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Brucellosis in Herat Province, Afghanistan: Epidemiological Status and Risk Factors

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Abstract

Background: Human brucellosis, also known as Malta fever, is an acute systemic zoonotic disease in several parts of the world. The most pathogenic *Brucella* specie is *Brucella melitensis* that occurs in the human population of all age groups and of both sexes.
Objectives: The present study aimed to investigate human *Brucella* infection in Afghanistan.
Methods: The participants in this cross-sectional study were 44 patients diagnosed with *Brucella* infection during eight months and confirmed using Wright test by physicians of Iran Clinic Hospital. For data analysis, a statistical model was used through SPSS.
Results: The most affected patients were female housewives (40.9%) and students (18.18%). The most frequent clinical manifestations were recurrent attacks of fever (95.34%), weight loss (81.39%), loss of appetite (79.06%), musculoskeletal pain (69.76%), boredom (67.44%), and lethargy (60.46%). A total of 41 (93.18%) patients mentioned the consumption of unpasteurized milk as the source of infection.
Conclusions: The study results revealed that the main route of *Brucella* transmission in Afghanistan is the consumption of contaminated dairy products. The highest prevalence of brucellosis was observed among the young and middle-aged populations and housewives.

Keywords: Afghanistan, Human Brucellosis, Risk Factors

1. Background

Brucellosis is the world's most widespread zoonotic infection caused by *Brucella* species. The main reservoirs of bacteria are sheep, goat (*B. melitensis*), cattle (*B. abortus*), swine (*B. suis*), and dogs (*B. canis*). The most pathogenic *Brucella* specie is *B. melitensis* that occurs in the human population of all age groups and both sexes (1-3), and it is a major problem in many countries (4, 5). The infection is transmitted to human through direct/indirect contact with infected animals. Direct contact includes contact with contaminated tissue, aborted fetuses and placentas, blood, vaginal discharges, and urine, and indirect contact is through the consumption of raw meat, milk, and other dairy products (3, 6). The main source of brucellosis for urban populations is indirect contact or food borne transmission (4). The symptoms of brucellosis in human are very diverse and non-specific and mainly affect the musculoskeletal system. The clinical manifestations mostly include fever, night sweats, fatigue, arthralgia, myalgia, weight loss, loss of appetite, and hepatosplenomegaly (7, 8). The importance of brucellosis for public health is associated with expanded trade of animals and animal products. Brucellosis affects livestock productivity through abortions and reduced milk production, resulting in major losses for international trade and cash income (3, 9).

While brucellosis is widespread around the world, it is most prevalent in the Mediterranean basin, Arabian Peninsula, Indian subcontinent, parts of Mexico, and Central and South America (10). According to a surveillance report in 2012, 376 confirmed cases of brucellosis were reported by 27 European Union (EU) and European Economic Area (EEA) countries, of which73% belonged to Greece, Spain, Italy, and Portugal. However, some northern and central European countries, along with the United States, have succeeded in the eradication of the disease (10, 11). Now, despite the animal brucellosis control and, subsequently, the reduced number of human cases, it still remains a major health problem in the Mediterranean region. Afghanistan, with a population of 35 million people, is one of the Mediterranean countries where human brucellosis is endemic.

Brucellosis has remained one of the major public

health issues affecting the human and animal population in Afghanistan. Annual reports from the disease early warning system (DEWS) in Afghanistan indicate a high prevalence every year. For instance, in two districts of Bamyan province in 2011, 500 cases of brucellosis were reported (12). To the best of our knowledge, very few studies have discussed the epidemiological status and risk factors of brucellosis in Afghanistan. Therefore, more investigative and surveillance research is required.

2. Objectives

The present study aimed to address brucellosis and its epidemiological status in Afghanistan and will provided information for future planning.

3. Methods

A cross-sectional study was conducted in Herat Province in Afghanistan. According to the Central Statistics Organization, the estimated population in this city in 2019 was 556,200. During eight months, all patients with brucellosis who attended Iran Clinic Hospital were enrolled in the study. In this cross-sectional study, the necessary information was obtained through personal interview using a standard questionnaire. The questionnaire was completed by the same physician. Those who refused to participate were excluded from the study.

The epidemiological data included age, sex, place of residence, occupation, exposure to animals, ingestion of high-risk foods (unpasteurized dairy products), signs and complications, diagnostic tests (Wright (with a titer $\geq$ 1/80), Coombs-wright and 2ME (with a titer $\geq$ 1/40), and medications. Each participant signed a written informed consent form. Their information was kept confidential and not shared with anyone outside of the study team. The statistical analysis of the collected data was performed using SPSS version 26.

