importance

Economically, bovine dermatophilosis is important due to morbidity and mortality, damage to hides and its effect on draught animal power (Pal, 2008). Hide condemnations are an important cause of economic loss for the leather industry in countries that specialize in leather exports (Chatikobo *et al.*, 2009). In addition, introduction of exotic breeds to improve meat and milk production has been frustrated in other parts of Africa by this disease. The disease is also of public health significance as it can be transmitted to humans(Awad, *et al* 2008) .

2.4 Implications of the prevalence

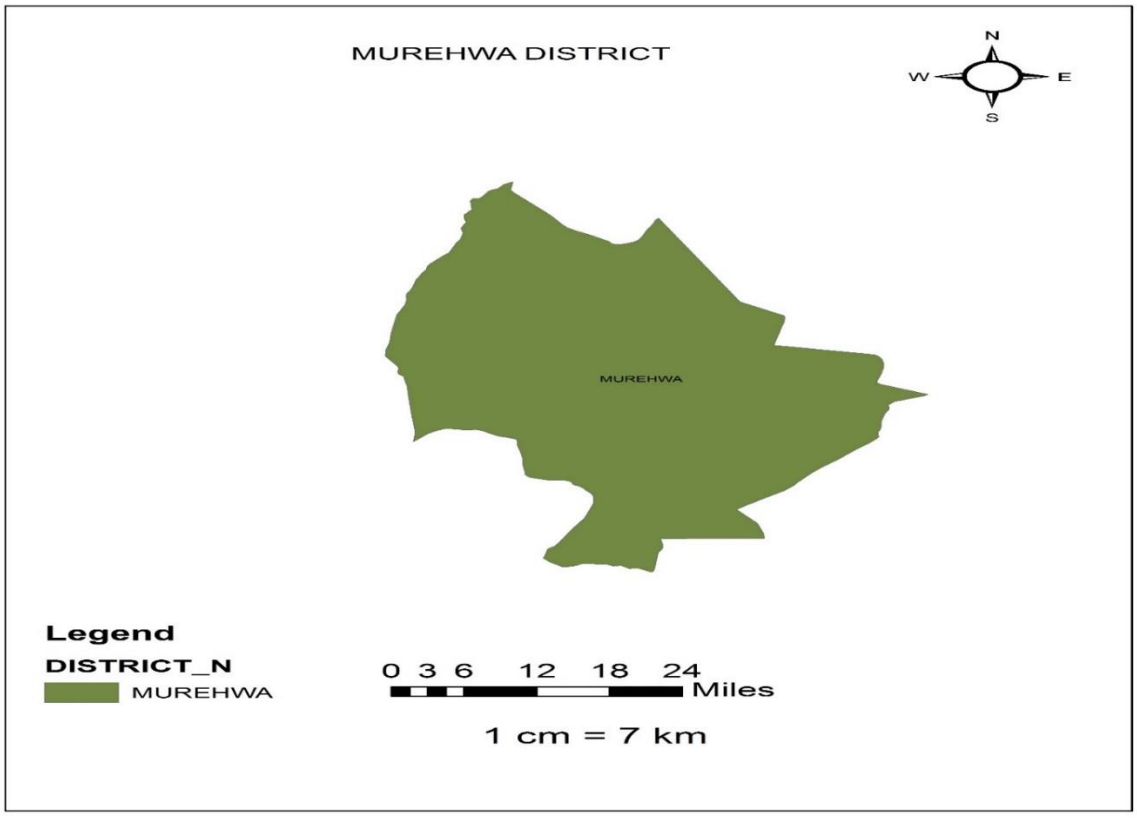
Dermatophilosis often creates economic problems by creating severe skin matting resulting in hide depreciation, overall decrease in animal productivity and severe case mortality in susceptible weak animals(Gebreyohannes *et al* 2013). In Africa the disease in cattle causes great losses and many deaths, and the disease ranks as one of the four major bacteriological diseases with equivalent importance to Contagious Pleuro Pneumonia and Brucellosis (Chiodini, 2000). Cattle become weak, loose defense and often succumb to secondary infections by other microorganisms. Infected cattle may face succumbing the disease again because of failure to gain immunity against the disease. Failure to mount due to lameness (Chatikobo *et al.*, 2009) .

