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Sero−prevalence of brucellosis among blood donors in Ahvaz, Southwest Iran

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PEER REVIEW

Peer reviewer
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Comments
This is a valuable study, since Brucellosis is an endemic disease in parts of Iran, so any research in this area is of importance in epidemiology of the disease point of view. The present paper investigated the prevalence of serologic Brucellosis in blood donors in southwest of Iran and the findings represented low sero−positivity rate.
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ABSTRACT

Objective: To identify sero−prevalence of brucellosis among blood donors in Ahvaz city, Southwest Iran.
Methods: A total number of 1 450 serum samples from blood donation were collected and were screened for the presence of brucella antibody. Rose Bengal Plate Test, Standard Agglutination Test (SAT), and 2−mercaptoethanol (2ME) agglutination were tested in the sample. SAT dilution ≥1/80 and 2ME agglutination ≥1/40 were considered positive.
Results: Sero−prevalence of brucellosis among the blood donors was 0.70%, 0.34%, and 0.20% by Rose Bengal Plate Test, SAT, and 2ME respectively.
Conclusions: Considering the 1/80 titer of SAT as the criteria of contamination with *brucella*, routine screening of sero−prevalence of *brucella* in blood donors is not recommended in this area.

1. Introduction

Brucellosis is a public health problem in many parts of the world, notably in the Middle East countries. The disease is considered as one of the most widely spread zoonoses in the world. It is also a disease of considerable social and economic importance[1].

Brucellosis is transmitted to humans through the consumption of unpasteurized dairy products or through direct contact with infected animals. Person−to−person transmission of brucellosis is unusual; however, blood transfusions and bone marrow transplants are known sources of brucellosis, especially in endemic areas[2,3].

Incidence of brucellosis is different in the world. The World Health Organization reported 500 000 cases of brucellosis each year throughout the world. The map of the global distribution of brucellosis indicates the prevalence of brucellosis in some places such as North America, Canada and Australia, is very low (less than 2 cases per 100 000 population), while in Mongolia and Syria, it is more than 500 per 100 000 population[4]. The

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true incidence, however, is unknown and it is estimated higher than the reported incidence, due to underreporting and misdiagnosis[5].

The prevalence of brucellosis varies widely from country to country, and also varies within the countries. The prevalence of brucellosis has been reported to be 0.5% to 10.9% in different areas of Iran[5].

Sero–prevalence of brucellosis was investigated in many populations in Iran; however, few studies on the prevalence of brucellosis among healthy blood donors are available[6–8]. Brucellosis was investigated in a study in high risk population (nomads) in Ahvaz[9]; however, no study on the prevalence of brucellosis among blood donors as a healthy population is available.

Serological investigation of the blood donors is of paramount importance for diagnosis and future management of brucellosis in endemic areas. Hence, it is important to know the prevalence of *brucella* agglutinins in blood donation as healthy individuals, which might give an overview of the endemicity of the disease. Therefore, this study carried out to investigate the background prevalence of *brucella* antibodies in blood donors population in Ahvaz, Southwest Iran.

2. Materials and methods

This cross–sectional study was conducted over one year during 2011 to determine the sero–prevalence of brucellosis among blood donors population. A total of 1450 blood donors attending the Ahvaz Blood Transfusion Center were screened for *brucella* agglutinins.

The study was approved by the Ethical Committee of Ahvaz Jundishapur University of Medical Sciences.

After preparing the demographic questionnaire including age, gender, occupation, 3 mL blood was taken from all participants who were attending to Blood Transfusion Center. After centrifugation and separation of serum, sera were collected and stored at −20 °C for subsequent *brucella* serological tests.

Laboratory tests including Rose Bengal Plate Test (RBPT), Standard Agglutination Test (SAT), and 2–mercaptoethanol (2ME) agglutination were tested in all participants.

RBPT is a rapid agglutination test commonly employed as a screening test but the results should be confirmed by bacteriological and other serological tests. Any degree of agglutination was taken as positive and no agglutination was taken as negative[10].

SAT is the most widely used test for the detection of *brucella* antibodies in humans. It measures the total quantity of agglutinating antibodies *i.e.* IgM and IgG. The Standard Tube Agglutination Test was carried out with *Brucella abortus* antigen provided by the Pasteur Institute of Iran. Any serum with titers of 1/80 or above was considered as a positive result[10].

