

## Epidemiology of brucellosis in Shahr-e-Kord from 2010 to 2014

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### Abstract

#### Introduction:

Zoonosis, common diseases between humans and animals, is still one of the most important health problems. Brucellosis is a zoonosis with special health, economic and social importance.

#### Materials and Methods:

This cross-sectional prospective study was conducted on data recorded from 2010 to 2014 in health centers and laboratories of Shahr-e-kord city.

#### Results:

A total of 267 cases of brucellosis were registered from 2010 to 2014, with 27.3% female and 72.7% male, and a mean age of  $33.68 \pm 17.46$  years. The most common jobs of the participants with brucellosis were livestock and agriculture (38.8%) and housekeeping (21.1%). The most frequent clinical symptom was fever (73%), and the most frequent risk factor was a history of contact with animals (75.5%). The overall prevalence was 14.67 per 100000 during the years 2010-2014.

#### Conclusion:

Considering the high prevalence of brucellosis in Shahr-e-kord, especially in rural areas and the high frequency of consuming non-pasteurized dairy products, it is important to train people about consumption of pasteurized dairy products.

**Keywords:** Epidemiology, Brucellosis, Prevalence

### Introduction

Zoonotic diseases are still one of the most important health problems (1) with significant health, economic and social consequences (2).

Brucellosis is transmitted from infected animals to humans, mainly by unpasteurized milk and dairy products. It can also be transmitted to humans through the contact of injured skin with animal blood or secretions (3).

The incubation period of brucellosis lasts 1-3 weeks with influenza-like symptoms such

as fever, sweats, headaches, backache and inertia (4).

The World Health Organization estimates that half a million people are annually infected with brucellosis, about 45,000 of whom are in the Eastern Mediterranean region, where Iran is located. However, according to WHO, only one out of five cases are diagnosed (5). The prevalence of brucellosis is endemic in Iran and it is more prevalent in rural areas than urban areas (3). According to the Ministry of Health and Medical Education, the prevalence of

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brucellosis in Iran is about 16 per 100,000 people and Chaharmahal-Bakhtiari Province has a moderate prevalence of 11 to 20 per 100,000 people (6).

Considering the fact that, in addition to causing disease in humans, brucellosis has lots of complications such as abortion and reduced milk production in animals, and heavy economic losses, the present study aimed to investigate the epidemiology of brucellosis in Shahr-e-Kord, the capital of Chaharmahal-Bakhtiari Province, with a moderate prevalence. It is hoped that the results would help improve the state of the disease.

### Materials and Methods

This retrospective cross-sectional study utilized the data recorded from 2010 to 2014 in health centers and laboratories of Shahr-e-Kord. The diagnostic criteria were clinical signs and laboratory diagnostic tests including Wright and 2ME tests, recorded in patients' information forms sent to the county's health network for final conclusion after the final confirmation. The forms contained information such as age, gender, occupation, history of unpasteurized dairy consumption, season, clinical signs, laboratory tests and recorded complications. The SPSS software version 16 and descriptive statistics were used for data analysis.

### Results

A review of the data on 267 cases recorded from 2010 to 2014 showed that 27.3% of patients were female and the rest were male

with a mean age of  $33.68 \pm 17.46$  years. Categorizing patients in 10-year age groups revealed that the highest frequency was in the second and third decades of life (totally 31.5%) (Table 1).

Employment status review of the subjects based on their place of residence indicated that jobs related to animal husbandry and agriculture (38.8%) were the most associated jobs with the disease both in urban and rural areas, followed by housekeeping (21.1%) (Table 2).

Clinical signs of brucellosis, in decreasing order, included fever (73%), anorexia (46%), myalgia (45.3%) and low back pain (34.4%). An examination of the risk factors indicated that history of contact with animals (75.5%), consumption of unpasteurized milk (40.1%), consumption of unpasteurized cheese (31.8%) and non-vaccinated animals (29%) were the most frequent (Table 3).

Finally, examination of the prevalence of the disease from 2010 to 2014 by place of residence and the incidence season showed that the prevalence of brucellosis was far more in the rural areas (44.25 per 100,000 people) than in the urban areas (8.06 cases per 100,000 people). Seasonal patterns of brucellosis showed that it was generally more prevalent in spring (4.75 per 100,000 people) and summer (4.94 per 100,000 people). The year 2011 had the highest record (19 per 100,000 people) in the studied years, which was more than the overall prevalence of 14.67 per 100,000 people from 2010 to 2014 (Table 4).

