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Incidence of dermatophillosis among one humped camel (*camelus dromedarius*) provided to tamboul livestock market, Sudan

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Abstract
The present study aimed to the determined incidence of Dermatophillosis among one humped camel (*Camelus dromedarius*) provided to Tamboul livestock market, Sudan. Three hundred camels of different ages and sex that came from different parts of Sudan were studied in different season's assessment of some factors on the incidence of Dermatophillosis, and haematological and biochemical values for infected camels were done. The results showed that the incidence rate of Dermatophilus infection in camels was 3%, visually; loss of hair and accumulation of necrotic white materials around the neck, forelimb, thorax and sometimes all parts of the body was shown; the necrotic white materials were deep and hard attachment with skin. Microscopically the *Dermatophilus congolensis* under the microscope revealed cocci was used 10% KOH and Giemsa stain. According to age, Chi-square revealed a significantly higher incidence rate in the age group less than 6 years (88.9%) followed by 6-12 years (11.1%) years and not noted in ages more than 13 years. Therefore, a high significance variation in sex and all infected camels were noticed in male. While the season factor showed an insignificant effect on Dermatophilus infection. In addition, the results showed that Dermatophilosis was an insignificant effect on the mean of hematological and biochemical parameters (p>0.05). Dermatophillosis mixed with dermatophytosis was detected in most examined samples. Direct examination using 10% KOH is a reliable technique to determine chronic Dermatophillosis and the Strategic application of anti-biotic drugs mixed with anti-fungal drugs for the treatment of camel Dermatophillosis is strongly recommended.

Keywords: Dromedary, dermatophillosis, incidence, tamboul, Sudan

Introduction
Dermatophillosis is a skin disease caused by a bacterium called *Dermatophilus congolensis*; the disease affects many species of domestic and wild animals and occasionally humans [1]. This organism is found throughout the world, but is most prevalent in tropical and subtropical regions, and has a wide host range [2]. The disease is non-pruritic and is characterized by exudative, proliferative or hyperkeratosis dermatitis, accompanied by the production of crusts and folliculitis. Several factors are involved in the pathogenesis of Dermatophillosis; among them are mechanical injury to the skin, rainfall, tick infestation, concurrent diseases and stress that compromise the host immune system, humidity is a major predisposing factor in the spread and epidemiology of Dermatophillosis [3]. Dermatophillosis often lead to creates economic problems by severe skin matting resulting in hide depreciation and decrease animal productivity also mortality from severe cases in susceptible weak animals was detected [4,5]. In addition that the disease revealed a loss of condition impaired reproductive performance and decrease in milk production and a marked increase in the somatic cell counts in milk [6]. Camel Dermatophillosis has been reported in Kenya, Sudan and Saudi Arabia. In Sudan the outbreaks was in the Butana region, The fatality rates ranged from 0% in Saudi Arabia to 30% in Sudan, mixed infection involving *Dermatophilus congolensis* and *Microsporum gypseum* were founded [7]. Tick control in infected animals and environment is indicated to minimize the risk of Dermatophillosis [8] in study was carried out at Qassim Region, Central of Saudi Arabia, to study dermatophytosis in a private farm of dromedary camels.

The prevalence of dermatophytosis in camels was 11.5% and significantly differed among different age groups (p≤.0001 and odds ratio = 14.61), with higher prevalence among camels younger than three years (22.10%). Clinical signs of ringworm recorded in this study were non-pruriginous dry circumscribed discrete, crusty hairless lesion distributed over the head, neck, shoulder, limbs and flanks [9].

In man the disease has been characterized by pimples and multiple pustules (2-25) on the hands and forearms, containing a Serous or yellowish-white exudate. The lesions healed in 3 to 14 days, leaving a purplish-red scar [4]. Clinical diagnosis is confirmed by microscopic examination of Stained smears (Giemsa, methylene blue, or Wright's stain) made from exudates or scabs. [10]. the present study aimed to the determined incidence of Dermatophillosis among one humped camel (*Camelus dromedarius*) provided to Tamboul livestock market, Sudan

Materials and Methods

Study area

The study was conducted in Tamboul livestock market; it is one of the biggest markets of camels founded in Sudan, and located in East Gezira state and far about 150 km to the south of Khartoum; the capital of Sudan.

Study Design

A case-control study was applied, one hump camel suspected to be infected by Dermatophillosis was examined by 10% KOH direct examination, and assessment was done according to age, gender and season and description of the *Dermatophilus congolensis* visually and microscopically. Evaluated the effect of the disease on hematological and biochemical value, furthermore, used negative cases as a control.

