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Keywords: dermatophytosis, camel, public health, KOH.

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Prevalence and Risk Factors Associated with Dermatophytosis in the one Humped Camel (*Camelus Dromedarius*) Dairy 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 Dermatophytosis. Camel 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 to determine the prevalence and risk factors associated with Dermatophytosis infection among One-humped camel (*Camelus dromedarius*) in Camel dairy farms of Benadir Region, Somalia. Three hundred eighty four camels randomly surveyed from camel dairy farms. During screening 54 camels (14%) were clinically suspected and samples of skin scraping were examined by using 20% KOH for detection of Dermatophytosis under the microscope. Among these 29 camels (7.5%) were infected with Ringworm. According to the age group the highest prevalence was recorded in camels younger than three years.

There was significant difference in the prevalence of Dermatophytosis infection between male and female camels ($P \leq 0.05$), also there was significant difference ($P \leq 0.05$) the majority of Ringworm infection associated with appetite, body condition, rearing system, and type of lesion. The results obtained showed that camel Dermatophytosis infection poses a problem in camel dairy farms in Benadir Region. Direct examination based on KOH is rapid and reliable technique for diagnosis of Dermatophytosis infection. It could be recommended in a field test to control the prevalence and the impact of zoonotic Dermatophytosis on camel health, human health, welfare and production.

Keywords: dermatophytosis, camel, public health, KOH.

1. INTRODUCTION

The one-humped camel (*Camelus dromedarius*) or Arabian camel, commonly called the dromedary, is an important species uniquely adapted to hot and arid environments. The Genus *Camelus* was probably among the last of the major domestic species to be put to regular use by man. Since its domestication 3000-4000 years ago, the one-humped camel (*Camelus*

dromedarius) accompanied humans and provided many facilities in arid and semi-arid areas. It is an indispensable species of domestic animal. It had been exploited by man in Asia and Africa in arid and semi-arid areas often being the only supplier of food and transport for people. It is a multipurpose animal (Ahmed, 2011). That can be used for milk, meat, wool, hide, transport, races, tourism, agricultural work and beauty contests. No other domestic animal is able to provide as many variable services to humans. The dromedary one-humped camel (*Camelus dromedarius*) served the needs of people for thousands of years ago. They secured trade and communication through wide arid and semi-arid expanses. The majority of camels are kept by pastoralists in subsistence production systems (Ahmed, 2011). There are two species in the genus *Camelus*: the dromedary, or Arabian camel, (*Camelus dromedarius*) which gets its name from the Greek and *C. bactrianus*, the Bactrian camel named after the area of Bactriana in Central Asia where it has been domesticated (Al-Ani, 1998) the ten first countries in the world according to their camel populations are Somalia, Sudan, Ethiopia, Niger, Mauritania, Chad, Kenya, Mali, Pakistan and India (Faye, 2011). Somalia has the largest number of one-humped camels (*Camelus dromedarius*) globally. The camel population of the country is 7.5 million tropical livestock units (TLUs). (FAO, 1978, 1984). And currently there is no information about camel populations.

Camels in the Somali are normally found in the southern, central and northern parts of the country. Past and present experiences proved that the dromedary camel is a very hardy animal and has very special anatomical characteristics, and many varied physiological mechanisms, which enable the animal to live, reproduce and produce milk and meat, and to work under extreme conditions of heat and aridness, even during periods of drought when cattle, sheep and goats barely survive. Nevertheless, they suffer from ectoparasitic disease which is the major constraints in the improvement of camel health. This disease causes substantial economic losses in terms of decrease in

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working capacity, growth and productivity (Parsani, 2008)

a) *Significance of the study*

Somalia is considered home of one-humped camels globally, mainly camel pastoralists and other livestock providing livelihoods for nearly 60% of the country. Camel hides are important products that fulfill many functions. The hides are used traditional purposes of pastoral communities. Some Dermatophytes have great zoonotic importance, where many of them occurring primarily in animals and can be transmitted from infected animals to man. The transmission of Ringworm is usually by direct contact with infected host (animals or humans) or asymptomatic carriers and/or indirect contact with infected exfoliated skin or hairs in premises and equipment. Recently there are semi-intensive camel dairy farms in Benadir region and there is need to determine the prevalence and risk factors associated Ringworms in camel farms so that to create appropriate measurement, improve the awareness of the camel farmers and reduce economic impact of Dermatophytosis.

