The prevalence of brucella antibodies in Yemen

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ABSTRACT

Objectives: To determine the prevalence of seropositivity to brucella among individuals in five selected areas in Yemen.

Study design: A cross-sectional survey.

Methods: The study was conducted in five major population areas in the Yemen. The study population consisted of all those donating to blood banks. A tube standard agglutination test was used to indicate positive serology. A total of 1405 samples were selected.

Results: Five persons had a titre of ≥1:160 which was considered positive for brucella antibody. The rate of serologically positive sera ranged from 0 to 0.8%.

Conclusions: This data shows that sero-prevalence of brucella in Yemen is lower than other nearby countries in the Arabian Peninsula and demonstrates the importance of regional variations of the disease in these endemic areas.


Keywords: Brucella antigen, Arabian Peninsula, Yemen.

Brucellosis is a bacterial disease which affects approximately about 500,000 individuals worldwide each year.30,41 The incidence of reported human brucellosis in countries of the Arabian Peninsula is very high. In Saudi Arabia the incidence in man was estimated to be 86 cases/100,000/annum,3,47 and a study by Sharif and others37 reported that 3.5% of pregnant women were seropositive. Cooper4 reported that 4.9% asymptomatic military recruits and 11.1% antenatal patients tested in a hospital in Riyadh were seropositive at titre of ≥1:160. In Kuwait the incidence rate was 85 cases/100,000/annum32 and about 40% of patients presenting with pyrexia of undetermined origin had brucellosis.31 In Oman human brucellosis has been reported22 and a recent cross-sectional study by Idris and others21 reported seropositivity rates of up to 2%.

Brucellosis in animals is well recognized in the Arabian Peninsula. The sero-prevalence in camels in Kuwait is 14.8%; while in Oman sero-prevalence is 8% in camels, 6.4% in goats and 3.3% in cattle.28 In Saudi Arabia sero-prevalence among indigenous sheep, goats, cattle and camels is 0.5%, 0.8%, 3.6% and 2.8% respectively, and among imported sheep, goats, cattle and camels is 5%, 4.8%, 13.3% and 4.2% respectively.26 Brucellosis is transmitted in the Arabian Peninsula from animals to humans by ingestion of raw milk, milk products, raw liver, close contact with animals through breeding, birth, slaughtering and inhalation of contaminated dust,5,7,23,32 although infection may also be acquired in a number of other ways.

Considerable difficulty is found in the interpretation of serological tests in populations in which large numbers of individuals are frequently exposed to brucella antigen. These individuals frequently develop antibody titres in the absence of active disease.6,40 In developed countries, a high incidence of seropositivity in disease-free individuals occurs among specific groups such as farmers, farm workers,42 veterinarians, veterinary assistants,38,39 laboratory and research workers,17,27,36 and others occupationally exposed to brucella antigen. In the Arabian Peninsula where animal brucellosis is endemic, exposure to brucella antigen is common and serological tests are particularly difficult to interpret as an individual cannot be easily identified as belonging to a high risk group.

Brucellosis of goats and sheep has been reported in Yemen16 as well as human brucellosis.1 Br. melitensis biotype-2 has been isolated from sheep (the isolate was confirmed by FAO/WHO Collaborating Center for Reference and Research on Brucellosis, Weybridge, Surrey, UK). Furthermore, Falade and Hussein12 found a high
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Table 1 - Brucella antibody prevalence among blood donors in five localities in Yemen.

<table>
<thead>
<tr>
<th>Substation</th>
<th>Number of samples tested</th>
<th>Number of samples positive ≥ 160</th>
<th>% positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sana’a</td>
<td>300</td>
<td>2</td>
<td>0.70</td>
</tr>
<tr>
<td>Taiz</td>
<td>240</td>
<td>2</td>
<td>0.80</td>
</tr>
<tr>
<td>Mokalla</td>
<td>290</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Hajja</td>
<td>287</td>
<td>1</td>
<td>0.35</td>
</tr>
<tr>
<td>Hodadah</td>
<td>288</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1405</strong></td>
<td><strong>5</strong></td>
<td><strong>0.40</strong></td>
</tr>
</tbody>
</table>

prevalence of brucellosis among exotic goats and sheep from Somalia (2.8%) and Hosie and others18 found the prevalence of brucellosis among exotic goats from Africa to be 5.6% and among exotic sheep from Africa 1.7%. The objective of this study was to determine the prevalence of seropositivity to brucella among individuals in the five selected areas in Yemen.

