ISSN (Online): 2091-2609
DOI Prefix: 10.3126/ijasbt

International Journal of Applied Sciences and Biotechnology (IJASBT)

Research Article

Epidemiology of Camel Brucellosis Intended for Export from Kassala State – Eastern Sudan

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Article Information

Received: 18 September 2022
Revised version received: 15 December 2022
Accepted: 19 December 2022
Published: 30 December 2022

Cite this article as:
H.M. Bashir et al. (2022) Int. J. Appl. Sci. Biotechnol. Vol 10(4): 216-220. DOI: 10.3126/ijasbt.v10i4.48495

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Peer reviewed under authority of IJASBT

Keywords: Camel Brucellosis; cELISA

Abstract

This study was designed to determine the seroprevalence rate of Brucellosis and to identify the risk factors for Brucella infection in camels intended for export from Kassala State. A total of 400 blood samples were collected for serum from all Kassala localities, tested using Rose Bengal Plate test (RBPT) and Competitive Enzyme Linked Immunosorbent Assay (cELISA). The prevalence rate was (29.5 %) and (27.8%) based on the results of RBPT and C.ELISA respectively. According to sex, the prevalence rate of the disease was (30.4%) out of 335 in males and (24.6%) out of 65 in females. There were no clinical signs of camel's Brucellosis in all tested animals. The prevalence of the disease was (14.4%) in Rural KhashmElgerba, (15.3%) in North Delta, (8.5%) in Wad Elhilau, Rural Kassala (11.9%), Hamashkoreb (12.7%), Rustic Arouma (14.4%), Talkook (16.9%) and Atbra river locality (5.9%) with a significant statistical difference. Herds with more than 20 camels were more frequently affected. In this study the Seroprevalence of Brucella was (9.3 %) in young (1-2 years) and (23.7%) in adult camels (above 5 years). The results of the present study provide the status of seropositivity to Brucella in camels intended for export in Kassala State and the risk factors that contribute to prevalence of Brucellosis among camels. This situation requires more attention and effort to implement.

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Introduction

Brucellosis is a common bacterial zoonotic disease that has important veterinary and public health concerns and economic impact (Sayour *et al*., 2015; Nielsen, 2002; OIE, 2016). It is worldwide spread, particularly in Middle East, Mediterranean countries, Africa, Asia, Arabian Gulf, Central and South Americas (OIE, 2012). Brucella microorganisms localize in the supra-mammary lymph nodes and mammary glands of the infected animals and thus may continue to be secreted in the milk throughout the life (Bamaiyi *et al*., 2012). The susceptibility of animals to Brucellosis depends on their natural resistance, age, level of

immunity, and environmental stress (Capasso, 2002). The disease is responsible for enormous economic losses in affected animals due to abortions, infertility premature birth, reduced reproduction and drop in milk production. It is also represents a great public health problem in endemic areas (Corbel, 2006; Pappas *et al*., 2006). Moreover, the disease poses a barrier to trade of animals and animal products, an impediment to free animal movement (Zinsstag *et al*., 2011).

In Sudan camels are important for meat, milk and export to gain foreign currency.Epidemiology of brucellosis among sheep, goats and camels was done in Gadarif state which indicated the presence of the Brucella antibodies with varied rates (Mahasin *et al*., 2017; Adam *et al* ., 2017; Abdalla *et al.,* 2019). This study was designed to evaluate the prevalence of the disease in camels intended for export in Kassala State, implementation of well-organized disease control and prevention methods must be undertaken to mitigate its impacts. And to determine the prevalence of Brucellosis in camels that ready for export in Kassala quarantine, Kassala State. - To identify the risk factors associated with the disease occurrence in Kassala State.

Material and Methods

Study Area

This study was carried out in Kassala State which is located in the East of the Sudan, covers an area of about (42,282) square kilometers. The State is divided to nine localities; the capital of the State is Kassala town. Kassala State has a large livestock population estimated in 2018 as (4.540.250) camel- cattle- Sheep and goats of which (490.000) head of cattle and (1.700.651) head of camels, (1.401.000) head of sheep and (948.600) head of goats which has different breeds (Ministry of Agriculture and Animal Resources, Kassala State, 2018). The study was conducted in all Kassala localities, Rustic KhashmElgerba, North Delta, Wad elhilau, Rustic Kassala, Hamashkoreb, Rustic Aroma, Talkook and Atbra river locality.

Collection of Samples

A total of (400) blood samples were collected for serum from camels, which 50 samples of sera from each locality in Kassala State. Five ml of blood were collected aseptically from the jugular vein in sterile tubes using a disposable syringe after disinfecting the area with 70% alcohol. Tubes were placed in slanting position and left to clot, then taken to the laboratory on ice and placed in the refrigerator for overnight, serum was separated into Bijou bottles and kept at -20 ºC.