Study population and samples size

Three hundred suspected camels (300) of different ages, sex, and season were examined. Samples size was calculated based on the formula $N= Z^2pq/d^2$ [11]. And the prevalence of camel Dermatophillosis probability was taken according to Gitao *et al*., [12] that revealed 20% of camels in the Butana area were infected with Dermatophillosis.

Sample Collection

Skin scrapings of the lesion from three hundred suspected camels with clear skin lesions were collected with a blunt scalpel in sterile Petri dishes. All specimens were labelled and transferred to the laboratory for the diagnosis of Dermatophillosis using a direct examination technique.

Direct 10% KOH Examination technique

The collected skin scrapings were transferred to test tubes and mixed with a small amount of 10% potassium hydroxide solution and left to stand for 0.5–1 hours until the skin particles have partly disintegrated. The tubes were centrifuged at 3000 revolutions per minute. The supernatant fluid was discarded, and a drop of sediment was investigated under a microscope for the detection of the *Dermatophilus congolensis* [13]

Clinical investigations

Three hundred camels of different ages, sex and season (winter, summer and autumn) were examined visually for Dermatophillosis and clinical signs with lesions characterization for all suspected camels were detected.

Blood samples

Venous blood samples were obtained in three seasons; winter, summer and autumn (100 in each season). Blood samples were collected from the Jugular vein of suspected camels by Using a Vacationer EDTA tube, vacationer needle, syringe, needle, needle holder, and disinfectant for blood parameters. At the same time, 3 ml Blood without anticoagulant was used to obtain serum for biochemical tests; the blood was centrifuged at 3000 rpm for 15 minutes and the serum was kept in Eppendorf tubes and then stored at -20 ºC until used [14].

Haematological and Biochemical parameters

Haematological parameters were measured according to Kemal, [14], and total protein and albumin were determined according to the manufacturer's instructions while globulin was measured according to the formula Globulin g/dl = **(**Total protein _Albumin).

Statistical Analysis

Data collected from this study were compiled using an appropriate statistical package SPSS version 16. Results were summarized as means ± standard deviation (S.D) and Levels of Significance were taken at ($p\leq 0.05$).

Results

The results of current study examined three hundred (300) skin scrape conducted in suspected camels provided to Tamboul livestock market 9(3%) out of 300 camels were infected with Dermatophillosis. Camels infected by Dermatophillosis were diagnosed clinically by loss of hair and accumulation of necrotic white materials around the neck, forelimb, thorax and sometimes all parts of the body; the necrotic white materials were deep and hard attachment with skin Figure (1). The *Dermatophillus congolenses* under a microscope revealed cocci after preparation by 10% KOH and stained by Giemsa stain Figure (2).

According to age groups {(less than 6 years), (6-12) and (more than 13 years)} examined, the present study discovered high significant variation and higher incidence rate with camel Dermatophillosis was detected in age group less than 6 years (88.9%) followed by 6-12 years (11.1%) years and no cases in age more than 13 years. Also, chi-square detected high significance variation according to gender and all infected camels were noticed in males. The Incidence rate of *Dermatophilus congolensis* in camels according to season, the result was revealed no significant variations (p>0.05). In additions that, the present result also recorded there was no significant variations in the effect of camel Dermatophillosis on hematological and biochemical parameters shown in table 1&2.

Table 1: Factors affect camel Dermatophillosis in the Tamboul area.

Factor	Numbers (%)
Sex	
Male	9(100%)
Female	0(0%)
Age	
less than 6 years	8 (88.9%)
6-12 years	1 (11.1%)
more than 13 years	0 (0%)
Season	
Winter	2 (22.2%)
Summer	5 (55.6%)
Autumn	2 (22.2%)

Table 2: Effect of camel Dermatophilosis on hematological and biochemical parameters

Parameters	Mean ± SD for positive cases	Mean ± SD for negative cases
Total protein	7.2±0.0	6.2±1
Albumin	3.1±0.0	2.9±0.6
Globulin	4.1±0.0	3.3±1
HB	11.2±0.0	12.1±1.7
PCV	28±0.0	27.4±4.2
TRBCS	14.4±0.0	14.3±3.3
MCV	19.4±0.0	20±5.3
MCHC	40±0.0	44.5±5.5
TWBCS	13.6±0.0	19.6±7.5
Basophiles	0.0±0.0	1.3±1.5
Eosinophil	0.0±0.0	3.1±3.3
Monocytes	6±0.0	3.9±2.3
Neutrophil	65±0.0	51.7±15.8
Lymphocytes	29±0.0	40.3±14.6
P. Value	(p>0.05)	

Fig 1: Camel infected by Dermatophilosis revealed loss of hair with accumulation of necrotic

