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Brucellosis and Internal and Blood Protozoan Parasites of Camels in North Kordufan State, Sudan

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Brucellosis is a serious zoonotic disease affecting humans and all domestic animals including camelidae. Blood parasites are one of the most important and serious pathogenic protozoal diseases which caused by Babesia, Theileria and Anaplasma species. In the Sudan the one-humped camel (*Camelus dromedarius*) is affected by many parasites. These include Protozoans, Helminthes and Ectoparasites. This study was conducted in Al Obied city of North Kordufan State Locality of White Nile State, during the years 2019 and 2020. The study was aiming at detection of brucellosis and internal and blood protozoan parasites in camels. A total of 60 blood samples and 60 faecal samples were collected from camels in Al Obied city. Blood samples were subjected for parasitological examination using thin blood smears, stained with Giemsa stain and examined under the light microscope (1000X). Sera were separated from blood samples and examined using Rose Bengal Plate Test (RBPT) for detection of Brucella antibodies. Faecal samples were subjected for parasitological examination using Floatation and Sedimentation techniques. Five (8.3%) blood sera were positive for RBPT. Twenty five (41.6%) blood samples were positive for blood protozoan parasites. The detected protozoa were 14 Theileria spp. (23.3.0%). 7 Babesia spp. (11.7%) and 4 Anaplasma spp. (6.6%). Twenty eight faecal samples (46.7%) were positive for Internal Parasites. The detected Internal Parasites were 16 Nematodes (26.7%), 5 Ascaris spp. (8.3%), 4 Trichais spp. (6.7%) and 3 Schistosoma spp. (5.0).

Keywords: Internal parasites; blood protozoa; camel; Kordufan.

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1. INTRODUCTION

Brucellosis is a one of the highly contagious and most important zoonotic diseases in tropical area and a significant cause of reproductive losses in animals [1]. Losses due to abortion or stillbirths, irregular breeding, loss of milk production and reduced human productivity are some of the economic consequences of the disease [2]. Camels are not known to be primary hosts of Brucella, but they are susceptible to both *B*. *abortus* and *B*. *Melitensis* [3]. Camelid brucellosis caused by *B*. *melitensis* and *B*. *abortus* has been reported in all camel-rearing countries except Australia and the incidence appears to be closely related to breeding and husbandry practices, which [4] were able to prove in Saudi Arabia. They compared the brucellosis seroprevalence of a female dromedary herd which was in close contact with small ruminants (n = 165) with a closed female dromedary herd (n = 95). The brucellosis prevalence in the open camel herd was 8.5%, whereas only one animal (1%) was diagnosed in the closed herd. The diagnostic tests used were the Rose Bengal test (RBT), serum agglutination test (SAT) and complement enzyme-linked immunosorbent assay (cELISA) [5]. In Sudan [6] found that the infection with brucellosis in Darfur State in 50 (45.5%) of 110 herds, with prevalence rates ranging from 1.4 to 89.5%. Piroplasmosis is highly fatal and has serious economic impact on livestock. This disease is caused by protozoan parasites belonging to family Babesiidae and family Theileriidae of suborder Piroplasmidae. Babesisosis and Theileriosis are of the most important and serious blood parasitic diseases affecting animals in the area [7,8]. Theileriosis is transmitted by the tick species *Hyaloma dromedarii* in camels, its main host, but it is also found on the skin of cattle, sheep, goats, and donkeys. So far, two species of Theileria have been reported in the world: *T*. *camelensis* and *T*. *dromedarii*. So far, no clinical symptoms have been reported for *T*. *dromedarii*, but *T*. *camelensis* causes a chronic disease in camels with symptoms such as fever, lack of appetite, swelling of surface lymph nodes, Lacrimation, hemolytic anemia, abortion, and infertility [9]. [10] reported Babesia cameli infection in *Camelus dromedarius* for the first time in Egypt [11] found that there was increasing reports of camel Anaplasmosis with pathogens that include *Candidatus* Anaplasma *camelii* in Kenya. Helminthic infections of camelids Gastrointestinal (GI) tract are classified into two groups: common and occasional. Several helminthes are camelids specific, but some are also common to other hosts, especially domestic ruminants and wild animals. Among the Nematodes, some appear to be practically specific to the dromedary. Camel specific nematodes are included; Haemonchus longisipes, Nematodirus Mauritanicus, Nematodirus dromedarii but most of camel Nematodesarealso common to Sheep and Goats, like Trichostrongylus prololurus, Tichostronglus vitrinus, Ostertagia mongolica, Nematodirus spathiger, Oesophagostomum venulosum [12].

