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Prevalence and Distribution of Dermatophytosis Lesion in Cattle Farms in Benadir Region, Somalia

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ABSTRACT

Dermatophytosis is zoonotic skin disease and one of the most frequently occurring in human and domesticated animals. It is estimated that 20% of the world population is affected by Ringworm. Cattle Dermatophytosis has great public health and economic impact that leads to low milk yield, meat production and poor hide quality. A cross-sectional study was carried out from September2022 to February 2023 to determine the prevalence and distribution of dermatophytosis lesion in cattle farms in Benadir Region, Somalia. 384 cattle surveyed from cattle farms randomly were screened in Ringworm infection. 76 cattle (20%) were clinically suspected by examining skin scrapings in 20% KOH for detection of Ring- worm under the microscope. Among this 46 cattle (11.973%) were infected with Ringworm. Ac- cording to the age group the highest prevalence recorded was young age. There was significant difference in the prevalence of ringworm infection between male and female cattle (P≤ 0.05), also there was significant difference (P ≤0.05) in the prevalence of ringworm infection related to body condition and management system. The results obtained were indicative that cattle Ringworm in- fection poses a problem in cattle farms in Benadir Region. Direct examination based on KOH is rapid and reliable technique for diagnosis of Ringworm infection. It could be recommended in a field test to control the prevalence and the impact of zoonotic Ringworm infection on cattle health, human health, reproduction, production and animal welfare.

Introduction of the Study

Cattle have held a very special role in human history ever since their domestication some 10,500 years ago in the ancient Fertile Crescent. They are raised for their meat, dairy products, leather and hides and are also used as draft animals in farming for pulling ploughs, and in transport for pulling wagons and carts. As the human population increased, there was a corresponding increase in the need for more cattle to provide additional meat and milk, as well as other dairy products. This is particularly the case with the recent exponential human population growth. The increase in the consumption of meat (beef and veal) and dairy products requires that increasing numbers of live- stock be kept. The cattle breeding sector needs to address the emerging challenge that, while the increasing demand for livestock products should be met, the environmental effects of cattle breed- ing have to be kept in check. This breeding contributes significantly to greenhouse gas emissions, pollutes the soil and water, and can reduce biodiversity through overgrazing. Another issue is the efficient management of manure, of which a useful utilization is as fertilizer. More than 1.4 billion cattle are kept worldwide today, of which 159 million (11 percent) are in this region of Europe and Central Asia. The sub-region of EU other and EFTA accounts for five percent of the global cattle population, corresponding to 50 percent of the total cattle numbers of the region. The most im- portant countries here are France (20 million heads), Germany (13 million heads) and the United Kingdom (10 million heads). The Russian Federation is another important cattle breeder account- ing for 13 percent of the total regional number of animals. Another 13 percent is in Central Asia, where Uzbekistan and Kazakhstan have the largest numbers. Turkey, with 11 million heads, ac- counts for seven percent of the total cattle numbers in this region. The average global of density of cattle in 2010 was 29 cattle per hectare. In this region there are significant variances in this density: in EU other and EFTA it is 56 heads per hectare, with the highest densities in the Nether- lands (207 heads per hectare), followed by Belgium and Ireland with 191 and 164 heads per hec- tare, respectively. In Central Asia, on the other hand, the value is seven heads per hectare. In the

In the Last two decades the global cattle stock has increased by 10 percent. In South East Europe the cattle stock has quadrupled from a rather insignificant base; and it has also increased in the Caucasus and Turkey, and Central Asia. In the other sub regions, however, cattle numbers have decreased. The highest decrease was in Ukraine where the cattle population is one fifth of what it was 20 years ago (FAO, 2010).