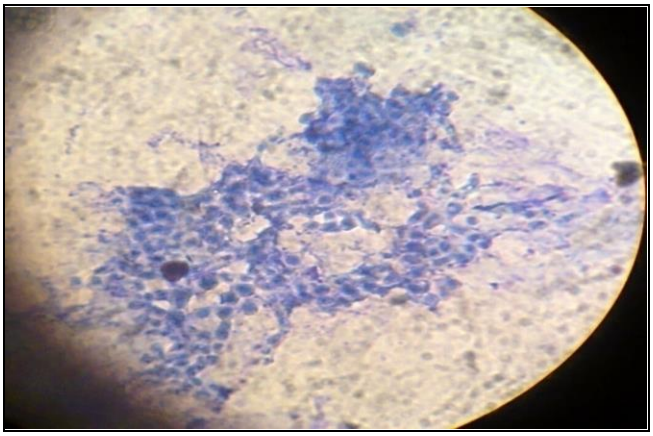

Fig 2: Photomicrograph of *Dermatophilus congolensis* by 10× lens under microscope

Discussion

Dermatophilosis occurs most frequently in domestic animals, But is increasingly recognized in wildlife. *D. congolensis* was first described in domestic cattle in Zaire, Africa in 1910 [15] This present study recorded 3% of camels provided to Tamboul livestock markets from all over Sudan from 2015 to 2016 were infected with Dermatophillosis. The prevalence rate in this study was less than the results recorded by Gitao *et al*., [16] that revealed 20% of camels in the Butana area were infected with Dermatophillosis [17]. The prevalence of camel Dermatophillosis in Iran was 13.6%. This variation is due to the result of the wide use of ox tetracycline drugs among camel herds and also may be from different climates according to the duration of the study. Macroscopically and microscopically characterization for *Dermatophilus congolensis* in this study was in full agreement with other results discovered others researchers [16, 17, 18]. The study revealed higher significant different effect of sex on prevalence of Dermatophillosis; the incidence rate was more infected in males than females. This is Similar results were obtained by Nath (2010). While the current study did not recorded significant different between season and incidence Dermatophillosis, its disagree with the results obtained by Gitano *et al*., [16] that recorded that Dermatophillosis was found to be more prevalent in the wet season (21.2%) compared to its prevalence in the dry season (14.5%). These different results return back to the environmental condition because season interference was found in a few last years in Sudan area. Other factor like prevailing of transmitting ticks and acacia tree could be behind this prevalence rates. The current study the effect of age detected Significant different (p<0.02) effect of age on Dermatophillosis, where founded high incidence rate in 1-5 age group was reported compare to other groups. Similar conclusion was reached previous studies [12, 16, 19]. Study reports the incidence of dermatophytosis in a circus dromedary aged about 2.5 years with emphasis on clinical signs, laboratory examination and treatment. Camel had skin problem persisting for a month [20]. In One-humped camel (*Camelus dromedarius*) in Al-Butana area, El-Gazira State, Sudan, among these; 18 camels (3.6%) were infected with mange, 50 camels (10%) were infected with ringworm and 4 camels (0.8%) were infected with dermatophilosis. There was significant difference in the prevalence of ringworm infection between male and female camels ($p\leq$ 0.05), but no significant difference was observed in mange and dermatophillosis infection ($p\leq$0.05 [21]. The infected animals were examined clinically and the outbreak was reported as mixed infection of camelpox and dermatophilosis. Hair matting particularly on the head, neck, and abdomen was the common skin lesion that observed on the infected animals. Lesions showed hairless brownish crusts with irregular sizes and pus exudation that left irregular border crusted lesions [22] Skin lesions were reported in 17 of 140 animals and were distributed throughout the animals' head, neck, back, and perineum. Lesions ranged in size from paintbrush matted hairs to wart-like lesions up to 2 cm in diameter. Skin scrapings were taken from living animals and stained directly with gram stain. There was severe multifocal exudative dermatitis with hyperkeratosis on histology. Neutrophils, mononuclear cells, and numerous branching filaments coccoid bodies infiltrated the dermis [23]. In the Brazilian study, cases occurred in all seasons, with 2 (18%) outbreaks in winter, 2 (18%) outbreaks in summer, 3 (28%) outbreaks in autumn, and 4 (36%) outbreaks in spring. The morbidity rate in cattle ranged from 2.5% to 80%, in horses from 66% to 100%, and in sheep from 9% to 10%. Outbreaks in sheep presented mortality ranging from 2% to 3% [24].

Conclusions

The study concluded that chronic dermatophillosis was present in 3% of Sudanese camels. Dermatophilus infections and dermatophytosis were found in most of the samples tested. The direct examination technique was a reliable technique for detecting chronic dermatophillosis. The study recommended that for dermatophillosis, treatment strategic should be use anti-biotic drugs combined with anti-fungal.

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