CHAPTER 3: METHODS AND MATERIALS

3.1 Study site

The study was carried out in Murehwa district Mashonaland East province of Zimbabwe. It is located 80 km north east of Harare. The district falls under natural region 2 which receives annual rainfall of over 750mm. Temperatures range from 25 to 32 degrees, in the Highveld of Zimbabwe. Farm ownership patterns ranges from large farms owned by a few to many small holder plots that benefited from the land reform program and communal farmers (Dhliwayo and Matondi, 2012) .

Figure 3.1: geographical map of the Murehwa district



3.2 Study design

A total of 189 cattle were examined in the study. History of age, sex, breed and clinical signs were recorded. The animals were examined clinically by close visual inspection and palpation of the entire skin surface of the body and the case selected on the basis of clinical signs by veterinarians. In every case where by clinical dermatophilosis was visible, the age, sex,,

presence of ticks and dipping frequency was done through a structured questionnaire to 20 cattle owners who faced clinical dermatophilosis. Skin scrapings were collected in dry test tubes for laboratory analysis and were confirmed by using Giemsa staining technique with results either positive or negative

3.3 Sampling strategy

Sampling was done in two phases, in the dry season and wet season, meaning that the 189 cattle were examined in the dry season and the same procedure was also done in the wet season. Age was also grouped into two classes in this case cows below the age of 3years were classified as young whereas those with 3 years and above were classified as old. Breed prevalence of dermatophilosis was also examined by grouping the cattle into 3 classes which are exotic, indigenous and nondescript crosses. Dipping frequency was also categorized into two in which regular dipping described dipping that was conducted fortnightly and irregular dipping described dipping that was done rarely after more than three weeks or more.

3.4 Data collection

Data was collected from September 2016 to June 2017. The cattle owners were administered with structured questionnaire whereby simple answers were required. The farmers were interviewed by the student with the help of animal health inspectors from the department of veterinary services so as to make sure that correct samples were taken for laboratory use. The lesions were collected from the skins of infected cattle and submitted to Central Veterinary Laboratory for confirmation.

The diagnosis was confirmed by Giemsa staining of all the animals that exhibited the clinical signs. The Giemsa stain shows the Dermatophilus gram positive by showing a set of branching filamentous rods that are composed of fine mycelial elements. Only branching and filamentous shapes are seen in the Giemsa staining method. Therefore in the Giemsa staining only structure of the bacterium is shown.

3.5 Clinical examination

An animal was said to be clinically positive if it exhibited any of the characteristics that involved small lesions that look like clumped hair appearing like a small paint brush; scabs of at least I cm in diameter and confluent scab lesions affecting significant parts of the animal’s body. Presence or absence of ticks was also recorded. Tick species were identified in situ

using their characteristics (Walker *et al.* 2003). Tick load was recorded by the investigator, with regards to tick infestation an animal was considered positive of any tick species if the ticks exceeded a number of 18; a method used by (Hoosgral, 1956).

3.6 Data analysis

Results were analyzed by SPSS version 20 and Epi-info 3.1.The significant level was determined at p<0, 05. Data was analyzed using Epi-info 3.1; for prevalence**.** To determine association of the risk factors and the status of the animal; the logistic regression was done using SPSS v20 (OR, 95%CI; and the p-values).

CHAPTER 4: RESULTS

4.0 Results

The overall prevalence in the Murehwa was 35.9% in this case only one hundred and thirty six cattle were found to be positive out of the overall population of 378 cattle that were examined in the population.

The logistic regression was used to find out which factor is a determinant to dermatophilosis. The logistic regression indicated that all factors had an indirect association with the occurrence of dermatophilosis. The p value was the main parameter used in determining the association of dermatophilosis and the risk factors. The risk factors studied in this current study were presence of the *Amblyomma variegatum*, season (wet and dry), sex (male and female), dipping frequency, tick load and presence of different of other tick species that were observed during tick counts and examinations (Rhepicaphalus tick species and the presence of the *Amblyomma hebraeum*.

4.1 Clinical observations

Visual inspection of bovine dermatophilosis was done and early lesions where usually noticed on the groin region, resembling matting of hair which might have happened into forming paint brush like structures. Scabs where also noticed with hairs protruding through them. Removal of these scabs occasional caused bleeding or leaving a pinkish surface. The first condition in calves is mostly characterized by erectness of the hair into designated tuffs. As the disease progresses the material on the skin form into crusts that are perforated by the hair. In generalized chronic cases, thick horny scabs often were confluent forming a mosaic pattern. The scabs vary in size from 4 to 5 cm in diameter. An animal that exhibited clinical dermatophilosis was seen by its profuse discharge, reluctant to graze, localized lesion on the groin, neck and limbs in which it caused lameness. No cases of mortality recorded in the study.