Since Brucellosis and Blood Protozoa are the main disease problems facing Camels production in Sudan, this study was aiming at detection of brucellosis and Internal and Blood Protozoan Parasites of camel in Al Obied city of North Kordufan State, Sudan.

2. MATERIALS AND METHODS

2.1 Area of Study

This study was conducted out in Al Obied city, North Kordufan (Sudan), during the years 2019 and 2020.

2.2 Source of Samples

In this study a total of 60 blood and 60 faecal samples were collected from the different 120 camels in Al Obied city, North Kodufan State (Sudan).

2.3 Sampling Procedure

2.3.1 Collection of blood samples

Blood samples were collected in 10 mL sterile tubes from jugular vein. Blood smears were immediately prepared, dried and fixed. Sera were separated from blood samples by using centrifugation at 1000 rpm/ 5mins. Sera were stored in -20°C and transported in iceboxes to the Veterinary Laboratory in college of Veterinary Medicine University of Bahri with the fixed blood smears.

2.3.2 Collection of faecal samples

Faecal samples were collected straight from the rectum of the animal and from the ground only if the animals were seen passing out their faeces. The faeces were then collected in plastic container, labeled, preserved in 10% formol alcohol and immediately transferred to the laboratory in College of Veterinary Medicine University of Bahri for fecal examination [13].

2.4 Parasitological Examination

2.4.1 Thin blood film

A small drop of fresh blood was put in the middle of one end of the slide, and spread right across the slide and then air dried. The slide was labeled using a pencil. Blood films were fixed in absolute methyl alcohol for 2 minutes, stained in 5% diluted Giemsas stain for 45 minutes, and washed in distilled water and then dried. Immersion oil was put on the blood film and examined microscopically for the detection of blood parasites at 10×100 magnification [14].

2.4.2 Floatation method

This technique was described by [14] as follows: One to two grams of faeces were transferred to a morter and mixed with saturated sodium chloride solution. The mixture was stirred gently until faeces thoroughly suspended in the salt solution. The suspension was then poured through a tea strainer into a container and gently pressed the excess fluid from the debris remaining in the strainer. The mixture was immediately poured into a Bijou bottle until it produced a convex meniscus. A clean glass slide was then placed over the top of the bottle and left for 10 minutes after which the slide was removed quickly. A cover glass was applied on the slide which then examined microscopically for parasite eggs.

2.4.3 Sedimentation method

This test used for detecting those eggs which did not float well in available flotation solutions. Those are the operculate eggs such as fluke (Fasciola, Paramphistomum and Schistsoma). Two to three grams of faeces were taken in a mortar and emulsified with 5 ml normal saline. They were ground with pestle and mixed well. The suspension was poured through a tea sieve into a beaker to remove the large articles. The sieved suspension will then be poured in a falcon tubes and centrifuged at 1500 rpm for two min (this is the first wash). The supernatant was poured off and re-suspended in normal saline and centrifuged at 1500 rpm for two min. This will be repeated two times till the supernatant fluid is clear. A drop of the deposit was taken and put on a slide and examined under the microscope [13].

