

Notes on Toxoplasmosis and Brucellosis in Donkeys and Horses in Gadrif Town - Eastern Sudan

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Abstract - This study was carried out to estimate the seroprevalence rate of *Toxoplasma gondii* and *Brucella* antibodies in the donkeys and horses located in Gadarif State in May 2021. A total of one hundred and seventy (170) random blood samples were collected from donkeys and forty one (41) blood samples were collected from horses, of different ages and sexes, however latex agglutination test and Rose Bengal test was used to estimate the antibodies. Analysis was made using the statistical package for social sciences (SPSS). The present study revealed overall seroprevalence rate of toxoplasmosis as 31.2%, however the findings concluded that rates of 11.2%, 12.9% and 7.1% in less than seven years, seven to ten years and over ten years. The estimated overall *Brucella* seroprevalence rate was 24%. The in donkeys less than seven years and more than ten years among the different screened age group of donkeys showed 6.7% and 5.3% which is less than age group seven to ten years. The southern areas showed the highest rates of infection in the studied areas, mean while the most infection was reported among the donkeys which were used for water transfer purpose.

Keywords: Toxoplasmosis, Brucellosis, Donkeys, Horses, Eastern Sudan.

1. Introduction

Donkeys are kept specifically for work. Their most common role is for transport, pack transport or pulling carts, they may assist in threshing, pulling water, milling or other operations and source of meat and milk (Starkey *et al.*, 2004; Trinchese *et al.*, 2015). In underdeveloped countries donkeys play an essential role in the agricultural economies, but these animals have not yet been given sufficient care and they are subjected to many diseases which affect their viability and lower their work ability (Khalifa *et al.*, 1988; Kathy *et al.*, 2004; Svendsen, 1997; Najat, 2006).

In the Sudan donkey's population was estimated to be more than 6 million. Horses accounts to 784.5 thousand and donkeys are approximately 7.5 million heads, In Gadarif State, horse's population are estimated to be 13,000 while donkeys are 746,250 heads. (Anon, 2020).

Toxoplasmosis is animal zoonosis, distributed worldwide and affecting almost all warm-blooded animal species, and humans (Tenter *et al.*, 2002). Studies on animal toxoplasmosis in the Sudan were done by many researchers (Zein Eldin *et al.*, 1985; Khalil and Elrayah, 2011; Abdel-Hafez, 2013). Many studies were carried out on human toxoplasmosis (El Nahas *et al.*, 2003; Abdel Hameed, 1991; Siddig, 2010).

In Gadarif State Jomaa *et al.*, (2017) and Atil *et al.* (2017) reported a seroprevalence of 49.7%, 29.9%, 52.0 and 45.7% using LAT and ELISA, respectively.

Studies on toxoplasmosis among horses were carried out in many countries of the world ranging from 6.9% and 65% (El-Ghaysh *et al.*, 1998; Dubey *et al.*, 1999; Ghazy, 2007), but in Sudanese horses it was estimated as 38% and 30.08% in two different surveys, however in donkeys the prevalence was 27% and 27.6% (Shadia *et al.*, 2013; Abdalla *et al.*, 2014).

Brucellosis is a zoonotic disease of animals, especially domesticated livestock, caused by bacteria of the *Brucella* species (Nathaniel *et al.*, 2019). Brucellosis in animals was investigated in different animals in Gadarif (Khuzaima *et al.*, 2017; Mohammed *et al.*, 2019; Mahasin *et al.*, 2017).

Brucellosis among horses and donkeys was investigated in many countries such as Nigeria, Iran, Pakistan, Brazil, Turkey and Sudan using RBPT as a main screening test (Tahma tan *et al.*, 2010; Safirulla *et al.*, 2014; Jungenira *et al.*, 2015; Len *et al.*, 2011; Sadiqi *et al.*, 2013 and Musa, 2004).

In equines, the clinical signs due to brucellosis are mostly noticed in the musculoskeletal system mainly as the organism

localize in the bursae ,joints and tendon sheaths and Fistulous withers (Ocholi *et al.*, 2004; Kumaragurubaran *et al.*, 2016; Musa, 2004 ; Rashmir-Raven *et al.*, 1990; Cohen *et al.*, 1992).