4.1 Prevalence of dermatophilosis

Dermatophilosis was found to have affected 136 cattle (35.9%) out of 378 cattle that where examined in the dry and wet season.

Table 4.1: prevalence of bovine dermatophilosis

Factors	Number of animals examined	Prevalence %	95% CI
Dermatophilosis			
Yes	136	35.98%	31.3 - 40.9
No	242	64.02%	59.06- 68.70
Age			
Young	161	32.3%	25.6- 40.0
Old	217	38.7%	32.5- 45.3
Sex			
Male	132	39.4%	31.5- 47.9
female	246	17.9%	13.6- 23.2
Dipping			
Regular	158	36.7%	29.6- 44.5
Irregular	220	39.1%	32.9- 45.7
Tick load			
Heavy	259	41.3%	35.5- 47.4
light	119	24.4%	17.5- 32.8
Season			
Wet	189	65.44%	56.81-73.8
Dry	189	34.56%	26.60-43.19
A. variegatum			
Present	181	65.2%	58.0- 71.8
absent	197	9.1%	5.7- 14.2
A. hebraeum			
Present	112	38.4%	29.9- 47.6
Absent	266	35.0%	29.5- 40.9
Rhepicaphalus			
	171	43.3%	36.1- 50.8

Table 1 shows the prevalence of bovine dermatophilosis in the district of Murehwa and the the 95% confidence intervals. Dermatophilosis was more prevalent in old cattle (38.7%) which were classified as cattle that were 3 years and above as compared to young cattle that had a prevalence of (32.3%). Male cattle had a higher prevalence as compared to female cattle which had prevalence of 17.9%. The confidence intervals of the male and female groups were overlapping which means that that the comparison was not significant (25.6- 40.0) for young cattle and (32.5- 45.3) old cattle

Animals infested by the *A. variegatum* were more prevalent compared to those that were infested with other ticks as shown in the table above. 65.19% of cattle infested with the variagatum ticks were infected by dermatophilosis while cattle infested with ; A. *hebraeum and rhepicephalus species* of ticks had prevalence that was 38.4% and 43.3% respectively and the upper and lower confidence intervals were(58.0- 71.8) for presence of the tick and (5.7- 14.2) for absence of the tick on the animal

Association of dipping with outbreak showed that there was high prevalence of the in cattle that were dipped irregularly compared to those that were dipped on regular basis. The table above shows a prevalence of 39.1% in irregularly dipped cattle compared to 36.7% of cattle that were regularly dipped. The upper and lower confidence intervals showed an overlap in which it shows that the proportions are not significantly different, these were (29.6- 44.5) and (32.9- 45.7) respectively in terms of their prevalence.

Prevalence in heavy tick infested cattle was high (41.3%) whereas in cattle that were lightly infested with ticks was 24.4%. Showing the upper and lower confidence intervals of (35.5- 47.4) for heavily infested animals and (17.5- 32.8) for lightly infested animals. These confidence intervals do not overlap which meaning that the comparison between the proportions where statistically different.

4.2Association of potential risk factors and dermatophilosis

Season influenced the occurrence of dermatophilosis as evident by the p value which revealed a strong association of p=0.01. Dermatophilosis affected 87 cattle in the wet season as compared to the dry season which had 47 cattle infected, moreover, the prevalence of Amblyomma ticks influenced the occurrence of dermatophilosis by 65.19% hence there was a strong association of(

p=0.000). A. *variegatum* was significantly (p<0.00) associated with the occurrence of clinical dermatophilosis while association of the latter with A. *hebraeum* was not significant (p=0.275). A. *variegatum* ticks infested 65. 1 % (118/181, 95 % CI 12.697, 14.88 OR=23.72) of the cattle while 38.4 % (43/112, 95 % CI 0.763, 2.588 OR=1.405) were infested by A. *hebraeum* and (43.3% 95% CI 0.610; 1.845 OR=1.061) were infested by the Rhepicaphalus species. Age (CI 1.022-3.193 OR=1.860) the presence of the Amblyomma hebraeum and the Rhepicaphalus species was not statistically associated with dermatophilosis as their p values where greater than 0.05 as shown in table 2