2.4.4 Rose bengal plate test (RBPT)

Serum samples were tested for Brucella antibodies using the Rose Bengal Plate Test (RBPT). The test was performed according to the provisions of the World Organization for Animal Health (OIE) Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (World Organization for Animal Health [1]. The antigen used in the RBPT was obtained from Central Veterinary Research Laboratory, Soba, Sudan. It was prepared and standardized as described by [15]. The serum samples and the antigen were removed from the refrigerator and placed at room temperature for an hour then the test was done by dispensing 0.025 ml of each serum to be tested to an enamel white plate. The same amount of RBPT antigen was added to each serum and both were thoroughly mixed, rocked by hand for four minutes after which the test was immediately read. Agglutination appeared as weak positive, positive, strong positive or very strong positive [15].

2.4.5 Type of data analysis

The collected data were recorded and analyzed using Microsoft excel 2010 program.

3. RESULTS

3.1 Results of Rose Bengal Test

In this study 60 serum samples collected from camels in Al Obied city were investigated for the presence of Brucella Antibodies using Rose Bengal antigen test. 5 (8.3%) samples gave positive reaction with the antigen (Figs. 1and 2).

3.2 Prevalence of Blood Protozoans in Al Obied City

Out of 60 blood samples collected from camels in Al Obied city, 25 (41.6%) samples were positive for blood parasites (Figs. 3, 4, 5 and 6). The prevalence of Theileria spp., Babesia spp. and Anaplasma spp. was 23.3%, 11.7% and 6.6% respectively (Table 1).

3.3 Prevalence of Internal Parasites in Al Obied City

Out of 60 faecal samples collected from camels in Al Obied city, 28 (46.7%) samples were positive for internal parasites (Fig. 7). The prevalence of Nematodes, Ascaris spp., Trichuris spp.and Schistosoma spp. was 26.7%, 8.3%, 6.7% and 5.0% respectively (Table 2).