2ME agglutination test was performed similar to the Standard Tube Agglutination Test, except for the addition of 2ME in place of phenol saline to a final concentration of 0.05 mol/L in each tube. The 2ME inactivates IgM antibodies by disrupting disulfide bonds, hence permitting agglutination by IgG antibodies that are resistant to 2ME. The 2ME solution was obtained from Pasteur Institute of Iran. The presence of 2ME agglutination 1/40 or above

was considered positive[11].

In the present study, titers of 1/80 SAT or higher were considered as criteria of the sero–positivity of brucellosis in subjects.

Data was analyzed using Statistical Package for Social Sciences (version 18.0). The significance of difference between exposure variables and sero–prevalence of brucellosis was calculated using the chi–squared test, with $P<0.05$ as the level of significance.

3. Results

A total of 1450 blood donors were investigated for the *brucella* antibody. The age range of subjects was 17 to 68 years (mean 37.0±9.5 years), 1405 (97%) were males and 45 (3%) were females.

About 415 (28.6%) of population were less than 30 years, 538 (37%) were 30–39 years, 351 (24.2%) were 40–49 years, and 146 (10.2%) were higher 50 years.

The seasonal distribution of blood donors revealed that 370 donors (25.5%) were admitted during spring, 341 donors (23.5%) were admitted during summer, 343 donors (23.7%) were admitted during autumn, and 396 donors (27.3%) were admitted in winter.

With regard to the job status of the blood donors, 718 (51%) were employed, 588 (42%) were self–employed, 56 (4%) were students, 32 (2.6%) were housekeeper and 14 (1.3%) were unemployed.

The results of sero–prevalence of *brucella* antibodies among blood donors in Ahvaz are summarized in Table 1. In the present study, the sero–prevalence of anti–*brucella* antibody titer was 0.7% (10 subjects) for RBPT, 0.34% (5 subjects) with titers of 1/80 or higher for SAT and 0.2% (3 subjects) with titers of 1/40 or higher for 2ME. Amongst the 8 SAT positives, 3 showed agglutination at dilution 1/40, 4 at 1/80 and 1 at 1/160. Two samples showed agglutination with 2ME test at 1/40 and 1 at 1/80 dilution.

Table 1
Results of serological tests in 1450 blood donors in Ahvaz, Iran.

Number	Sex	Serological results		
		RBPT	SAT	2ME
1	M	+	1/160	1/80
2	M	+	1/80	1/40
3	M	+	1/80	1/40
4	M	+	1/80	−
5	M	+	1/80	−
6	F	+	1/40	−
7	M	+	1/40	−
8	M	+	−	−
9	M	+	−	−
10	M	+	−	−

RBPT: Rose–Bengal Plate Test; SAT: Standard Agglutination Test; 2ME: 2–Mercaptoethanol Test

The *Chi*–square analysis did not indicate significant differences among sero–prevalence of brucellosis by sex, age, job status, and season ($P>0.05$).

4. Discussion

Brucellosis has a worldwide distribution and high prevalence

in many countries and it has been one of the major health and economic problems. Prevalence of brucellosis is still unclear due to lack of precise diagnostic methods, inadequate reporting system and lack of adequate follow–up in many areas. Iran is also considered to be an endemic area. Since the risk of disease transmission from human to human via blood transfusion exists, the high prevalence of brucellosis in a community can be a risk factor in blood donation. Thus, screening and determination of prevalence of brucellosis is important, especially in endemic areas.

In the present study, the seropositivity of *brucella* antibody in blood donors was found to be 0.34% (5 out of 1450) which was slightly higher than the reported sero–prevalence of 0.33% in blood donors in Arak, Central Iran and 0.057% in Bushehr, South Iran[6,7].

Relatively lower sero–prevalence of brucellosis in blood donors in Ahvaz, in comparison with similar studies, can be due to education of human on the different aspect of the disease transmission and heightened public awareness of the danger of raw food and consumption of animal products such as milk, cheese, and dried whey.

Several studies have been conducted to determine the prevalence of the human brucellosis in blood donations in Iran and other countries. In Iran, brucellosis has been a major health problem reported with a high frequency in some parts of the country[12].