Table 4.2: Association of the risk factors and dermatophilosis

Risk factor	**OR**	**95 CI**	**p-value;**
Age	1.860	1.022-3.193	0.42
Sex	1.052	0.589-1.879	0.863
Dipping	0.858	0.484-1.522	0.601
Tick load	1.896	0.984-1.522	0.056
A. *variegatum*	23.872	12.697-14.88	0.0000
A. *hebraeum*	1.405	0.763-2.588	0.275
Season	2.805	1.566-5.025	0.01
Rhepicephalus	1.061	0.610-1.845	0.834

Table 2 also shows the odds ratio for all the variables in the study in which the odds ratio in the logistic regression represents how the odds change in an event that an outcome will occur in the event of an exposure as compared to the outcome occurring in the absence of the exposure. The OR for dipping is 0.858 and the p value is 0.601 which means that there was no statistical significant association of dipping frequency with dermatophilosis. Age (p=0.42 OR=1.860 95%C

1.022-3.193I); sex (p=0.863 OR=1.052 CI=0.589-1.879); dipping frequency(p=0.601 OR=0.858 95%CI 0.484-1.52); tick load(p=0.056 OR=1.896 95%CI0.984-1.522) ; presence of Rhepicaphalus ticks(p=0.834) and Amblyomma hebraeum(p=0.275) species were not statistically associated with the occurrences of dermatophilosis whereas season and presence of Amblyomma variegatum were statistically significantly associated with bovine dermatophilosis as shown in table above

CHAPTER 5: DISCUSSIONS

5.1 DISCUSSIONS

In the study; the clinical appearance was noted on the rump; back sides, inguinal region; front limbs and groin which is very similar to the observation by Oduye (1976) Moule and Sutherland (1947) and Nooruddin and Khaleque (1986) and the lesions recorded in this study were generalized and in some areas severe cases were seen.

The current study shows an overall prevalence of 35.9%; this was similar to the findings by (Chatikobo *et al.*, 2004); in which the seasonal peak was 40% in Sanyati; Kadoma; (Dalis *et al.*, 2009), (Admassu and Alemu, 2011) however reported lower prevalences of 9.7%, 8.07% and 1.04% from Zaria, Zaria and Jos, and Ethiopia, respectively. It can therefore be argued that the present distribution of bovine dermatophilosis in Zimbabwe is a reflection of the status of tick control in the country (Chatikobo *etal;* 2004).These variations on the prevalence of the disease are mainly based on geographical similarities as they vary from one region to another.

The current study suggested that dermatophilosis outbreaks had a close association with the season which is highlighted by an OR of 2.805 in the current study a fact further that was further supported by(Unganami 1996), apart from the association of the *A. variegatum* seasonality had direct and indirect effects on the prevalence of the disease. Rain activated zoospores; this explains high transmissions that occur in the wet season as compared to the dry season. Hence it is evident that an animal is at greater odds of being infected by dermatophilosis in the wet season as compared to the dry season.

Infested cattle with *A. variegatum* were more prevalent (65.44) than in animals with burdens of other tick species. Similar findings had been reported by Kassaye *et al*. (2003). The occurrence of the disease in association with this particular tick species in tropical Zimbabwe is in support of observations elsewhere (Koney *et al*. 1996; Chatikobo et al. 2001).Literature highlights that the Amblyomma variagatum has an effect on the host as it causes immunosuppression. Neither in this study nor previously by (Woldemeskel and Mersha, 2009) have we found the lesions to be confined to the tick attachment sites but have shown that ticks play an important role in the establishment of clinical dermatophilosis as mechanical vectors and immunosuppressors in particular the *Amblyomma variegatum* according to recent studies.

It was concluded that management practices such as dipping frequency was not associated with the prevalence of bovine dermatophilosis and this was in disagreement with Chatikobo *et al*. (2009) who postulated that poor dipping services were responsible for the spread of dermatophilosis in Zimbabwe. Chatikobo et al. (2001) reported that plunge dipping increased the risk of cattle contracting bovine dermatophilosis as compared to spray dipping. The frequency of dipping services in this study showed no statistical significant association with dermatophilosis but rather quality of dipping service delivery had association with herd-level dermatophilosis positivity.

The higher prevalence of dermatophilosis (39.3%) recorded in male cattle was in agreement with the work of Woldemeskel and Taye (2002). However, Samui and Hugh-Jones (1990) reported higher level of prevalence in female cattle than in the males. The higher prevalence in male cattle in the current study might be associated with work overload on male as draught power in the communal areas of Zimbabwe.

