Seroprevalence of Human Brucellosis in Kuku Dairy Scheme, Khartoum State, Sudan

Tamador-Elkhansaa Elnour Angara¹, Adil Abdel Rahman Ali Ismail² and Nageeb Suliman Saeed³
1. Department of Development Studies & Extension, Sudan University of Science and Technology (SUST), Khartoum 11111, Sudan
2. Department of Preventive Veterinary Medicine, University of Bahri, Khartoum 11111, Sudan
3. Department of Microbiology, Faculty of Medicine, University of Khartoum, Khartoum 11111, Sudan

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Abstract: A seroprevalence investigation of human brucellosis was carried out in Kuku Dairy Scheme, Sudan. A total of 176 serum samples were collected and screened by Rose Bengal Plate Test (RBPT). The positive sera were further examined using Tube Agglutination Test (TAT) and c-Elisa. The seropositivity was 15.9%, 14.8% and 11.4% using RBPT, TAT and c-Elisa respectively. Whereas, the active infection based on seropositivity and clinical signs were 4.6%, 4.6% and 2.3% in case of RBPT, TAT and c-Elisa respectively. Based on c-Elisa result the infected individuals were further subjected to clinical examination and treated with streptomycin and doxocycline for six weeks.

Key words: Malta fever, in contact persons, agricultural workers, Kuku Scheme.

1. Introduction

Brucellosis is one of the most common zoonosis in the world [1]. The disease is caused by organisms belonging to the genus Brucella, gram-negative, non-spore-forming, facultative, intracellular bacteria [2]. The centers for Disease Control and Prevention (CDC) classify B. abortus, B. melitensis and B. suis as “agents of mass destruction” and as category B organisms [3]. The occurrence of the disease in human is largely dependent on animal reservoir [4]. The disease is transmitted to humans by ingestion of infected food products, direct contact with an infected animal, or inhalation of aerosols [5]. Cattle are the most important livestock source of human brucellosis [6, 7]. Although the definite diagnosis of brucellosis is made by isolation of the organism from blood samples or other clinical specimens [8]. Human brucellosis is diagnosed on the basis of clinical findings and laboratory studies [9].

Serodiagnosis is most commonly made on the basis of the Tube Agglutination Test (TAT). Other assays, including the (RBPT) and the anti-brucella Coombs test. The ELISA is more sensitive than the TAT in diagnosis of brucellosis [10]. Studies on the infection in Saudi Arabia and Oman revealed that 20% of the population had serological evidence of exposure in southern Saudi Arabia [11] while 1% of healthy residents of Dhofar, Oman (mainly children) had serologic evidence of exposure [12]. The disease in agricultural workers was investigated in Bari, Southern Italy by standard tube agglutination test. None of the subjects examined had antibodies to Brucella [13]. In Castellon, Spain, the seroprevalence of brucellosis in agricultural workers was 3.1% based on Wright and Coombs tests; all sera were negative to Rose Bengal [14].

A 12.7% prevalence rate was reported in nomads community in Darfur states [15] using serological and bacteriological tests. In Chad brucellosis was investigated in three nomadic communities of Chad (Fulani cattle breeders, and Arab camel and cattle
breeders) by indirect ELISA, the seropositivity were 3.8% [16]. The combination therapies recommended by WHO for treatment of brucellosis are doxycycline plus rifampicin or doxycycline plus streptomycin [17]. Sudan was proved to be endemic with bovine brucellosis; Kuku Scheme was not an exception. There was no formal control strategy adopted to control the disease in cattle. The probability of the transmission of the disease to at risk population is very high; however, no data regarding human brucellosis in the scheme is available. This work aimed at providing data on human brucellosis among in contact individuals and the risk factors associated with the disease to highlight the seriousness of the problem and to draw the attention of the policy makers towards controlling the disease.

2. Materials and Methods

2.1 The Study Area

Kuku Scheme covers an area of about 2600 acre stretching out from the old riverain cultivation area on the Blue Nile banks, east of Khartoum North [18]. The project was established in 1963 by American aid to settle the semi nomadic tribes and to increase milk supply to the capital town by up grading the local cattle breeds. Currently the scheme is a part of East Nile locality one of the seven localities of Khartoum State [19].