Zebu cattle are used in cross breeding programs as they can adapt to hot and humid climates. How- ever, a number of these breeds are now being bred out because of intensive cross breeding with high milk producing exotic breeds and reduction of emphasis on draft ability due to mechanization of agriculture and transport. As a result, some of the native draft breeds are on the verge of extinc- tion. Hence, there is an urgent need to conserve these breeds. Breed characterization is the primary step in any conservation programme. The accuracy of phenotypic characterization of domestic cattle is often affected by the influence of the environment and the underlying genetic complexity. A number of studies have been initiated to characterize the European cattle breeds using the mo- lecular tools like microsatellite markers. Microsatellite markers, by virtue of their codominant and multiallelic nature prove to be efficient in genetic diversity studies, pedigree evaluation and genetic mapping as compared to other molecular markers like RAPD, RFLP and ISSRs. Microsatellites have become markers of choice in characterization of cattle breeds. Many studies have indicated that the deepest roots of cattle phylogeny occur between Indian cattle and those of Europe. In spite of the evolutionary significance of the Indian cattle breeds, the available literature on characteri- zation of these breeds using reliable molecular markers is scanty. Recently, Kumar *et al*. carried out admixture analysis of South Asian cattle breeds revealing the influence of *Bos Taurus* in the sub-continent. In the present study, we undertook the characterization of Ongole (n = 17) and Deoni (n = 13) cattle breeds using 5 di- and 5 tri-nucleotide repeat microsatellite markers. The two breeds showed a moderate genetic relationship (*F ST* = 0.117). A few breed-distinguishing al- leles were identified, which can be used to differentiate the two breeds) (Muralidhar Metta, 2004). In Somalia, the cattle of Somalia are mainly the East African Zebu type of which the following types are recognized, the Somali Boran, Gasara, Dauara and Surqo. The Somali Boran are believed to be a descendant of the first introduction of zebu into Africa from West Asia and are thought to have evolved following the migration of Ethiopian cattle into Somalia and Jubaland along the Somalia-Ethiopia border. The Surqo breed is a zenga breed. The zenga breeds are breeds that re- sulted from zebu-sanga crosses that came about following the introduction of zebu cattle into Af- rica from Asia. The Surqo breed is a crossbred of the Boran of Somalia or Ethiopia with an un- known Sanga population (Anne Muigai, 2006).

Dermatophytosis or known as (Ring worm) is a major contagious fungal disease affecting cattle of worldwide distribution. It invades and digested the keratinized tissues of skin and hair of host causing severe skin damage. Sever economic losses including damage or low-grade type of skin besides the reduction of meat and milk production. Moreover, contagiousness of this disease due to its zoonotic and public health concern to human throw direct or indirect contact with infected animals or materials. T. verrucosum considered a common fungus causing ringworm in cattle which characterized by rapidly spreading among susceptible animals. Longevity of Spores of T. verrucosum in different environmental conditions appear to be a big obstacle that prevent its erad- ication from the environment and difficulty of treatment. Mycological examination as well as Mo- lecular techniques as PCR were used effectively for diagnosis the disease in suspected cases. Re- cently, new modern alternative methods for treatment were applied as use of some plant extract or essential oils to avoid problems and side effects of traditionalAntifungal therapy. This review provide update information about some important points in risk factors and new trend in control of bovine dermatophytosis (Eman-abdeen, 2018).

In Somalia Dermatophytosis is widespread and zoonotic disease and its infection leads to loss of the protective barrier against infection with micro-organisms. The Dermatophytosis of cattle cause serious economic losses resulting from damage of hides and decreases in working capacity, growth and productivity. The diagnosis, epidemiological investigation, and analysis of the associated risk factors of ringworm, is an important approach for their control. The ringworm of cattle has public health significance that requires treatment, control and prevention.

This paper was investigated To determine the prevalence and distribution of dermatophytosis lesions in cattle farms in Benadir region, Somalia and the objectives were as follows:-

- To determine the prevalence of dermatophytosis lesions in cattle farms in Benadir region, Somalia.
- To assess the distribution of dermatophytosis lesions in cattle farms.

Although study related to problem under investigation has been conducted in, many parts of the word; however, there is literature gap in the study area therefore, this study is aimed to bridge this literature gap and determine the prevalence and distribution of dermatophytosis lesion in cattle farmers in Benadir region Somalia.

METHODOLOGY

The study was conducted in Mogadishu, the capital city of Somalia from September2022 to Feb- ruary2023 to determine the prevalence and distribution of dermatophytosis lesions in cattle farms in Benadir region, Somalia.

The study populations were comprised of randomly selected cattle in Mogadishu city. A total of 384 skin scraping samples were collected and examined for dermatophytosis lesions from farms and households to be estimate the prevalence and distribution of cattle dermatophytosis. Farms and households were selected purposively based on the higher cattle populations of the area to the age, sex, body condition, management, and housing type of cattle were gathered by short interview of owners, The study cattle were grouped into sex (male and female), age classified as young and adult, management (confined and non-confined), body condition (poor, middle, and good). Sample size required for the study was determined using the formula given by Thrusfield (Thrusfield M. , 2005). To calculate the sample size, 50% prevalence, 95% Confidence level, 50% expected prevalence and 5 % of desired absolute precision (d=0.05) was used.

$$n = \frac{(z)^2 pexp(1-pexp)}{d^2} = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2}$$

Where, n=required sample size, Pexp= expected prevalence, d2 = desires absolute precision. Since no previous study was undertaken in the study area, the expected prevalence was considered to be 50%. Accordingly, with 5% absolute precision at 95% confidence level, the number of cattle re- quired to determine the prevalence was calculated to be 384. Then, simple random sampling method was used to select the cattle from farms and households. Therefore 175 cattle from the confined and 209 cattle from the non-confined cattle with the totally of 384 cattle.