Higher prevalence of dermatophilosis recorded in adult cattle was in agreement with the work of Woldemeskel and Taye (2002); might be explained from the point of predisposing factors as adult cattle are more exposed to the disease by environmental factors like thorny bushes, thorns, ticks, insects, and trauma when they are usually sent out for grazing whereas young cattle are usually kept intensively before they are allowed to move from one area to the other.

The fact that the occurrence of dermatophilosis is high prevalence in the communal production system as compared to other production systems as postulated by (Ndhlovu and Masika, 2016) may be due to poor management which includes lake of strict adherence to the required dipping frequency which has been contributed by lack of knowledge. This has put the animals at risk of ecternal vectors and anthropods which traumatizes the skin of the animal by piercing and trauma of which the Amblyomma ticks are no exception.

Chapter 6: conclusions and recommendations

6.1 Conclusion

Therefore it is clear from the current study that season and presence of *Amblyomma variegatum* were statistically significantly associated with the prevalence of dermatophilosis as shown by their p values that were 0.001 and 0.000 respectively. These are season and presence of the *Amblyomma* variagatum tick The other associated risk factors such as age, sex, dipping frequency, presence of the *rhepicephalus* tick species, presence of the *Amblyomma hebraeum* and tick load proved to be nonsignificant as they exhibited p values that where greater than 0.05 ($p>0.05$).

6.2 Recommendations

Further researches need to be conducted in order to know the zoonotic impact of the disease in cases where high prevalence have been recorded

Awareness campaigns should be done on tick control measures where by in cases of acaricide shortages cattle owners should adopt traditional medicines in their area to avoid heavy tick infections which predispose cattle to dermatophilosis. Community based disease control strategies and treatment protocols for bovine dermatophilosis should be done

References

Admassu, M. and Alemu, S. (2011) 'Study on Clinical Bovine Dermatophilosis and its Potential Risk Factors in North Western Ethiopia', 3(1), pp. 33–36.

Arnott, J. L., Heron, I. D. and Walker, A. R. (1993) 'The effect of tick control on the prevalence of dermatophilosis on indigenous cattle in Ghana', 46, pp. 317–322.

Awad, W.S., Nadra-Elwgoud, M.I. Abdou and El-Sayed, A. . (2008) 'Diagnosis and Treatment of Bovine, Ovine and Equine Dermatophilosis', *Journal of Applied Sciences Research*, 4(4), pp. 367–374.

Chatikobo, P. *et al.* (2004) 'A Monitoring Study on the Prevalence of Dermatophilosis and Para ¢ lariosis in Cattle in a Smallholder Semi-arid Farming Area in Zimbabwe', 36, pp. 207–215.

Chatikobo, P. *et al.* (2004) 'A monitoring study on the prevalence of dermatophilosis and parafilariosis in cattle in a smallholder semi-arid farming area in Zimbabwe', *Tropical Animal Health and Production*, 36(3), pp. 207–215. doi: 10.1023/B:TROP.0000016833.27653.ba.

Chatikobo, P. *et al.* (2009) 'Bovine dermatophilosis, A re-emerging pandemic disease in Zimbabwe', *Tropical Animal Health and Production*, 41(7), pp. 1289–1297. doi: 10.1007/s11250-009-9314-y.

Chiodini, R. (2000) 'Veterinary Microbiology: Introduction', *Veterinary Microbiology*, pp. 229–230. doi: 10.1016/S0378-1135(00)00308-4.

Dalis, J. S. *et al.* (2009) 'Distribution of lesions of dermatophilosis in cattle sheep and goats in Zaria and Jos, Nigeria', *Journal of Animal and Veterinary Advances*, 8(2), pp. 385–388.

Dhliwayo, M. and Matondi, G. (2012) 'Determination of Amblyomma tick distribution in Murehwa District, Zimbabwe, post land reform', *Livestock Research for Rural Development*, 24(7).

Gebreyohannes, M., Gebresselassie, M. and Adv, J. A. S. (2013) 'An Overview on Dermatophilosis of Animals : a Review An Overview on Dermatophilosis of Animals : a Review', 3(7), pp. 337–344.

Kahn, C. and Line, S. (2010) 'The Merck Veterinary Manual', *The Merck Veterinary Manual*, p. 2945. doi: 10.1111/j.1751-0813.1962.tb04067.x.

Merck (2011) *The Merck Manual of Diagnosis and Therapy, Online edition*. Available at: http://www.merckmanuals.com/professional/psychiatric_disorders/mood_disorders/depressive_disorders.html.