2.2 Sample Collection and Testing:

A total of 176 out of 649 at risk were examined for brucellosis. Blood samples were collected using 5 cc disposable syringes. Case recording forms were used to collect data on the history and clinical symptoms. The blood samples were transferred to The National Health Laboratory for serological examination. Rose Bengal Plate Test (RBT), was used as screening test as described by Alton et al. [20]. The positive sera were subject to Tube Agglutination Tests (TAT) as described by Meyer [21] and Competitive Enzyme-Linked Immunosorbent Assay (cELISA) tests using SVANOVIR®Brucella-Ab C-ELISA test kits. Actively infected persons were interviewed in depth and subjected to further clinical examination and treated with streptomycin and doxycycline for six weeks and followed up for 6 months for any relapse.

3. Results

A total of 176 sera were tested by using RBPT as screening test, the result is shown in Table 1 where a total of 28 (15.9%) serum samples reacted positive to the test. To confirm this result the positive sera were subject to TAT and c-Elisa. The seropositive samples were 26 (14.8%) and 20 (11.4%) based on TAT and c-Elisa respectively.

The positive sera of symptomatic individuals were 8 (4.6%), 8 (4.6%) and 4 (2.3%) in case of RBPT, TAT and c-Elisa respectively.

The study revealed that one individual who reacted positively to c-Elisa had symptoms of fever, headache, arthralgia, whereas another one suffered from fever, headache, arthralgia and night sweat and two individuals showed symptoms of fever, headache, arthralgia, night sweat and, fatigue as shown in Table 2.

4. Discussion

The result based on confirmatory c-Elisa and clinical signs indicated that the scheme is endemic with brucellosis and the infection rate was 2.3%. This infection occurred as a result of direct contacts with herds in the scheme. The infection rate among cattle

| Table 1  Seroprevalence of human brucellosis Kuku Dairy Scheme. |
|------------------------------|-----------------|----------------|--------------------------|
| Total people investigated    | Test used       | Positive reactors | Symptomatic positive reactors |
| 176                          | RBT             | 28 (15.9%)        | 8.0 (4.6%)              |
|                              | TAT             | 26 (14.8%)        | 8.0 (4.6%)              |
|                              | cELISA          | 20 (11.4%)        | 4.0 (2.3%)              |
population in the scheme was 24.9% based on c-Elisa [22].

The result obtained in this study is slightly less than the result of 12.7% reported in nomadic tribes in Southern Darfur-Sudan by Musa [15]. On the other hand the current result disagrees with the RBPT result obtained from Agricultural workers living in the coastal areas of Castellon, Spain [14] where all the participants reacted negative to RBPT in contrast to the current result where 15.9% of the participant reacted positive to the test. On the other hand the seroprevalence of 3.8% obtained from three nomadic communities of Chad by Schelling et al. [16] was much lower than that obtained in this study. Comparing the four-seroprevalence results of the agricultural workers: the current work, Darfur (nomads), Chad (nomads), Castellon, Spain and in Bari, Southern Italy. The prevalence rates obtained from Sudan are much alike in spite of the different production systems: sedentary in Kuku and nomadic in Darfur. The authors expect that the prevalence rates of the two nomadic communities in Darfur and Chad to be much alike than those of Kuku and Darfur. The two former communities are more similar alike with regard to geographical condition, pattern of life, type of cattle breed and animal husbandry practices, whereas the latter differ much in these aspects. The results of Spain and Italy differ largely from the results of Sudan and Chad this may be attributed to different factors including human behavior, and public health measures and control of the disease in animal. Unlike the case of Southern Saudi Arabia [11], the seroprevalence result of brucellosis in the general population in Dofar, Oman [12] is less than those in the agricultural workers.

### Table 2  Symptoms of individuals found serologically positive to c-Elisa.

<table>
<thead>
<tr>
<th>Description (Symptoms)</th>
<th>No infected</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever, headache and arthralgia</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Fever, headache, arthralgia and night sweating</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Fever, headache, arthralgia, night sweat, fatigue</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Total symptomatic people</td>
<td>4.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

5. Conclusions

The study proved that the scheme is endemic with brucellosis and that many cases passed undiagnosed. The recommendations were raising the awareness of in contact individuals, test the in contact population routinely, and formulation of a control strategy in animal population.

### Acknowledgments

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### Ethical Considerations

This study carried out in The National Health Laboratory. The infected people were further clinically examined and treated in Faisal Professional Private Clinic.

### References


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