II. MATERIALS AND METHODS

a) *Study Area*

The study was conducted mainly camel dairy farms at three districts in Benadir region, Somalia, and

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

Is as follows:

Where:

N = sample size required.

q = 1- pexp.

Pexp = expected prevalence

d = desired absolute precision

In this formula expected prevalence of 50 % and absolute precision of 95% were considered. The number of camels required to determine the prevalence will calculated to be 384.

e) *Risk factors*

Data on the risk factors were collected through a questionnaire addressing camel farm owners and were as follows: age, sex, body condition, appetite, rearing system and distribution and type of lesions.

f) *Camels Surveyed*

Camels were examined by visual inspection, and suspected animals with Dermatophytosis were carefully examined by skin the scraping technique and photographed. A questionnaire regarding the potential risk factors associated with ringworm infection (age, sex,

most of the farms were outskirts such as Deynile, Kaxda and Dharkenley districts. Benadir Region is the southern part of the country. It lies at the latitude 2.0469°N and longitude 45.31°E, the city is situated along side of the Indian with an average rain fall of 428 mm. The mean ambient temperature ranges from 24 °C to 30°C. Mean relative humidity stands at 80%. (Metz at.al, 1993)

b) *Study Design*

The study was a cross-sectional to establish the prevalence and risk factors associated with Dermatophytosis in One-humped Camel dairy farms, in Benadir Region, Somalia.

c) *Camels Examined*

The study was conducted in three hundred eighty four camels selected by the simple random sampling method.

d) *Sample Size*

The sample size was determined based on the formula recommended by (Thrusfield, 1995), and

body condition, appetite, rearing system and distribution and type of lesions) was completed.

g) *Collection and examination of skin scrapings*

Deep skin scrapings were collected from camels with ringworm. The skin scrapings were conducted until hyperemia without bleeding occurred.

h) *Laboratory investigation*

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.

i) *Statistical analysis*

The data obtained were statistically analyzed using Statistical Package of social science (SPSSv20).

III. RESULTS

a) *Dermatophytosis (Ringworm) in camels*

Skin scrapings examined in 20 % potassium hydroxide (KOH) showed arthrospores characteristic to

the Dermatophytes in 29 samples. The lesions of Ringworm appeared on the head especially round the eyelids and muzzle, neck, shoulders, abdomen, legs and tail. The lesions varied in size and characterized by their circular or semi-circular shape.

b) Prevalence of Dermatophytosis in the surveyed camels

Three-hundred and eighty-four camels were surveyed and 54 were clinically suspected with Ringworm infection. Among those suspected the prevalence of Ringworm was 14 %.

Table 3.2: Prevalence of Dermatophytosis of surveyed camels

Animals surveyed	No.	%
Infected	54	14.0
Not infected	330	85.9
Total	384	100

Table 3.3: Prevalence of Dermatophytosis infection in examined camels under Microscope

Microscopic examination	No.	% within the total number of animals
Ring worm infection	29	7.5%
Not infected	355	92.4%
Total	384	100%

c) Dermatophytosis and its associated potential Risk factors

i. Sex of the animals

Among the total number of camels surveyed (384 camels); 111 were males and 273 were females. Among male camels 13 (11.7%) were found infected, while among female camels 16 (5.8%) were infected.