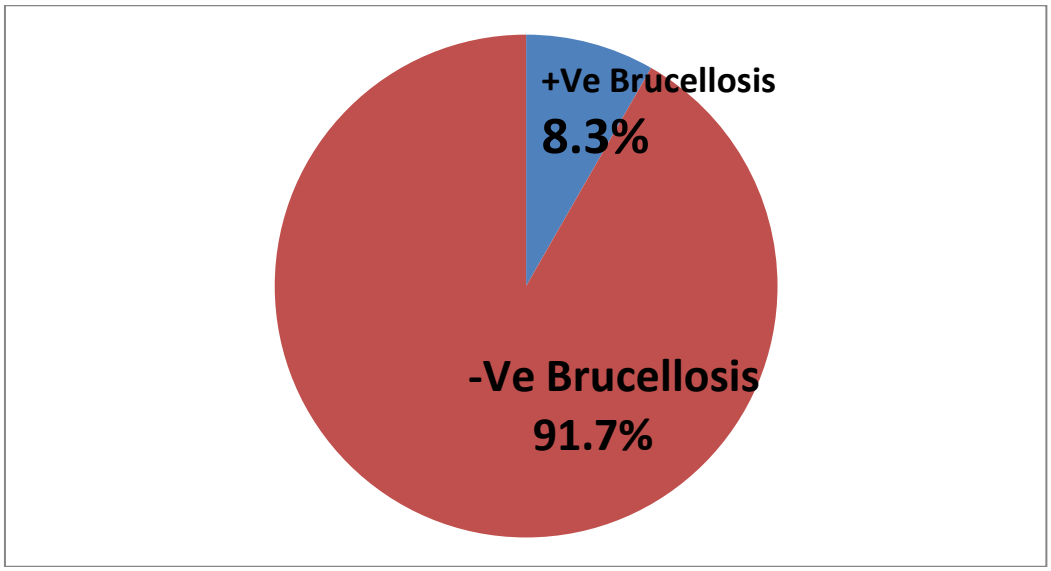

Fig. 1. Positive and negative rose bengal test

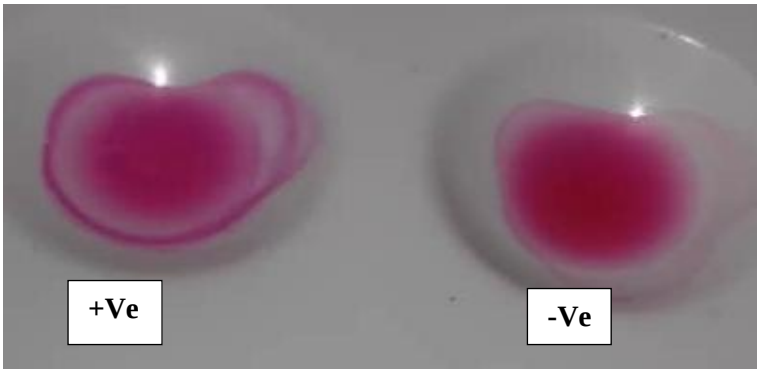

Fig. 2. Positive and negative rose bengal test

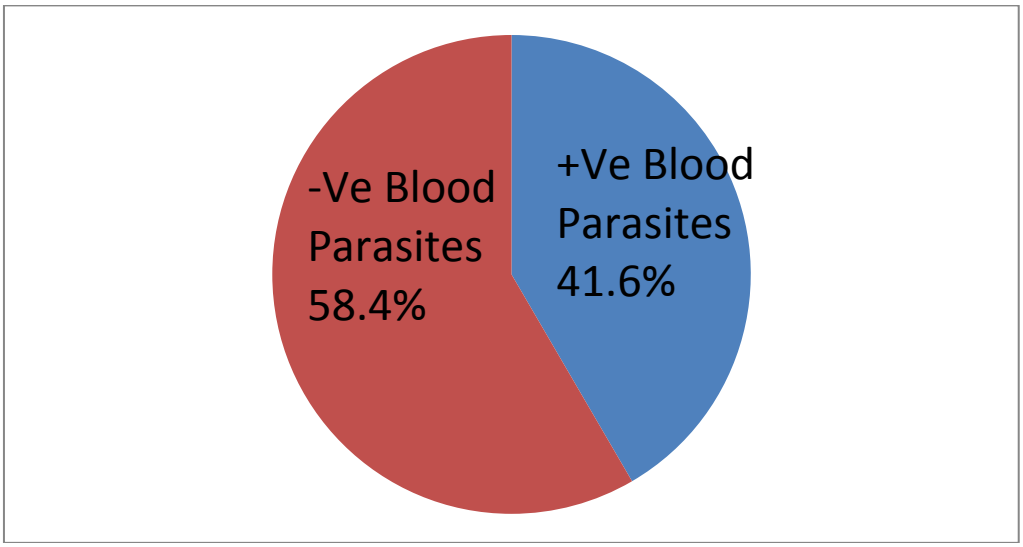

Fig. 3. Positive and negative camel blood samples collected from Al Obied city for detection of blood parasites