Cattle were examined by visual inspection, and suspected animals with ringworm were carefully examined by skin the scraping technique and photographed. A questionnaire regarding the preva- lence and distribution associated with ringworm infection (age, sex, body condition, appetite, and distribution and type of lesions, housing management, related communities and response to treat- ment) was completed.

Deep skin scrapings were collected from cattle with ringworm. The skin scrapings were conducted until hyperemia without bleeding occurred. The skin scrapings were examined in 20 % KOH for demonstrating arthrospores for Ringworm.

On a clean glass slide, a part of each specimen was placed, added to it few drops of 20% Potassium Hydroxide (KOH) to digest the keratin material, then covered with a clean glass and gently heated for one minute, the slide was microscopically examined used 10X objective lens for the presence of arthrospores.

The data obtained were statistically analyzed using Statistical Package of social science (SPSSv20). Descriptive statistical analysis was first displayed in frequency distribution 24 and cross-tabulation tables. Then Univariate analysis using the chi-square for qualitative data was per- formed. A P-value ≤ 0.05 was considered as a significant association, and the distribution were then selected to enter the Multivariate analysis. Multivariate analysis forward stepwise logistic regression was used to analyze the data and to investigate the association. A P-value ≤ 0.05 indi- cates significant association between cattle Ringworm and the distribution.

Table 1: Prevalence of Ringworm infection in the surveyed cattle.

Animals surveyed	**Total Survered cattle**	**Percentage**
Infected	76	20
Non infected	308	80
Total	384	100

Three-hundred and eighty-four cattle were surveyed and 76 were clinically suspected with Ring- worm infection. Among those suspected the prevalence of Ringworm was 20%.

Table 2: Prevalence of Ringworm infection in the examined cattle.

Microscopic examination	No	% within the total number of animals
Ringworm infection	46	11.973
Not infected	338	88.02
Total	384	100

In the current study a total of 384 of cattle managed under of Intensive and extensive of production system were examined for Dermatophytosis. Out of which 46 were found to be positive for the presence of arthrospores. And an overall prevalence of 11.973 was found in the current study.

Table 3 prevalence of dermatophytosis according to age

Age	**No of exam- ined**	**No of posi- tive**	**Prevalence%**	**X2**	**P-value**
Adult	232(60.4%)	18(4.7%)	7.8		
				9.901	**0 .002**
Young	152(39.6%)	28(7.3%)	18.4		

Out of 232 cattle examined were adult age, 18(4.7%) of them were found positive, where152 cattle examined were young age 28(7.3%) of them were found positive for ringworm infection, the difference between the two age groups was statistically significance different in cattle derma- tophytosis X2 (1, N=384) = 9.901, P-value = 0.002.

Table 4 prevalence according to sex

Sex	No of exam- ined	No of posi- tive	Preva- lence%	X2	P-value
Female	247	26	10.5	**1.386a**	**.155**
Male	137	20	14.6		

Dermatophytosis prevalence in female and male cattle were 10.5% and 14.6 respectively, a signif- icant different was not observed between the prevalence of female and male cattle diagnosed, X2(1, N=384) = 1.386[a], P-value=1.55. Male cattle were found to have a slightly higher prevalence compared to female cattle.

Table 5 Prevalence of dermatophytosis according to body condition score

Body condi- tion	No of exam- ined	No of posi- tive	Prevalence	X2	P-value
Good	195	5	2.6	35.308[a]	.000
Middle	71	13	18.3		
Poor	118	28	69.5		

The body condition score was categorized as good, middle and poor and its prevalence was 3%, 22.4%, and 31% respectively. Statistically significant difference in the prevalence of cattle derma- tophytosis was recorded X2 (2, N = 384) =35.308[a], P=0.00, higher in poor body condition cattle than middle and good body condition. (Table 5).

Table 6 Prevalence of dermatophytosis according to management system

Management system	No of exam- Ined	No of posi- tive	Prevalence%	X^2	p-value
Confined	175	30	17	8.131	0.004
Non-confined	209	16	7.6		

The prevalence of dermatophytosis in cattle managed under confined and non-confined production system was found to be 17% and 7.6% respectively. Significance difference in prevalence of der- matophytosis infection was observed between cattle managed under confined and non-confined production system of the study X2 (1, N=384) = 8.131[a], P=0.004 . Confined production system was found to have a higher prevalence of dermatophytosis compared to those managed under non-confined production system.

Table 7 Prevalence of dermatophytosis according to appetite

Appetite	No of exam- Ined	No of posi- tive	Prevalence%	X^2	p-value
In appetence	58	29	50	93.664	0.000
Normal	326	17	5.2		

Among the total number of cattle surveyed (384 cattle), 58 animals showed in appetence and 326 animals had normal appetite. Among the cattle that showed in appetence 29(50%) were found infected, while only 17(5.2%) animals with normal appetite were found infected. A significant association X2 (1, N=384) =93.664, P= 0.000 was observed between appetite of animals and ring- worm infection.