Table 1: Frequency of brucellosis by age and gender from 2010 to 2014

Age groups	Gender		Total
	Female	Male	
0-9 year-old	7(9.60)	35(18.00)	42(15.7)
10-19 year-old	17(23.30)	71(36.6)	88(33.00)
20-29 year-old	11(15.10)	34(17.5)	45(16.90)
30-39 year-old	19(26.70)	20(10.3)	39(14.60)
40-59 year-old	12(16.40)	19(9.80)	31(11.60)
over 60-year-old	7(9.60)	15(7.70)	22(8.20)
Total	73(27.30)	194(72.70)	267(100.00)

Table 2: Frequency of brucellosis by employment status and place of residence from 2010 to 2014

Employment status	Place of residence		Total
	Urban	Rural	
Housewife	31(25.8)	25(17.1)	56(21.1)
Dairy farmer and farmer	27(22.5)	76(52.1)	103(38.8)
Student	20(16.7)	12(8.2)	32(12.00)
Employee	5(4.2)	1(0.7)	6(2.3)
Self-employed	16(13.3)	21(14.4)	37(13.9)
Other	21(17.5)	11(7.5)	32(12.00)
Total	120(100.00)	146(100.00)	266(100.00)

Table 3: Frequency of risk factors and clinical signs of brucellosis from 2010 to 2014

Clinical signs	Frequency (percent)	Possible risk factors	Frequency (percent)
Fever	195(73.00)	Unpasteurized milk consumption	195(73.00)
Myalgia	121(45.3)	Unpasteurized cheese consumption	121(45.3)
Backache	92(34.4)	Unpasteurized cream consumption	92(34.4)
Anorexia	123(46.00)	Colostrum consumption	123(46.00)
Weight Loss	79(29.5)	Animal contact history	79(29.5)
Lethargy	18(6.7)	Family history of brucellosis	18(6.7)
Splenomegaly and hepatomegaly	14(5.2)	Non-vaccinated animals	14(5.2)

\* Some patients had multiple clinical signs and risk factors.

Table 4: Prevalence of brucellosis by place of residence and incidence season from 2010 to 2014

Year	Population at risk		Prevalence (100,000 people)		Prevalence (100,000 people)				Total prevalence (100,000 people)
	Urban	Rural	Urban	Rural	Spring	Summer	Fall	Winter	
2010	283009	67690	6.3	38.4	1.71	4.56	4.84	1.42	12.5
1390	289015	67628	11.41	51.75	6.44	5.04	3.64	3.92	19.00
1391	296140	67192	6.41	46.1	6.33	4.12	1.37	1.92	14.00
1392	301365	66561	8.62	39.06	3.26	6.52	2.44	1.63	13.8
1393	318212	63120	7.54	47.52	5.76	4.45	2.36	1.57	14.16
Total	1487741	332191	8.06	44.25	4.75	4.94	2.91	2.08	14.67

## Discussion

The results showed that men were diagnosed with brucellosis more than women. This finding is consistent with the results of Farahani et al., 2011 (3), Hamzavi et al., 2014 (7), and Dehnavi et al., 2014 (8). A similar study by Donev et al. (2010) showed that 66.2% of all studied cases were male (9). Although a study conducted in Isfahan by Zeinalian et al. (2012) suggested that brucellosis was more prevalent among females (10), it seems that it is more common in males altogether. The high prevalence of brucellosis among men could be due to the fact that they are more involved in jobs associated with animal husbandry and animal contact.

The patients' mean age in this study was about 33 years, similar to a study by Mohammadian et al. (2014) (11). Similarly, Moradi et al. (12) and Soleymani et al. (13) reported the mean age as 30 years. According to the results, brucellosis was more prevalent in the active age group due to their involvement in animal husbandry. Age-related data analysis revealed that the disease was most frequent in the second and third decades of life, which is in line with the results of Farahani (3) and Hamzavi et al. (7).