Materials and methods

Study population In June 1993, a survey was conducted in five major population areas in the Yemen: the capital Sana’a, the mountain cities of Hajja and Taiz, and the coastal cities of Hodadah and Mokalla. The study population consisted of those donating blood to blood banks in the five areas during June 1993. Based on an expected prevalence of 1.5% and worst acceptable value of 0.4%, not less than 1322 randomly selected subjects were needed out of a total estimate of 12,000,000 population at a confidence level of 99.9%. A systematic random sampling of every 5th serum blood donation was selected. One thousand, four hundred and five samples were selected: 300 from Sana’a, 240 from Taiz, 290 from Mokalla, 287 from Hajja and 288 from Hodadah. All the donors were asymptomatic and well at the time of donation.

Laboratory method

Tube standard agglutination (SAT) test The sera were tested by standard agglutination test using Difco reagents (B.abortus and B.melitensis), (Difco Laboratories, Detroit, Michigan 48232, USA). Positive and negative control were tested in parallel with the tested serum. To avoid laboratory error due to prozone at low titre the final dilution of each serum and positive and negative controls were 1:20 to 1:640 after addition of an equal volume of antigen. Any serum giving a titre of ≥1:640 a further dilution was carried out.

The test was carried out as described by Alton and others.3 The test was reading at 37 °C after 48 hours of incubation. A titre of ≥1:160 was considered positive.

Results Table 1 shows the results of the tube agglutination test for sera from the different localities. Two (0.7%) sera from Sana’a, 2 (0.8%) from Taiz and 1 (0.35%) from Hajja were positive for a titre of ≥1:160. Out of 1405 sera examined from the five localities, 94 (6.8%) showed a reaction of ≥1:20 (Fig. 1). Titres obtained with B.melitensis and B.abortus antigen did not differ. In these localities 0.4% of asymptomatic blood donors were found to have a standard agglutination titre of ≥1:160.

Discussion The present reports show that brucellosis is being reported much more than before in countries of the Arabian Peninsula,11,24 and while animals continue to carry the infection, the possibility of further increases in the number of human cases cannot be dismissed.

Although the participating population could not be selected entirely at random, the deduced
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...prevalence of seropositivity should not be grossly different from the true value in Yemen.

The prevalence of antibody to brucella noted in these asymptomatic populations may have been due to either past infection (apparently subclinical), currently active, subclinical disease or to exposure to antigen without active disease.

The data presented in our study suggests the involvement of brucella species as an etiological agent. It should be noted that there is antigenic cross reaction, although at low titre with *Yersinia enterocolitica* serotype 0:9, *Vibrio cholerae*, *Francisella tularensis*, *Escherichia coli* serotype 0157:H7 and *Salmonella* serotype 0:30.10,12,13,16,26,33-35

We cannot, therefore, rule out the possibility that the titres measured are due to infections with other etiological agents. However, brucellosis remains the most likely cause of the responses noted.

Titres obtained with *B. abortus* and *B. melitensis* antigen did not differ because of the extensive cross-reaction between both species.14,20

In order to identify the infecting species of brucella, blood cultures would have been required but these were not technically accessible for the study population.

In the populations tested, 0.4% of asymptomatic blood donors fulfilled the serological criterion of brucellosis as determined by this standard.

The sero-prevalence of brucella antibody in our study (0.4%) was less than that reported in Oman, 1.1%21 and much less than reported in Saudi Arabia by Sharif and others37 (3.5%) among pregnant women in rural areas and more recently by Cooper4 4.9% and 11.1% in asymptomatic military recruits and antenatal patients respectively.

The low prevalence of human brucellosis in Yemen, in contrast to other nearby countries of the Arabian Peninsula, could be explained by the low prevalence of brucella among indigenous animals in Yemen. In a recent survey carried out by the Central Veterinary Laboratory, Ministry of Agriculture, Sana'a, Yemen in 1993, the overall prevalence of brucella antibodies among goats was 1.3%, sheep 0.6% and cattle 0.06%.

Conclusion

The data demonstrates the importance of regional variation in the prevalence of antibody to brucella in the Arabian Peninsula countries in which the disease is endemic.

The low prevalence of antibody to brucella measured by a standard agglutination test demonstrates the importance of this test in predicting the presence of persistent disease activity in these locations.

Human brucellosis should be made a notifiable disease in Yemen and further studies will be required to determine the importance of the disease in Yemen.

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