Table 8 Prevalence of dermatophytosis according to drug use

Drug use	**No of exam- Ined**	**No of posi- tive**	**Prevalence %**	**X2**	**P-value**
Irregular	109	14	12.8	**28.267**	**0.000**
Regular	122	0	0		
Not use	153	32	20.9		

Among the total number of cattle surveyed (384 cattle), 153 animals did not receive drugs, 109 animals received drugs on irregular basis, and 122 animals received drugs on regular basis. Among the animals that did not receive drugs 32 (20.9%) were found infected, while among animals that received drugs

on irregular basis only 14 (12.8%) animals were found infected. A significant as- sociation X^2 (1, N=384) =28.267, P= 0.000 was observed between drug frequency and ringworm infection (Table 8).

Table 9 Prevalence of dermatophytosis according to type of lesions

Type of lesions	No of examined	No of positive	Prevalence %	X^2	P-value
Health	280	0	0	145.966	0.000
Moist	7	5	71.4		
Scab	97	41	31		

Among the total number of cattle surveyed (384 cattle), 97 animals showed scab covered lesions, 7 animals had moist lesions and 280 animals were healthy. The animals that had scab covered lesions were 41 (42.2%) were found infected, while animals showing moist lesions were 5 (71.4%) infected. A significant association X^2 (2, N=384) = 145.996 P-value = 0.000 was observed between the type of lesions and ringworm infection .

Table 10 Distribution of Ringworm lesions on the cattle's body:

Distribution	No of examined	No of positive	Prevalence%	X^2	P-value
Head	96	15	15.6		
Neck	161	20	12.4		
				3.448	0.448
Abdomen	50	6	12		
Back	44	3	6.8		
Thighs	33	2	6		

Cattle based on neck the total of 161 examined cattle 20 were positive for dermatophytes, ring- worm lesions were seen most frequently on the neck region. Around the head in 96 examined cattle 15 of them were positive while 50 of examined cattle 6 of them the lesions were found on the abdomen, 44 of 3 animals on the back and 33 of 2 on the thigh.

LITERATURE REVIEW

Skin disease

Other than dermatophytosis, mange and dermatophilosis, the most common prevalent condition was Lumpy skin disease (LSD). Lumpy skin disease is a vector-borne pox disease of domestic cattle and Asian water buffalo and is characterized by the appearance of skin nodules. Endemic across Africa and the Middle East, the disease has, since 2015, spread into the Balkans, the Cau- casus and the southern Russian Federation. Outbreaks of LSD cause substantial economic losses in affected countries, but while all stakeholders in the cattle industry suffer income losses, poor, small-scale, and backyard farmers are hit hardest. The disease impacts heavily on cattle produc- tion, milk yields, and animal body condition. It causes damage to hides, abortion, and infertility. Total or partial stamping-out costs add to direct losses. Indirect losses stem from restrictions on cattle movements and trade. In addition to vectors, transmission may occur through consumption of contaminated feed or water, direct contact, natural mating or artificial insemination. Large-scale vaccination is the most effective way of limiting the spread of the disease. Effective vaccines against LSD exist and the sooner they are used the less severe the economic impact of an outbreak is likely to be. The purpose of this manual is to enhance awareness of LSD and to provide guidance on early detection and diagnosis for private and official veterinary professionals (in the field and in slaughterhouses), veterinary paraprofessionals and laboratory diagnosticians. The field manual comprises a general description of LSD, including clinical signs, geographic distribution, epide- miology, host range, and transmission pathways. It then moves chronologically from detection of cattle showing typical clinical signs of LSD – later referred to as "suspected case(s)" – to the consideration of differential diagnoses, postmortem findings, and laboratory confirmation of field diagnosis. The primary diagnostic tools available for the detection of both virus and antibodies are described, as well as recommendations for sample collection and transport from the field to na- tional or international reference laboratories. The immediate control and eradication actions fol- lowing a suspected/detected LSD case on a farm are described. Additionally, the manual covers various aspects related to awareness-raising and feasible post-outbreak surveillance. This manual is one of a series prepared by FAO's Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) as an aid to preparedness for major transboundary animal diseases (TADs) of livestock. Lumpy skin disease is classified as a TAD due to its significant economic impact on production and local livelihoods, and to the international trade restrictions it entails in affected countries. In addition, LSD can rapidly spread across national borders and reach epidemic proportions, thus requiring regional cooperation in prevention, control and eradication (Eeva Tuppurainen, 2017)