4. Results

The study population included all the patients infected with brucellosis who attended Iran Clinic Hospital located in Herat Province. A total of 44 individuals participated in the study with the mean age of 30.9 years (from 2 to 70 years), of whom 26 (59.09%) were female, and 18 (40.9%) were male. The highest number of cases was seen in the age group of 30 - 39 years (31.81%). In terms of location of residence, 21 (47.72%) patients lived in rural areas and 23 (52.27%) in urban regions. In the present study, the most affected patients were female housewives (40.9%), followed by students (18.18%) (Table 1).

Table 1. Socio-demographic Characteristics of Patients with Brucellosis (N = 44)

Socio-demographic Characteristics	No. (%)
Age	
2 - 9	2 (4.54)
10 - 19	6 (13.63)
20 - 29	13 (29.54)
30 - 39	14 (31.81)
40 - 49	4 (9.09)
50 - 59	4 (9.09)
60 - 69	1 (2.27)
Sex	
Males	18 (40.9)
Females	26 (59.09)
Pregnant	7 (26.92)
Not pregnant	19 (73.07)
Occupation	
Housewife	18 (40.9)
Animal husbandry and farmer	5 (11.36)
Student	8 (18.18)
Employee	4 (9.09)
Others	7 (15.9)
Residency	
Rural	21 (47.72)
Urban	23 (52.27)
Drug use	
G + D	13
Ri + D	14
Ri + Cot	2
Others	3
Missing data	12

Abbreviations: G, gentamicin; D, doxycycline; Ri, rifampicin; Cot, cotrimoxazole.

The most frequent clinical manifestations were recurrent attacks of fever (95.34%), weight loss (81.39%), loss of appetite (79.06%), musculoskeletal pain (69.76%), boredom (67.44%), and lethargy (60.46%). Other signs and symptoms are shown in Table 2.

The association between some risk factors and brucellosis is presented in Table 3. A total of 41 (93.18%) patients mentioned the consumption of unpasteurized milk as the source of infection, 26 (59.09%) patients reported the con-

Table 2. Clinical Manifestations of Patients with Brucellosis (N = 44)

Signs and Symptoms	No (%)
Fever	41 (95.34)
Weight loss	35 (81.39)
Loss of appetite	34 (79.06)
Musculoskeletal pain	30 (69.76)
Boredom	29 (67.44)
Lethargy	26 (60.46)
Backache	10 (23.25)
Hepatomegaly	4 (9.3)
Splenomegaly	3 (6.97)

Table 3. Some Risk Factors for Brucellosis (N = 44)

Risk factors	No. (%)
Consumption of unpasteurized milk	41 (93.18)
Consumption of unpasteurized cheese	26 (59.09)
Consumption of unpasteurized cream	16 (36.36)
Contact with animals	15 (34.09)
Consumption of colostrum	12 (27.27)
Familiar history of brucellosis	10 (22.72)
Dealing with unvaccinated animals	2 (4.54)

sumption of unpasteurized cheese, 16 (36.36%) reported the consumption of unpasteurized cream, and 12 (27.27%) reported the consumption of colostrum. Contact with animals and familiar history of brucellosis were mentioned by 15 (34.09%) and 10 patients (22.72%), respectively (Table 3).

5. Discussion

Brucellosis is an animal disease transferred to humans through interaction with infected animals and consumption of their products, such as milk products and meat (13). The WHO estimates the annual incidence rate of brucellosis at more than 500,000 cases per year worldwide (10, 14). In the eastern Mediterranean region, more than 45,000 cases are reported annually (15). Although brucellosis is controlled in many developed countries, in the Mediterranean and Middle Eastern countries, such as Afghanistan, the prevalence has increased because of lack of knowledge regarding the disease and pasteurization procedures of dairy products (16-18). In contrast to earlier findings, no evidence of human brucellosis in Afghanistan was detected. Only one study, to our knowledge, has reported brucellosis and *Coxiella burnetii* infection in householders and their animals in secure villages in Herat Province. The main objective of this study was to draw attention to human brucellosis disease in Afghanistan. According to our results, 44 new brucellosis cases were confirmed during eight months in Iran Clinic Hospital, indicating that brucellosis still remains a considerable public health problem in this country.