In a study among blood donors from Bushehr (south of Iran), 10 500 sera were evaluated and the sero–positivity of brucellosis was only 0.057%, which suggested that the sero–prevalence of brucellosis in blood donation in Bushehr was low[6]. In another study conducted on 897 blood donors in Arak (central part of Iran), the overall sero–prevalence of antibodies to *brucella* was reported 0.33%[7]. In contrast, the results of another study performed on 300 blood donors in Yazd (east of Iran) showed seropositivity of brucellosis of cases was 6.3%[8]. The seropositivity rates in these results were at variance to those observed in the present study. This probably indicates the geographic and climatic changes, unhygienic conditions and the dairy eating habits which affect the difference of the brucellosis in these areas.

Several studies were carried out on *brucella* agglutinine prevalence in blood donors in different countries. The reported incidence and prevalence varies from country to country. A range of prevalence of 0.63% in Turkey, 1.2% in Sudan, 3.11% in India, 3.6% in Mexico and 5.29% in Iraq have been reported[13–17]. These differences in sero–prevalence in a particular region may be due to factors such as food habits, environmental hygiene, socioeconomic status, and methods of processing milk and milk products.

These data show the importance of regional differences in the sero–prevalence of brucellosis in countries in which the disease is endemic. Contact with animals, poor hygiene, and consumption of unpasteurized dairy products are causes of outbreaks in different areas[18].

Several publications indicated that human brucellosis could be a fairly common disease in Iran. In a study performed among the nomads in Khuzestan (south–west of Iran), the reported sero–prevalence of *brucella* was 8%[9]. In another study carried out in rural areas in Abhar (north–west of Iran), the seropositivity

rate of 4.58% was reported in high risk groups and indicated that profession was the main risk factor for seropositivity[19]. The seropositivity rate of 9.8% and 5.5% respectively were reported by Nikokar *et al*. among slaughterhouse workers and the people living in rural areas in nourth of Iran[20]. All these data showed that brucellosis was still endemic in many parts of Iran, so issue of transmission of brucellosis through the blood would be seriously considered.

In a study from Turkey (northwest neighboring country), the sero–prevalence of brucellosis in patients who were referred to hospitals was 18%[21]. In another study on slaughterhouse workers in Pakistan (southeast neighboring country), sero–prevalence of *brucella* antibodies reported 21.7%[22]. This high rate is also important for Iran, because uncontrolled animal transportation exists between these countries.

Although career has been considered as a risk factor for brucellosis; but it does not seem to be essential for infections in the developing countries[23]. Therefore, one of the main causes of the incidence of brucellosis can be considered as food habits and poor hygiene. Due to a low public awareness of disease transmission and lack of hygiene standards in raw milk and dairy consumption, all endemic communities are at risk for brucellosis.

Considering the high incidence of the disease in some areas, education and interventions are required. With more education and increased awareness of the disease transmission, its incidence can be reduced.

Insufficient comparable data and low numbers of positive results obstructed to get statistically significant results. Therefore, the results were not being discussed statistically.

In conclusion, the study reveals that brucellosis has no epidemiological and clinical importance in blood donors in Ahvaz; therefore, it is not recommended to perform screening tests to identify *brucella* antibodies in the sera of blood donors in this area.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

Comments

Background

Brucellosis is a public health problem in many parts of the world. Incidence of brucellosis is different in the world. The World Health Organization reported 500 000 cases of

brucellosis each year throughout the world. The prevalence of brucellosis varies widely from country to country, and also varies within the countries. The prevalence of brucellosis has been reported to be 0.5% to 10.9% in different areas of Iran.

Research frontiers

Serological investigation of the blood donors is of paramount importance for diagnosis and future management of brucellosis in endemic areas. It is important to know the prevalence of *brucella* agglutinins in blood donation as healthy individuals, which might give an overview of the endemicity of the disease.

Related reports

There are some similar sero–prevalence reports of brucellosis from blood donation of Iran which is mentioned in the manuscript. The results of similar studies in other countries are mentioned, too.

Innovations & breakthroughs

This is the first report of the sero–prevalence rates of brucellosis in blood donation in southwest of Iran. The study revealed brucellosis had no epidemiological and clinical importance in blood donors.

Applications

The result of this study can be very important for blood transfusion organization. According to low sero–positivity of brucellosis in the blood donation in this area, it is not recommended to perform screening tests for blood donors.

Peer review

This is a valuable study, since Brucellosis is an endemic disease in parts of Iran, so any research in this area is of importance in epidemiology of the disease point of view. The present paper investigated the prevalence of serologic Brucellosis in blood donors in southwest of Iran and the findings represented low sero–positivity rate.

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