Psoroptic mange is a severe disease, which reduces animal welfare and causes financial losses due to performance loss and treatment costs, especially in the sheep and in the beef industry. This disease is caused by a non-burrowing ectoparasite, Psoroptes Ovis, which lives on the skin surface. The mouthparts of these mites are adapted to the consumption of serous exudate, lymph and red blood cells from the host skin surface. Meanwhile, the mites abrade the stratum corneum and de- posit allergens (such as faecal pellets), which cause skin irritation, intense pruritus, and severe allergic dermatitis in livestock. The cutaneous inflammatory response developed by hosts in re- sponse to the mites is a serious threat to epidermal integrity. The damage in the epidermis

is con- sidered as promoting the hypersensitivity reaction in the host to control the mite infestation. Pre- vious work in sheep demonstrated that a reduction of lesion development and mite numbers was caused by suppressing the host immune response. However, the relationship between lesion de- velopment and immunosuppression in cattle has not been clarified.

Generally, the development of clinical signs in cattle starts at 1 week post infestation. Next, a rapid growth phase sets in with a sharp increase in mite numbers and active lesions that are mainly found at the withers, back and the tail base, but can eventually cover most of the body. During this pro- cess, pruritus becomes more intense due to the host allergic reaction to the mites, leading to self- trauma behavior, such as licking and rubbing. Although these actions will make the affected ani- mals comfortable to some degree, mechanical skin abrasion can cause hair loss, skin damage and bleeding wounds. All these factors will intensify the local intradermal inflammation, which leads to increased serum extravasation, creating the perfect microclimate for mites to survive. This ideal environment will in turn translate in a further growth of both mite population and skin lesions. Subsequently, the lesion size and mite numbers decrease and, eventually, the clinical signs disap- pear and the mites are eliminated. However, whether or not animals fully recover from the disease depends on different factors, such as the cattle breed. For instance, natural recovery in Holstein Friesian (HF) cattle is more frequent compared to Belgian Blue (BB)

Bovine dermatophilosis is one of the diseases which are economically important in dairy cattle breed. It is an acute or chronic exudative, pustular dermatitis caused by bacterium Dermatophilus congolensis). D. congolensis is a gram positive facultative anaerobic actinomycete and an obligate invader of the skin of cattle and other species (Radostitset al., 2007). The dermatophilosis infection is clinically observed in 3 stages: first stage lesion appears as nodule formation and exudation; stage two as scab formation and coalition of initial lesions and stage three as lesions characterized by accumulation of cutaneous keratinized materials (wart-like lesion).Thick crusts or scabs, which comes away easily with tuft of hair leaving a moist, depressed area with bleeding points from capillaries is characteristic of lesions of dermatophilosis . The actual time when bovine dermatophilosis was introduced to Ethiopia is not known, however, its presence was confirmed by different workers. The disease causes reduction of productivity and hide and skin quality and death and culling of affected cattle. However, published reports on bovine dermatophilosis relatively scarce and the epidemiological investigation done in both intensive and extensive production systems is not sufficient, which is indicative of limited attention given to the disease. In West Shewa zone of Oromia region where small holder dairy farming is growing, personal observation and complaints from dairy owners showed the presence of cattle with chronic skin lesion that led to loss of milk yield, death and culling of valuable cows. Moreover the level of the disease was yet not investigated in this region and information regarding bovine dermatophilosis is lacking especially in dairy farms which are in promising development. Therefore, the objective of this study was to investigate the status of clinical bovine dermatophilosis and risk factors involved in dairy cattle in selected dis- tricts towns of West Shewa zone of Oromia regional state (Borena, 2017).

Etiology

Dermatophytes are divided into three main types according to habitat, geophilic (soil), anthrophilic (man) and zoophilic (animal). T. verrucosum belong to zoophilic type that considered the main frequently fungi responsible for ringworm in cattle although T. mentagrophytes may also causing such disease in cattle and to less extend M. canis. There are difference between these species in diagnostic culturing and examination as shown in the blow table (1). Moreover, T. verrucosum can remain infective in environment for long thus, prevent complete eradication and control of the disease in farm animals. The pathogenesis of dermatophytes begins firstly from contact between skin abrasion of host and contaminated environment or infected animal lesion containing arthro- condia, which germination occur in hair follicles then the invasion the cell wall of skin (stratum corneum) with digestion of keratin content and highly formation of hyphae and conidia (ecto or endothrix). The growing hair carrying fungal elements (ecto or endothrix) leading to rapid spread- ing of infection in form of ring shape lesion covered by scales and crusts that may coalescence together forming large area of alopecia. Moreover skin hyperkeratosis may developed (Eman- abdeen, overview on bovine dermatophytosis, 2018).