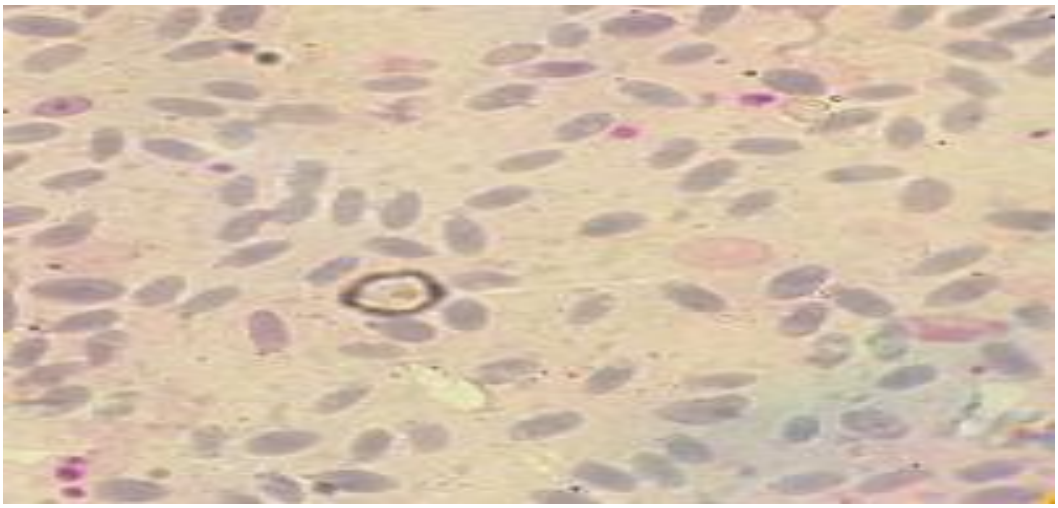

Fig. 4. Thin camel blood smear stained with Giemsa stain and positive for Theileria spp

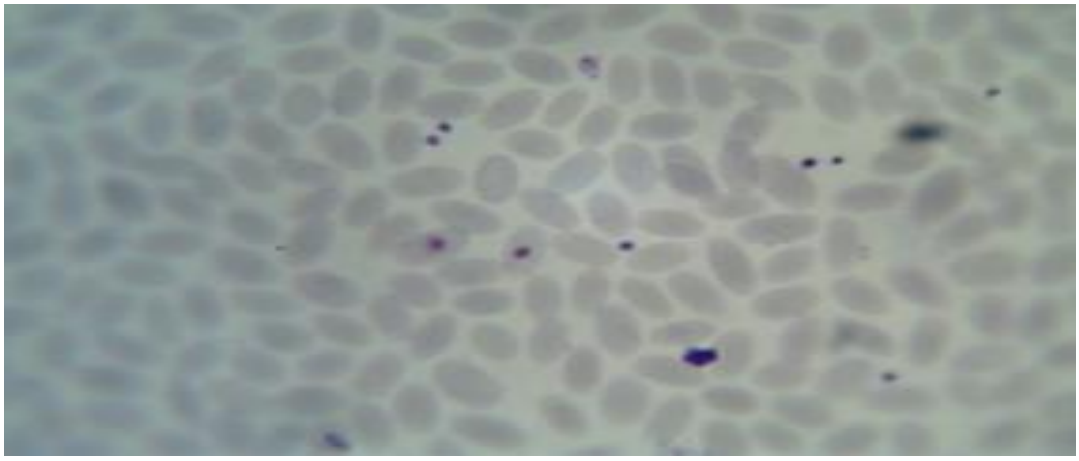

Fig. 5. Thin camel blood smear stained with Giemsa stain and positive for Babesia spp