Rose Bengal Plate Test (RBPT)

The serum samples were screened using Standardized buffered Rose Bengal Test antigen for detection Brucella antibodies, the test was carried out as described by (Alton *et al*., 1988).

Competitive Enzyme Linked Immuno Sorbent Assay (cELISA)

The test was performed using Svanovir® brucella-Ab (cELISA) kit for detection of antibodies against Brucella in sera samples according to the instructions of manufacturer.

Statistical Analysis

Statistical analysis was performed using 'Statistical package for the social sciences' (SPSS), version 16.0 software for windows (SPSS Inc., Chicago, IL, USA). All risk factors with $p \leq 0.05$ were considered significant (5ml) – 0.05% Merthiolate. - Negative control sera (5ml) – 0.05% Merthiolate.

Results

Data shown in Table 1 to 4 and Fig. 1-2 show that the prevalence of camel Brucellosis in Kassala State was (29.5%) and (27.8%) based on the results of RBPT and cELISA respectively (Table 1 &2). The presence of seropositive camels was significantly associated with the variables: location, age, mixed rearing, water sources and herd size. The location of camel rearing (locality) showed significant association with the prevalence of Brucellosis, however the occurrence of the disease was slightly higher in Tlkook (16.9%) and low in Atbara River (5.9%). Regarding the location of camel rearing (locality) showed significant association with the prevalence of Brucellosis, the occurrence of the disease was slightly higher in Tlkook (16.9%) and low in Atbara River (5.9%), the prevalence was lower among the young animals screened in this study compared to the older ones. In this observation Seroprevalence of Brucellosis was (9.3%) in young camels and (23.7%) in adult camels., Percentage of infected male was about 25.5% and the percentage of infected females was about 4%, in this study, Brucellosis was more prevalence in males than females as the number of female animals examined was small (Fig. 1 & Fig. 2).

Table 1: Results of RBPT in serum samples of camels intended for export in Kassala quarantine.

No. inspected	Total of serum samples	Positive	Positive%
Male of camels	335	102	30.4%
Female of camels	65	16	24.6%
Total	400	118	29.5%

Table 2: Results of cELISA in serum samples of camels intended for export in Kassala quarantine.

No. inspected	Total of serum samples	Positive	Positive%
Male of camels	335	94	28.1
Female of camels	65	17	26.2
Total	400	111	27.8