Geographic Distribution

Dermatophytes grow best in warm and humid environments and are, therefore, more common in tropical and subtropical regions. Their distribution varies with the organism. M. canis, M. nanum,

M. gypsum, T. mentagrophytes, T. verrucosum and T. equinum, occur worldwide, although their prevalence varies with the region. T. simii was thought to be endemic only in Asia, specifically the Indian subcontinent; however, infections acquired in Europe and Africa suggest that its distri- bution might be more widespread. T. mentagrophytes var. erinacei (T. erinacei) is associated with hedgehogs, and it is found where these animals occur in the wild (Europe, New Zealand and Af- rica), or in countries where they are kept as pets. M. persicolor has been reported in Europe, and T. bullosum has been detected in Tunisia, Sudan, Syria and France. Like zoophilic species, anthro- pophilic dermatophytes may be either cosmopolitan or more limited in their distribution. The latter group may be imported into other countries on infected individuals.

Transmission

People and animals become infected by dermatophytes after contact with spores (conidia). Der- matophytes growing in a vertebrate host normally form only arthrospores (arthroconidia), asexual spores that develop within the hyphae. In the environment (e.g., in laboratory culture), they can also produce microconidia and macroconidia, asexual spores that develop outside the hyphae. In- itially, the dermatophyte infects a growing hair or the stratum corneum of the skin. These organ- isms do not usually invade resting hairs, since the essential nutrients they need for growth are absent or limited. Hyphae spread

in the hairs and keratinized skin, eventually developing infectious arthrospores. Anthropophilic and zoophilic dermatophytes are mainly transmitted between hosts by arthrospores in hairs or skin scales. Other asexual or sexual spores formed by the environmental stages may also be infectious. Fomites such as brushes and clippers are important in transmission. Spores may remain viable in suitable environments for up to 12-20 months, and some spores were also reported to persist for at least a year in salt water. Certain types of spores (e.g., microconidia) might be dispersed by airborne means.

Clinical Sign

Dermatophytes generally grow only in keratinized tissues such as hair, nails and the outer layer of skin; the fungus usually stops spreading where it contacts living cells or areas of inflammation. Many dermatophytes can invade hairs as well as the skin; however, some anthropophilic species such as E. floccosum and T. rubrum are limited to the skin. Mucus membranes are not affected. The symptoms of dermatophytosis vary, depending on the infecting organism, affected tissues most severe at the edges, with erythema, scaling and occasionally blister formation. The central area may clear, resulting in the formation of a classic “ringworm” lesion. In haired areas, the hairs become brittle and areas of alopecia may appear. Dermatophytes acquired from animals or the soil generally produce more inflammatory lesions than anthropophilic dermatophytes (but not all indi- vidual cases are highly inflammatory). These infections are also less likely to become chronic than those caused by anthropophilic organisms in humans, dermatophytes are referred to as “tinea” infections, and are named according to the area of the body involved. Infections can, however, spread from one area to another.

Diagnostic Tests

Diagnosis is based on the history, physical examination, and microscopic examination of scrapings and hairs from the lesions, sometimes in conjunction with fungal culture and other techniques such as Wood’s lamp examination and histology of the tissues. Some dermatophytes fluoresce when they are stimulated by the wavelengths of ultraviolet (UV) light in a Wood’s lamp. Organisms that exhibit fluorescence include some strains of the zoophilic dermatophytes M. canis and T. quinckeanum, as well as a few anthropophilic species, such as M. audouinii. T. tonsurans and T. violaceum, which are the most common agents in some regions, are not revealed by this technique. Certain topical preparations may mask the fluorescence, and alcohol can either suppress it or cause non-specific fluorescence. Dermatophytes can often be detected by microscopic examination of infected hairs and skin or nail scrapings. Hyphae rounding up into arthroconidia are diagnostic, but hyphae alone could be caused by other fungi, including contaminants. In hairs, arthroconidia may be found outside (ectothrix) or inside (endothrix) the hair shaft. Skin scrapings should be taken from the edge of the lesion, and hairs should be plucked (not cut) from this area. The best hairs to select are those that fluoresce under a Wood's lamp, or are broken or scaly. Nail scrapings are generally taken from the nail bed, or from deeper portions of the nail after removing the outer layers (except in cases where the infection is entirely superficial). Samples are usually cleared with potassium hydroxide (KOH) or other agents to help visualize the organism. Various stains such as chlorazol black E, Parker blue-black ink, Swartz-Lamkin stain or Congo red stain may be added. Fluorescence microscopy, using calcofluor white or other stains, can also be used to visualize der- matophyte structures. Fungal cultures, which identify the species of dermatophyte, can be useful in understanding the source of the infection and targeting preventive measures appropriately. Cul- ture may also be necessary if the diagnosis is uncertain, or the infection is resistant to standard treatment. However, recommendations vary in the literature, and uncomplicated cases are not al- ways cultured in practice. Samples for culture include hair, skin and nail samples, as for micro- scopic examination. In some situations (e.g., infections in sensitive sites, or the identification of asymptomatic carriers), other techniques such as brushing the hair, using adhesive tape to collect samples, or rubbing the area with a sterile toothbrush or moistened, sterile cotton swab may also be effective. Colonies appear in 5 days to 4 weeks, depending on the organism. Colony morphol- ogy can differ with the medium. Descriptions are usually based on Sabouraud agar, but dermato- phyte medium or other fungal culture media can also be used for isolation. Dermatophyte species can be identified by the colony morphology; the appearance of microconidia, macroconidia and other microscopic structures; biochemical characteristics such as urease production; and nutri- tional requirements. Specialized tests such as the ability to penetrate hairs in vitro, or mating tests (which are usually available only at reference laboratories) may be used occasionally. Differential media (e.g., bromocresol purple-milk solids glucose) can be helpful during differentiation. Some fungal cultures from infected people are negative. Histology (biopsy) is occasionally helpful, es- pecially in deep mycoses and some infections of the nails. The organisms are visualized best with periodic acid–Schiff (PAS) staining, although they may also be found in hematoxylin-eosin- stained preparations. PCR tests have been published for a number of organisms, and molecular methods of diagnosis might become more common in the future (medicine, 2013).