Our data showed that the 20-39 years age group was highly involved with *Brucella* infection. Among the 44 cases of brucellosis, 27 (61.35%) were among the young and middle-aged population (20 - 39 years old). This can be due to the employment of this age group in economic activities related to livestock and livestock products. These results are in good agreement with a study conducted among mentally ill patients in conflict-stricken Afghanistan. Qader et al. (19) suggested that age was significantly associated with TB for mentally ill patients aged 16 - 34 and > 45 years. Also, these results confirm the findings reported by Karimi and Karimi (18) and Akhvlediani et al. in Georgia State (20). Their results exhibited that the highest prevalence of brucellosis was in the age group of 25 - 34 years (20.9%) and 10 - 50 years (68.7%), respectively.

In contrast to some reports that men were infected with the disease more than women (Sharkia governorate [Egypt], Kuwait, Saudi Arabia, and India) (21-24), in our study there were more female patients (59.09%) in comparison with male patients (40.9%). This was similar to Qader et al. (19) study that showed women (90.5%) were significantly more infected with TB among mentally ill patients in conflict-stricken Afghanistan. This difference could be due to the fact that women and girls are more vulnerable because they have more contact with livestock and dairy products (25). These results provide confirmatory evidence that in Afghanistan women are more infected with *Brucella* than men are.

The other factors associated with the higher prevalence of *Brucella* were place of residence and occupation. The study results showed that 47.72% and 52.27% of the patients were rural and urban residents, respectively. Also, the results of the study showed a 40.9% prevalence in housewives, which is in agreement with the findings of Ramezani Avval Riabi and Razmara (26) and Karimi and Karimi (18). They reported that most cases of brucellosis occurred among housewives (35.3% and 28.7%, respectively). Considering the fact that housewives do most livestock activities, the highest number of cases was related to this group. In the present study, 18.18% of the patients were students, which was due to their collaboration with their parents in keeping the livestock.

In this study, a higher *Brucella* prevalence was not observed in animal husbandry and farmers involved with slaughtering and milking animals (11.36%), which was in

agreement with a number of studies (27, 28). However, this finding was quite unexpected because the chances of carrying infection in slaughterers and milkers of animals are much higher (29).

Brucellosis has a wide range of clinical manifestations. In our survey, most clinical symptoms included fever (95.34%), weight loss (81.39%), loss of appetite (79.06%), musculoskeletal pain (69.76%), boredom (67.44%), and lethargy (60.46%). Various studies have presented different results in this regard. Avdikou et al. (10) reported that fatigue, night sweats, fever and shivering, and musculoskeletal symptoms were the most common manifestations. Also, in studies carried out in Alexandria, South Jordan, Yemen, and Greece, the common symptoms of brucellosis were recurrent attacks of fever with profuse sweating at night with no prior antipyretic (15, 30-32).

For the serological diagnosis of human brucellosis, Wright, 2-ME, Coombs-wright, WBC, Hg, ALT, AST, and Platelet count tests are the standard methods. In our study, all patients with *Brucella* infection completed the Wright test. In 2014, Najafi et al. (33) showed that Wright test, compared with ELISA, has higher sensitivity, lower specificity, and higher accuracy.

This research investigated some risk factors for brucellosis. The consumption of unpasteurized milk was high in brucellosis patients (93.18 %), which is consistent with the findings of other studies. Kassiri et al. (5) reported that the cause of the disease in 62.8% of patients was the consumption of non-pasteurized milk. The high rate of consumption of local dairy products (unpasteurized cheese 59.09%, unpasteurized cream 36.36%, and colostrum 27.27%) has been cited as an important source of brucellosis. These results suggest that the main route of transmission still remains the consumption of unpasteurized dairy products. This might be due to a very poor understanding of the disease, lack of hygiene of food products, and avoidance of pasteurized milk and milk products in Afghanistan. Also, the data obtained in this study showed that direct contact with animals (34.09%) is a key factor causing the high incidence of brucellosis in endemic areas such as Afghanistan, especially Herat Province.

5.1. Conclusions

In sum, it is evident from our study results that the main route of brucella transmission in Herat Province, Afghanistan is the consumption of contaminated dairy products, and the highest prevalence of brucellosis is among the young and middle-aged populations and housewives. On the basis of the findings presented in this paper, further work on the remaining issues is warranted.

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Footnotes

Authors' Contribution: Study concept and design: Farshid Abedi; Acquisition of data: Frozan Salguqie; Analysis and interpretation of data and drafting the manuscript: Effat Alemzadeh.

Conflict of Interests: There is no conflict of interest.

Data Reproducibility: The data presented in this study are openly available in one of the repositories or will be available on request from the corresponding author by this journal representative at any time during submission or after publication. Otherwise, all consequences of possible withdrawal or future retraction will be with the corresponding author.

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