Nath, Babul Deba., Ahasan, S.Md., Rahman, S. Md., Huque, A. K. M. . (2010) 'Prevalence and Therapeutic Management of Bovine Dermatophilosis', *Bangladesh Research Publications Journal*, 4(3), pp. 198–207.

Nath, B. D. and Nath, B. D. (2010) 'PREVALENCE AND THERAPEUTIC MANAGEMENT OF BOVINE', pp. 198–207.

Ndhlovu, D. N. and Masika, P. J. (2012) 'Ethno-veterinary control of bovine dermatophilosis

and ticks in Zhombe, Njelele and Shamrock resettlement in Zimbabwe', *Tropical Animal Health and Production*, 45(1), pp. 525–532. doi: 10.1007/s11250-012-0253-7.

Ndhlovu, D. N. and Masika, P. J. (2016) 'Bovine dermatophilosis: Awareness, perceptions and attitudes in the small-holder sector of north-west Zimbabwe', *Onderstepoort J Vet Res*, 83(1). doi: 10.4102/ojvr.v83i1.1004.

Newman, M. S. *et al.* (2015) 'Dermatophilosis in two polar bears', *Journal of the American Veterinary Medical Association*, 167(7), pp. 561–564.

Pal, M. (2008) 'Prevalence in India of Dermatophilus congolensis infection in clinical specimens from animals and humans.', *Revue Scientifique et Technique*, 16(3), pp. 857–863.

Radostits, O. M., Gay, C. C., Hinchcliff, K. W., & C. (2007) 'A Textbook of the Disease of Cattle, Horses, Sheep, Pigs and Goats.', *Veterinary Medicine*, pp. 1452–1461.

Tarazi, Y. H. and Al-ani, F. K. (2013) 'Original Article An outbreak of dermatophilosis and caseous lymphadenitis mixed infection in camels (Camelus dromedaries) in Jordan', 3, pp. 1–6. doi: 10.3855/jidc.7023.

Walker, A. R. and Lloyd, C. M. (1993) 'Experiments on the relationship between feeding of the tick Amblyomma variegatum (Acari: Ixodidae) and dermatophilosis skin disease in sheep.', *Journal of medical entomology*, 30(1), pp. 136–143. doi: 10.1093/jmedent/30.1.136.

Woldemeskel, M. and Mersha, G. (2009) 'Study on caprine and ovine dermatophilosis in Wollo, Northeast Ethiopia', *Tropical Animal Health and Production*, 42(1), pp. 41–44. doi: 10.1007/s11250-009-9383-y.

Yeruham, I., Elad, D. and Perl, S. (2003) 'Dermatophilosis in goats in the Judean foothills', *Revue de Medecine Veterinaire*, 154(12), pp. 785–788.

APPENDICES

Appendix A: Questions asked to farmers on dermatophilosis

Questionnaire (a)

Number of cattle in the household: ☐

Any knowledge on the disease: ☐ yes ☐ no

Age: young=<3 years ☐ old>3years ☐

Sex: male ☐ female ☐

Historyoftheherd:

……

……

Clinical signs: ……..

:……

Number of deaths that has occurred during the course of the disease: ☐

Section(b)

Prevalence of ticks

Amblyomma variegatum: tick infested ☐ tick free: ☐

Rhipicaphelus ticks: tick infested ☐ tick free: ☐

amblyomma hebreum: tick infested ☐ tick free: ☐

*"Tick infested" or " tick free" as stated in the Animal Health Act.

Dipping frequency: regular ☐ irregular ☐

Which acaricide is in use?.....ARMITRAZ/AMITIK/OTHER

Type of dipping facility……PLUNGE/SPRAY RACE

Number of positive clinical cases ……

Dip/tank……

Date ……

APPENDIX 2: DATA ANNALYSIS WORKSHEET

Logistic Regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	378	100.0
	Missing Cases	0	.0
	Total	378	100.0
Unselected Cases		0	.0
Total		378	100.0

Categorical Variables Codings

		Frequency	Parameter coding	
			(1)	(2)
Rhipice	0	134	1.000	.000
	1	171	.000	1.000
age	1	161	.000	.000
	2	217	1.000	
sex	0	132	1.000	
	1	246	.000	
dipping	1	158	1.000	
	2	220	.000	
TickLoad	0	119	1.000	
	1	259	.000	
Avariegutum	0	197	1.000	
	1	181	.000	
Ahebreum	0	266	1.000	
	1	112	.000	
season	1	189	1.000	
	2	189	.000	

a. If weight is in effect, see classification table for the total number of cases.