Direct microscopic examination

Small portion of the collected samples (hair and skin scrapings) were placed on a microscopic slide with a drop of 20% potassium hydroxide and covered with a cover slip additional drops of KOH solution were added from the side of the cover if needed that spread under the cover by capillarity to replace air bubbles ,then the slide was heated gently over Bunsen flame(not boil ,only three to four passages on the flame) , the 17 slide was left for 20-30 min then examined under low and high power magnification for the presence of fungal elements as long branching septated hyphae or arthrospores. A prolonged clearing time and an accurate observation are required due to thick crusty lesions (Liu et al, 2010)

Culture

After direct microscopic examination, irrespective of demonstration of fungal elements, the spec- imens were cultivated on: -

Cultivation on sabouraud's dextrose agar

Cultivation on Sabouraud's dextrose agar (SDA) with chloramphenicol (50 mg⁄L) and cyclo- heximide (500 mg⁄L) (MAST) (Laron, 1976). The specimens were cut out into small pieces by sterilized needle and scalpel, a light inoculum of each hair and skin scrapings specimen was picked up with sterile forceps and scattered at centre location on the surface of the medium and gently pressed down into the agar. The cultures were labeled with the specimen number and date of in- oculation. Then incubated at 25-30 ˚C for three weeks, it was preferable not to discard the negative culture before one month.

Cultivation on dermatophyte test medium (DTM)

Cultivation on dermatophyte test medium (DTM) (HIMIDIA Indian) (Liu et al, 2010) Subcultur- ing was done on DTM then incubated at room temperature for 10 to 14 days. As dermatophyte test medium (DTM) a special media has been formulated for growing and identification of dermato- phytes. Without having to look at the colony one can identify the dermatophyte by a simple color test. If the fungus is a dermatophyte, the medium will turn bright red. If the fungus is not a derma- tophyte, no color change will 18 be noted. If kept beyond 14 days, false positive can result even with non-dermatophytes. The mycological identification was based on macroscopic and micro- scopic examination of the culture isolates were consist of two types and the first is macromorphol- ogy which the colonies were examined from all aspects for rate of growth whether slow or rapid, topography (flat, heaped, regularly or irregularly folded), texture (yeast like, glabrous, powdery, granular, velvety or cottony), surface pigmentation and reverse pigmentation. And the second type is Micromorphology which was done by taking a small part from the colony by a sterile needle into a glass slide and a drop of cotton blue was added, with needle tease the specimen and remove any hard parts or remaining of the agar then cover with a cover slide, LPCB was added if needed. The slide was examined by low and high power to demonstrate the presence of hyphae and its modification, macroconidia, microconidia, chlamydospores and other fungal structure.

DNA extraction

DNA extracted from isolated dermatophytes species using Biospin fungus genomic DNA extrac- tion kit. (Bioer Technology Co., Ltd., Hangzhou, P.R. China) At first, the sample was lysed in LE buffer, and then DNA in the sample was liberated. After adding DA buffer and centrifuging, the impurity was discarded, released DNA was bound exclusively and specifically to the Biospin membrane in presence of a Binding buffer under appropriate salt iron and PH conditions. De- naturated protein and other contaminants were removed by several washing procedures. The DNA was then eluted from the membrane with the Elution buffer. The extraction occurred according to manufactures protocol (Liu et al, 2010)