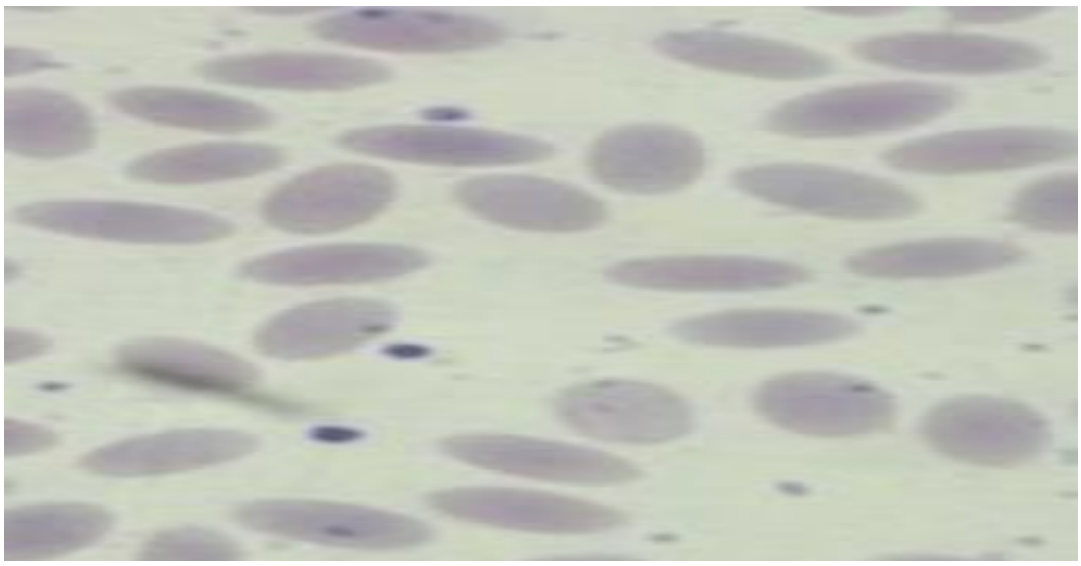

Fig. 6. Thin camel blood smear stained with Giemsa stain and positive for Anaplasma spp

Table 1. Number and percentage of blood parasites detected in camel blood samples collected from Al Obied city

Blood parasite	Number	Percentage
Theileria spp	14	23.3%
Babesia spp.	7	11.7%
Anaplasma spp.	4	6.6%
Negative samples	35	58.4%
Total	60	100.0%

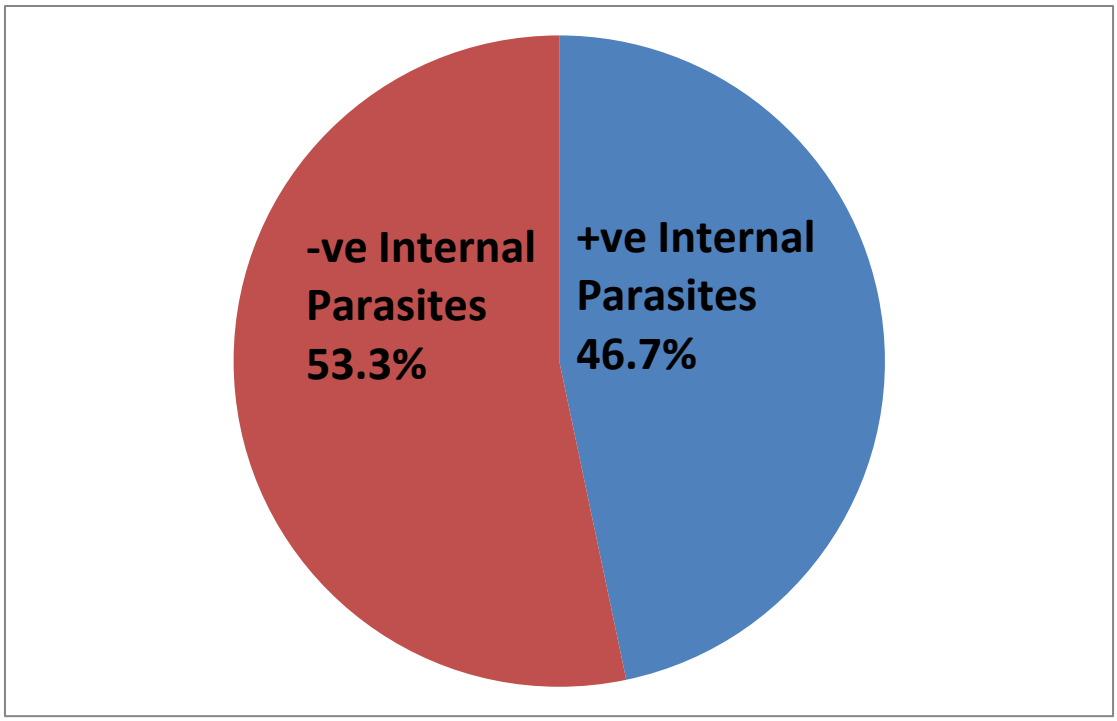

Fig. 7. Positive and negative camel faecal samples collected from Al Obied city for detection of Internal parasites