In Sudan few reports about brucellosis in donkeys and horses were recorded, however in south Darfur estimates of 3.6% and 4.6 % in donkeys and horses were reported respectively (Musa, 2004). Studies were carried out in different parts of the world including Algeria and Nigeria (Hamza *et al.*, 2019; Nathaniel *et al.*, 2019).

2. Materials and Methods

Study area:

This study was carried out in Gadarif town in Gadarif State which is located in eastern Sudan neighboring Ethiopia and the Sate of Kassala to the east, Khartoum State to the north, Gezira to the west and Sennar State to the south.

Samples Collection

Blood samples were obtained from the jugular vein of 150 donkeys and 41 horses in Gadarif State .For each sample, serum was removed from clotted blood and stored at -20 °C until tested.

Data Collection

Data about risk factors were obtained with each sample. The risk factors in clued age, sex, and breed, and location, purpose of donkey and case history of fistulous wither.

Latex Agglutination Test (LAT)

The Toxo-Latex diagnostic kits (Spinreact, S.A. /S.A.U, Spain) were purchased from Shifak Company, Khartoum, Sudan. Initially sera were examined for anti- T. gundi qualitatively in the LAT based on the manufacturer instructions (25µl of antigen in 50 µl of tested serum).

Rose Bengal Plate Test (RBPT):

All sera were screened by RBPT using RBPT antigen production Brucella Department, Veterinary Research Institute, Khartoum. The protocol that was followed in testing the serum samples was that described by (Alton *et al.*, 1975).

Data Analysis

The Statistical Package for Social Sciences (SPSS) for Windows® version 18.0 (SPSS Inc., Chicago, Illinois) was used for all appropriate statistical analyses.

3. Results

The overall estimated Toxoplasma seroprevalence rate was 31.2% in donkeys also the present study revealed rates of 11.2%, 12.9% and 7.1% in less than seven years, seven to ten years and over ten years old, the seroprevalence of toxoplasmosis in both sexes were 30% and 1.2% in males and females respectively.

In donkeys the study revealed the overall seroprvalence rate as 24%, however it was the lowest in less than seven years old also this study showed higher seroprevalence rate (25%) in male compared with female (0%), Regarding location this study found no significant association with brucellosis in donkeys.

This study concluded that donkeys used for water revealed the lowest rate (19%) compared with donkey used for transport and riding purpose as well as donkeys from northern areas showed highest rate 28.2% compared with other screened areas In this study (33%) of seropositive donkey had fistula wither while (23.1%) seropositive donkey have no fistulous wither.

In horses the study showed higher seroprevalence rate (31.7%) in male compared with (0%) in female, regarding location this study found no significant association. The southern areas showed the highest rates of infection in the studied areas. In the current survey the seroprevalence rate of horses brucellosis was between five and seven (17.1 %) among the all age group.

Table (1): Association between Age and Toxoplasmosis

| Age | Total | +Ve | % | P value |
|--------------------|-------|-----|------|---------|
| Less than 7 year | 80 | 19 | 11.2 | 0.079 |
| 7 to 10 years | 64 | 22 | 12.9 | 0.079 |
| More than 10 years | 26 | 12 | 7.1 | 0.079 |

Table (2): Association between Sex and toxoplasmosis

| Sex | Total | +Ve | % | P value |
|------|-------|-----|-----|---------|
| Male | 163 | 51 | 30% | 0.879 |

Table (3): Association between Age group and seropostivity of Brucellosis in donkeys

| Age | Total | + Ve | % |
|-------|-------|------|-------|
| <7 | 55 | 10 | 18,2% |
| 7-10 | 74 | 18 | 24,3% |
| >10 | 21 | 8 | 38% |
| Total | 150 | 36 | 24.0% |