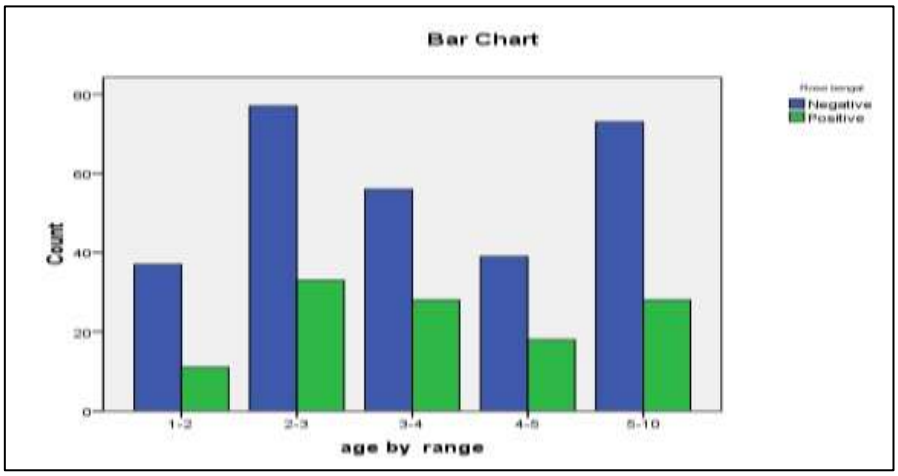

Fig 1: Prevalence of Brucellosis according to age of animals using RBPT

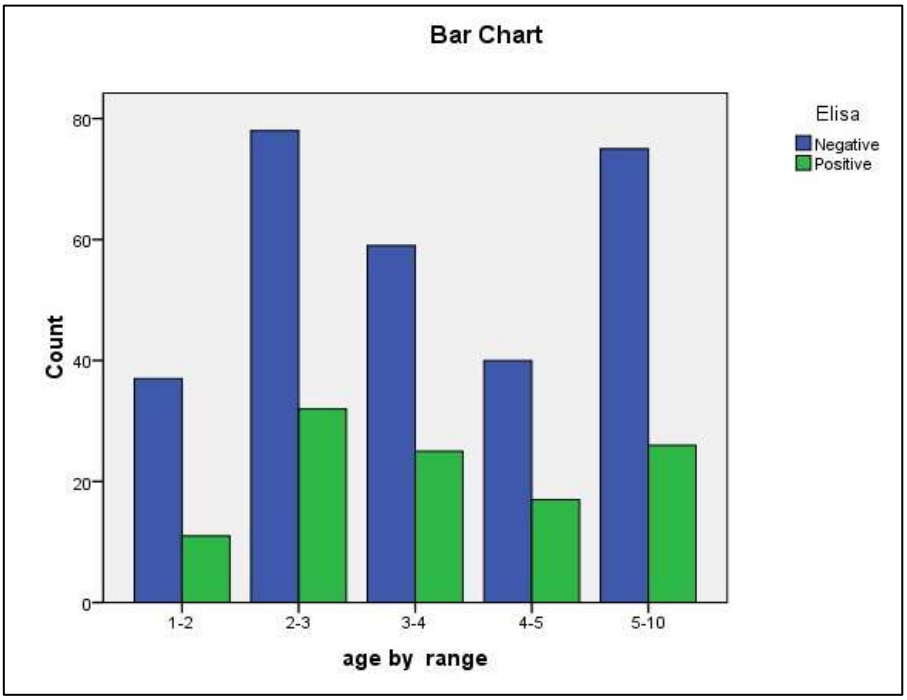

Fig 2: Prevalence of Brucellosis according to age of animals using ELISA

Table 3: Comparison between RBPT and ELISA results using Kappa test

Test	RBPT		Total
	Negative	Positive	
ELISA			
Negative	279	10	289
Positive	3	108	111
Total	282	118	400
Kappa = .92			

Table 4: The relationship between presence of Brucellosis and, sex, age and location among the camels examinedin Kassala State

Risk factors	Rose Bengal			ELISA		
	Df	Chi square	p-value	Df	Chi square	p-value
Sex	1	890[a]	.345	1	.099[a]	.753
Age	4	1.879[a]	.758	4	1.153[a]	.886
location	7	14.291[a]	.046	7	10.063[a]	.185

Discussion

Sudan exports sheep, goats, camels and cattle to many countries especially to Saudi Arabia and other Arabic Gulf countries. Brucellosis was the main cause for rejection of livestock vessels. The reason for these strict quarantine measures is attributed to the fact that the disease represents a public health hazard, because of the zoonotic nature of this disease.

In this study the prevalence of camel Brucellosis in Kassala State was (29.5%) and (27.8%) based on the results of RBPT and cELISA respectively. The presence of seropositive camels was significantly associated with the variables: location, age, mixed rearing, water sources and herd size. The location of camel rearing (locality) showed significant association with the prevalence of Brucellosis, the occurrence of the disease was slightly higher in Tlkook (16.9%) and low in Atbara River (5.9%). These variations and differences may be attributed to husbandry, management practice, lack of awareness, and uncontrolled movement of camels from place to another. These results were in agreement with that recorded by Teshome *et al*, (2003), Al- Majali *et al*, (2008).

Mixed rearing of camels with other ruminants (cattle, sheep and goats) showed a significant association on the prevalence of camel brucellosis. The present result was supported by that recorded by Al-Majali *et al*., (2008) who suggested the role of small ruminants for dissemination of Brucellosis. Herd size was also affecting the seropositivity of Brucella on animal level. Herds with more than 20 camels were more frequently affected. This result was in agreement with that previously reported by Abbas and Agab (2002), Bati (2004), Al-Majali *et al.* (2008) and Mohammed *et al.* (2011). It was suggested that more contact between camels may occur in large herds than smaller ones. The prevalence was lower among the young animals screened in this study compared to the older ones. In this observation Seroprevalence of Brucellosis was (9.3%) in young camels and (23.7%) in adult camels. The same results were recorded by Musa and Shigidi (2001), Bati (2004), AlMajali *et al*. (2008), Dawood (2008), Omer *et al.* (2010) and Swai *et al.*, (2011). Usually, young animals are protected by maternal immunity, thus susceptibility seems to be low among them. Also, older camels are more exposed the presence of growth factors such as Erytheritol and hormones favor infection in mature animals. The high prevalence seen in the older animals was demonstrating the chronic nature of Brucellosis. Percentage of infected male was about 25.5% and the percentage of infected females was about 4%, in this study, Brucellosis was more prevalence in males than females as the number of female animals examined was small.

Conflict of Interest

The authors have declared that no competing interests exist.

Acknowledgements

This work was carried out at Gadarif regional laboratory, Central Veterinary Research Laboratory, Soba (Animal Resources Research Corporation ARRC).

Author's Contribution

HM. Bashir, HH Abraheem, MI Khogly, YA Shuaib, NE Mohammed & MA Abdalla designed the research plan; HM. Bashir, MI Khogly & HAMA Bilal performed experimental works & collected the required data. All authors jointly prepared the manuscript. Final form of manuscript was approved by all authors.

Conflict of Interest

The authors declare that there is no conflict of interest with present publication.

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