The examination of the employment status of patients showed that the majority of patients were livestock breeders, farmers or

housewives. The results of other studies in this field also suggest that most patients were engaged in animal husbandry and agriculture. For example, a study by Mousavi et al. (2013) showed that the highest prevalence of brucellosis was related to animal husbandry, agriculture and housekeeping (14). A similar study by Earhart et al. (2009) showed that most of the patients' jobs were related to animal husbandry (15). Some studies, including the study by Dehnavi et al., 2014 (8) and Ebrahimpour et al., 2012 (16) showed that brucellosis was mostly prevalent among housewives. It seems that occupation, as a risk factor, is totally associated with the state of contact with animals and animal husbandry. In other words, housewives who are responsible for most of the activities related to animal husbandry in rural communities are more susceptible to zoonotic diseases such as brucellosis.

Evaluation of risk factors showed that contact with animals and consumption of unpasteurized dairy products, especially milk and cheese, were the most frequent risk factors. A study by Mousavi et al. (2013) showed that more than 85% of patients had a history of consumption of unpasteurized milk and 90% of patients reported a history of contact with the viscera of animals (14). A study by Shoraka et al. (2010) also indicated that animal contact and unpasteurized milk and cheese consumption were the most frequent risk factors among patients (17). A study by Ebrahimpour et al. (2012) also showed that consumption of unpasteurized milk and cheese was the most frequent risk factor (16).

It seems that despite confirming the relationship between the consumption of unpasteurized dairy and brucellosis, unfortunately, unpasteurized dairy consumption is still a risk factor for the spread of the disease, although contact with infected animal organs as an important risk factor should not be ignored.

Fever, anorexia, and myalgia were the most prevalent symptoms among the patients in

the present study. Dehnavi et al. (2014) stated that 81% of patients reported pain in the joints, bones, and muscles (8). A study by Shoraka et al. (2010) also indicated that fever, general body pain and arthralgia were the most frequent symptoms among patients (17). Haddadi et al. (2006) reported sweats, fever, lethargy, fatigue and arthralgia as the most common symptoms among patients, which is also in line with the results of the present study (18). General symptoms such as fever, joint and muscle pain, and fatigue were the most common clinical symptoms. Thus, it is suggested that if such symptoms exist, laboratory tests, including Wright and 2ME be used to confirm the diagnosis.

Finally, determining the prevalence rate of brucellosis based on place of residence and season showed that it was mostly prevalent in rural areas, and spring and summer. A study by Esmaeilinasab et al. (2007) on patients, 90% of whom were from rural areas, showed that brucellosis had a higher prevalence in May, June, and July. The overall prevalence of brucellosis in Kordestan Province was 73 per 100,000 people (1). Hamzavi et al. (2011) in Kermanshah also concluded that overall prevalence of brucellosis was about 40 per 100,000 people. Brucellosis is more prevalent in the early months of the year and in the rural areas (7). Another study by Soleymani indicated that the prevalence of brucellosis in East Azerbaijan Province was about 45 per 100,000 people in 2009, the highest prevalence of which was related to May and June (13). A study by Mohammadian et al. (2014) in Tiran and Karvan reported the prevalence of brucellosis in urban areas was about 5 per 100,000 people and in rural areas about 53 per 100,000 people. In addition, spring had the highest prevalence with about 26 per 100,000 people (11).

All results reflect the fact that although several countries are reportedly free of brucellosis (19), despite considerable progress in controlling this disease in Iran, it is still a public health problem,

particularly in western and the Zagros mountains areas including Chaharmahal-Bakhtiari Province.

The present study indicated that the prevalence of brucellosis in rural areas of Shahr-e-Kord was higher than in urban areas and even higher than the national average. This reflects the need for special attention to this matter in this county, especially in rural areas.

It appears that the close relationship of the people in these areas with livestock and animal husbandry and their eating habits including the use of local dairy products as an integral part of the food basket of this region continue to be the major causes of the high prevalence of brucellosis. The results indicated that brucellosis was more prevalent in rural areas than in urban areas due to more use of local dairy and jobs related to animal husbandry. Moreover, contact with the viscera of animals at calving seasons and consumption of colostrum can be a reason for the prevalence of brucellosis in spring and summer.

## Conclusion

Given the high prevalence of brucellosis in Shahr-e-Kord and especially in rural areas, as well as the high frequency of unpasteurized dairy consumption, it is essential to educate the residents of these areas to use pasteurized dairy products. Furthermore, it is necessary to reduce the prevalence of brucellosis through the cooperation between the health network and the veterinary network of the county and encouraging dairy farmers to vaccinate their livestock.

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## Conflict of interest

The Authors declare that there is no conflict of interest regarding the authorship or publication of this paper.

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