Table 2. Number and percentage of internal parasites detected in camel faecal samples collected from Al Obied city

Blood parasite	Number	Percentage
Nematodes	16	26.7%
Ascris spp.	5	8.3%
Trichuris spp.	4	6.7%
Schistosoma spp.	3	5.0%
Negative samples	32	53.3%
Total	60	100.0%

4. DISCUSSION

Camels are highly susceptible to brucellosis caused by *Brucella melitensis* and *Brucella abortus*. In this study the prevalence of brucellosis in camels in Al Obied city as found to be 8.3% [6]. 1.4% to 89.5% in Darfur State. [16] reported that the prevalence of Brucellosis in Sudan, eastern regions of the UAE, Chad and Ethiopia was 5.8%, 1.4%, 3.8% and 5.5% respectively. [17] reported that the overall prevalence of brucella in camels in Eastern Ethiopia was 2.43%. Parasitic diseases have severely hindered development of livestock production in many Countries. Theileriosis, Babesiosis and Anaplasmosis are the most

widely distributed blood protozoan diseases. The bulk of these diseases are caused by vector-borne Protozoa and Rickettsia. In this study Prevalence of blood protozoans in camels in Al Obied city as found to be 41.6%. [18] in Northern West Coast of Egypt reported that Theileria was the most common pathogen (50.8%, 71.9%), followed by Anaplasma (47.4%, 67.37%), Trypanosoma (20.24%, 67.06%), and a lesser extent Babesia (11.8%, 18.43%) respectively. They also reported that only *A*. *marginale* caused Anaplasmosis in 51 (22.9%) of infected dromedaries, while the majority were having *A*. *marginale* together with *A*. *centrale* 172 (77.13%) [19] stated that in Sudan the one-humped camel (*Camelus dromedarius*) is affected by many parasites. These include protozoans, helminths and ectoparasites. Although a number of protozoan parasites including Trypanosoma, Theileria, Eimeria, Toxoplasma, Hommondia and Sarcocystis have been reported to infect camel worldwide, five of these parasites were reported from Sudanese camels. Sudanese camels harbor several helminth parasites. Nematodes, cestodes and trematodes infecting Sudanese camels are well studied and documented [12] reported that the prevalence of gastrointestinal Nematode in camels slaughtered at Akaki abattoir, Addis Ababa, Ethiopia was 55.5%. The most common Nematodes encountered were Strongyle eggs (48.7%) followed by Trichuris species (3.9%) [20] reported that the identified gastrointestinal parasites ova/oocyte of camels (*Camelus dromedarius*) slaughtered at Addis Ababa Abattoir, Ethiopia included Strongylus species, Trichuris species, Strongyloides species and Coccidian at prevalence of 78.1, 47.1, 44.5 and 25.3%, respectively [21] in Burkina Faso and Bekele [22] in Southern Ethiopia also reported a higher prevalence of parasites in camel. This high prevalence of parasites could be related to rearing of camels in marginal areas where veterinary services are not available or very limited.

5. CONCLUSION AND RECOMENDA-TIONS

The result of the present study showed low prevalence rate (8.3%) of Brucellosis, high prevalence rate (41.6%) of blood parasites (23.3% Theileria spp., 11.7% Babesia spp. and 6.6% Anaplasma spp.) and high prevalence rate (46.7%) of internal parasites (26.7% Nematodes, 8.3% Ascaris spp., 6.7% Trichuris spp. and 5.0% Schistosoma spp.) Awareness creation on the camels owner should be given to prevent Internal and blood parasites and brucellosis. Further studies should be conducted to determine the pathological importance and impact of Internal and blood parasites and brucellosis.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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