Table (4): Association between sex group and serpostivity in donkeys

| Sex | Total | + Ve | % | P-value |
|------|-------|------|-------|---------|
| Male | 143 | 36 | 25,1% | - |

| | | | | |
|--------|-----|----|-------|-------|
| Female | 7 | 0 | 0.0% | - |
| Total | 150 | 36 | 24.0% | 0.128 |

Table (5): Cross tabulation of location and seropositivity of Brucellosis in donkeys

| Location | +Ve | Total | % | P-value |
|----------|-----|-------|-------|---------|
| East | 5 | 19 | 26% | 0.874 |
| West | 4 | 18 | 22,2% | |
| North | 11 | 39 | 28,2% | |
| South | 16 | 74 | 21,6% | |
| Total | 36 | 150 | 24.0% | |

Table (6): Location and Brucellosis in horses

| Location | + Ve | Total | % |
|----------|------|-------|------|
| North | 3 | 9 | 33.3 |
| South | 4 | 13 | 30 |
| East | 4 | 9 | 44.4 |
| West | 2 | 10 | 20 |
| Total | 13 | 41 | 31.7 |

Table (7): Association between age and Brucellosis in horses

| Age | +Ve | Total | % |
|-------------|-----|-------|-------|
| Less than 5 | 4 | 12 | 33.3 |
| 5 to 7 | 7 | 23 | 30.4 |
| More than 7 | 2 | 6 | 33.33 |
| Total | 13 | 41 | 31.7 |

4. Discussion

The overall seroprevalence rate of toxoplasmosis was 31.2% which was a bit higher than previous work carried out in Khartoum State with estimated 27% (Shadai, 2013), but compared to horses the current findings was a bit lower with estimated 38%.

As for age as risk factor , the present study revealed 11.2%, 12.9% and 7.1% in less than seven years , seven to ten years and over ten years , however the findings were not in agreement with (Abdala ,2014) who reported 22.2% 27.8% and 38.9% respectively in horses in Khartoum state .

The seroprevalence of toxoplasmosis in both sexes were 30% in males, however the first result was in in agreement with previous work in Khartoum state but the latter was significantly contradicting. it worth mentioning that females are not kept compared to males that is why less numbers of females were obtained (Abdalla, 2014).

The overall seroprevalence rate was 24% in donkeys with lowest rates in less than seven years (18%) among the all age group this findings is dramatically higher than the results in Nigeria, Iran, Brazil and Turkey with 5.5%, 12% 5% and 13.68% using RBPT respectively. (Tahma tan *et al.*, 2010; Jungenira *et al.*, 2015; Len *et al.*, 2011; Sadiq *et al.*, 2013). On

the other hand the results were is lower compared to the findings in Pakistan with 71.93% (Safirulla *et al.*, 2014), This study also showed higher seroprevalence rate in male compared to females with (0%) and (25%), this could be due to small number of females samples, since the latter is not kept.

Regarding location this study found no significant association with brucellosis in donkey. And conclude the donkey used for water revealed the lowest rates with (19%) compared with donkey used for transport and riding purpose we don't know actual reason for that. As for donkeys which had fistulous wither only (23.1%) seropositive donkey have no fistulous wither, much work should be done to isolate the organism causing fistulous wither.

In horses the prevalence rate of equine Brucellosis was higher in ages 5-Seven years (56%) while it was lower in other age groups result need more investigation. equines and bitches may be considered as a source of infection, but usually they are not significant in the spreading of the disease. (Corbel, 2006).

The current work revealed that no association between location and brucellosis in horses since all obtained sample wear from one town as well as No clinical signs of F W has been found, in this study which could be due to small number of equine in Gadarif town.

No clinical Signs of fistulous wither has been found in this study so could be duel to small number of examined horses.

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Citation of this Article:

Hatim H. A., Hosam B. A., Eslah A. D., Nada E. M., Nagwa E., Hamid K., Asjud J., Adil S., “Notes on Toxoplasmosis and Brucellosis in Donkeys and Horses in Gadrif Town - Eastern Sudan” Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 8, pp 83-87, August 2023. Article DOI <https://doi.org/10.47001/IRJIET/2023.708011>