PCR method using the (GACA) primer

Short oligonucleotide (GACA) 4 (Operon Biotechnologies, USA) was used as a primer for identi- fication of the tested dermatophyte isolates as described by (Shehata et al, 2008). Amplification reactions were carried out with volumes of 50 µl containing reaction buffer 50 mM KCl, 10 mM Tris-HCl (pH 9.0), 2.5 mM MgCl2, deoxynucleoside triphosphate mix (0.2 mM each of dATP, dCTP, dGTP, and dTTP), 160 ng of the (GACA)4 primer (Operon Biotechnologies), 2.5 U of Taq polymerase (Sigma, USA). And approximately 25 ng of template DNA, made up to a total volume 50 µl with pure, sterile double-distilled water]. PCR was carried out for 39 cycles of denaturation at 93°C for 1 min, annealing at 50°C for 1 min, and extension at 72°C for 1 min, followed by a final extension step at 72°C for 7 min.

Agarose gel electrophoresis

A volume of 10 µl PCR products were mixed with 3 µl 6x loading buffer. The samples were then run on 1 % agarose gel with 0.5 µg/ml ethidium bromide. The gel was run in an electrophoresis gel tank at 35v for 2.5 hours in 0.5x Tris-BorateEDTA buffer (45mM Tris-borate, PH 8.3, 1 mM EDTA). Sizes of PCR products were determined by comparing them to a 3000-bp DNA ladder. The DNA was visualized by UV light and photographed using a gel Documentation System (Shehata et al, 2008).

Prevention

Controlling dermatophytes in animals can prevent some cases of zoonotic dermatophytosis in hu- mans. Infected animals should be treated, and the premises and fomites cleaned and disinfected as much as possible. (Some environments can be difficult to decontaminate.) Contact with infected animals should be limited, and gloves and protective clothing should be used if these animals are handled. Better surveillance, improved living conditions and improved treatments can decrease the overall prevalence of anthropophilic dermatophytes, while hygiene, and prevention of contact are helpful in individual cases. Measures such as moisture control (e.g., in tinea pedis) are important in reducing susceptibility to some forms of tinea.

Treatment of Ringworm

For treatment, the scales and surrounding lesions should be cleaned with water and soap, dried and then rubbed with 2% iodine tincture. The lesions may also be locally treated with thiabendazole ointment or other suitable antifungal cream. However, the 20 use of griseofulvin orally is not rec- ommended since it may cause side effects such as nausea and diarrhea. Intramuscular administra- tion of Vitamin A (400,000 I.U./ animal) may assist in rapid

recovery (Almuzaini et al, 2016) For disease prevention, appropriate hygienic measures should be observed, including isolation of in- fected cattle, cleaning, disinfection, and proper ventilation of the cattle' dwellings and avoidance of overcrowding. Vaccine for protecting cattle was developed in the former USSR which helped in reducing the incidence of the disease. Diseased cattle were divided into two groups. Group 1 was treated after removal of skin crusts using topical application of 10% iodine ointment daily for three weeks, while group 2 was treated by the same method, but intramuscular injection of vitamin A (400,000 IU/animal) on alternate days for three times was administered along with mineral mix- ture supplementation as dietary additives for three weeks. Disinfection of animal housing and equipments was done in adjunct with animal treatment using 10% hypochlorite solution (Rycroft and McLay, 1991).

Conclusion

The result of the current study showed cattle dermatophytosis is the most important disease affect- ing cattle production in benadir region with an overall prevalence of 11.973%. The prevalence of dermatophytosis was found low in non-confined than in confined cattle farm. The study confirmed the presence of significance association between the prevalence of cattle dermatophytosis and sev- eral risk factors like management system, body condition score and age, where as those under confined system, poor body condition score method all showed higher prevalence. On the other hand the prevalence of dermatophytosis has no significant association with the sex of cattle exam- ined during the study period. The overall prevalence of Ringworm infection in the cattle farms, Benadir Region is high. Ringworm is common disease affecting young cattle. High prevalence of Ringworm was encountered in males than female. Ringworm in cattle cause loss of appetite and body condition. Ringworm in cattle was more prevalent in cattle in contact with other species of domestic animals, and in animals that did not receive drugs. Ringworm is zoonotic disease and also for public health significance.

Recommendation

Cleaning and disinfecting barns with a strong detergent followed by a solution of 1 gallon of household bleach diluted with 3 gallons of water does a good job. Halters and grooming equipment can be disinfected with bleach or a 4% solution of formaldehyde. At the first sign of the lesions of ringworm, topical treatment should be started. Reducing the density of animals and direct contact in addition to increased exposure to sunlight and being maintained on dry lots help prevent the spread between animals. The deleterious effects of tick and other ectoparasites in cattle should receive thorough attention because they play a significant role in the transmission of most skin diseases, and their treatment and control in a national program is warranted.

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