ii. Age of the animals

Among the total number of camels surveyed (384 camels), 96 camels were young (1 to 3 years), 173 were adult animals (4 to 8 years) and 115 old animals (more than 8 years). Among young animals 14 (14.5%) were found infected and among adult animals 7(4.04%) animals were found infected, while in old animals 8 (6.95%) were infected.

a. Appetite of the animal

Among the total number of camels surveyed (384 camels), 48 animals showed inappetence and 336 animals had normal appetite. Among the camels that showed inappetence 25 (52%) were found infected, while only 4(1.19%) animals with normal appetite were found infected.

b. Body condition

Among the total number of camels surveyed (384 camels), 13 animals were found with poor body condition, Another 13 animals were in fair body condition, and 358 with good body condition. Among the camels showing poor body condition 17(76.4%) animals were found infected, 8 (61.5%) 28 animals with fair condition were found infected, while among animals showing good body condition only four (1.1%) were found infected.

c. Rearing system

Among the total number of camels surveyed (384 camels), 22 animals were kept under mixed rearing conditions, and 362 animals were kept under separate rearing system. Among camels kept under mixed

rearing 14 (63.6%) were found infected with ringworm; while those kept under separate rearing 15 (4.14%) were found infected.

d. Type of lesion

Among the total number of camels surveyed (384 camels), 32 animals showed scab covered lesions, 1 animal had oozing lesions and 351 animals were healthy. The animals that had scab covered lesions were 28 (90.3%) were found infected, while animals showing moist lesions were all (100%) infected.

IV. DISCUSSION

Dermatophytosis (syn. ringworm) is a zoonotic skin infection of the keratinized tissues caused by a specialized group of fungi named Dermatophytes. The disease can affect man, and all domestic animals, including camels (Almuzainia et al, 2016).

In this study the overall infection rate was 7.5% (29/384) verified by microscopic examination. The prevalence of Ringworm recorded in the present study was higher than the prevalence rate reported by (Agab and Abbas, 1992) in Sudan who reported sero-prevalence of 5.8 % (217/3681) of Ringworm in camels, and in Ethiopia by (Megersa, 2010) who reported prevalence of 8.3% (14/169) in camels. Ringworm was more prevalent in male camels than female. This finding was contrary to the findings of (Fadlelmula, 1994)), and (salim, 2010) who reported no significant difference between Ringworm infection and gender. The prevalence rate of Ringworm in young animals was higher than old and adult animals. This finding was in agreement with (Agab, 1993)) who reported that ringworm occurs in camels less than 3 years of age. This was probably due the weak immunity in young and old animals. The prevalence rate of Ringworm in animals showing in appetite was higher than animals with normal appetite. This result supported the findings of

(Saber, 2015). The most probable explanation to this finding is that animals showing in appetite become weak and are more susceptible to infection with Ringworm. The prevalence rate of Ringworm in animals with poor and fair body condition was higher than animals with good body condition. This result was in agreement with (Enany et al., 2013). This could probably be explained in terms of resistance to infection; animals with good body condition are more resistant to Ringworm infection than animals with fair or poor body condition. The prevalence rate of Ringworm in animals kept under mixed rearing was higher than animals kept under separate rearing system. Similar results were obtained by the (Center for Food Security and Public Health, 2013) who reported that Dermatophytes may be acquired from other species of animals grazing side by side with camels. Camels showing scab lesions (90.3%) were infected and (100%) of animals with moist lesions were infected. This finding authenticated the finding of (Fadlelmula and Shathele, 2010) who reported that the lesions start with thickening of skin, alopecia and scaliness involving small circular areas or become confluent covering extensive areas. The distribution of camel Ringworm infection in the body is shown above. Lesions of Ringworm initially involve the head, neck, abdomen and back with different ratios. Similarly, (Chermette et al, 2008) reported that the lesions of Ringworm initially involve the head, neck and shoulders, with a possible extension to the flanks and legs, leading sometimes to pyoderma and emaciation.

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Conflict of interest

The authors have declared no conflict of interest.

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