



Epidemiological Study of the Brucellosis in Iran, Isfahan, 2010–2015

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Abstract

Background and aims: Brucellosis is one of the most common infectious diseases in both humans and animals. It has been controlled in developed countries; however, it is still regarded as a public health problem in developing countries including Iran. The aim of this study was to investigate the epidemiology of human brucellosis in Isfahan province.

Methods: The present study is a cross-sectional descriptive study investigating the epidemiology of human brucellosis in Isfahan province from 2010 to 2015. Sampling was done using Isfahan's disease registry database. Chi-square and *t* test were used for analyzing the data, and all data analyses were performed using SPSS software version 21.0.

Results: A total of 3,245 patients were included in this study, and their mean (SD) age was 35.29 (18.00) years. The age group of 15-25 years with a frequency of 23.80% had the highest frequency of the disease. The annual incidence of the disease from 2010 to 2014 shows an increasing trend, reaching from 6.25 to 15 per 100,000 people. It was reduced in 2015 and reached 12.25 per 100,000. In addition, the highest incidence was observed in July.

Conclusion: This study implies that the trend of human brucellosis has been increasing over the years, so it is recommended that people be educated on how to prevent it in humans and animals. The results of this study can help health administrators in the province to more effectively control the disease at the provincial level by identifying high-risk cities and focusing on health care in these areas.

Keywords: Brucellosis, Isfahan province, Epidemiology

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Introduction

Brucellosis is the most common infectious disease of humans and animals around the world. More than 500,000 new cases occur annually in the world, with a heterogeneous distribution. Human brucellosis is closely related to domestic animals and is directly and indirectly transmitted from infected animals or their products to humans. The annual incidence rates range from 0.3 cases per million in the United Kingdom and in most parts of the United States to above 1 case per 1000 persons in endemic areas, where the disease represents an increasing health burden.^{1,2}

The development of the livestock industry and urbanization and lack of healthy food products made from animals have caused the brucellosis to continue to be a risk factor for public health.³ Although the disease has been controlled in most developed countries, it is endemic in most parts of the world, including Latin America, Spain, parts of Africa, West Asia, and Mediterranean countries including Turkey, Iran, and Saudi Arabia.⁴ Although the

disease is relatively rare in the United States and 100 cases of the disease are reported annually, the Middle East has a high prevalence.⁵

The disease mostly affects people who are dealing with animals that are infected through contact with animals or consumption of animal products. In some cases, the disease is transmitted by inhalation of contaminated air of animal stalls, in the form of an occupational disease in farmers, slaughterhouse workers, and veterinarians.⁶

Brucellosis in animals causes adverse effects on sexual system, leading to miscarriage, low birth weight, and poor health in infants, leading to high mortality.⁷ On the one hand, Brucellosis causes abortions, decreased milk production, sterility and infertility in cattle, leading to economic losses to the livestock industry. On the other hand, it creates economic problems in the diagnosis and treatment of disease, disability and physical as well as mental problems in patients.^{8,9}

Dairy products, weather conditions, and environmental health and socio-economic conditions are the main

causes of infection and transmission of brucellosis. The most common way of transmission is human contact with infected animals.¹⁰ During the first half of the year (spring and summer), the outbreak of brucellosis is higher. This is due to the direct contact between farmers and aborted fetuses as well as consumption of contaminated dairy products. However, there is a downward trend in the second half of year.¹¹ Dairy products, occupational exposure (through wounds and scratches of the skin and conjunctiva of the eye), inhalation of infectious aerosol, blood transfusion, tissue transplantation, and the consumption of contaminated food are the main sources of human infection.³

Due to the lack of precision in diagnosis and inadequate reporting systems, the actual global incidence of brucellosis is unknown, even in developed countries, and the actual incidence may be 10-20 times higher than the numbers reported.¹² Brucellosis also causes economic losses of livestock, especially in endemic regions in the country.¹³

In Iran, according to the directorate of communicable diseases, approximately 50 000 new cases have been reported.¹⁴ Iran had a high prevalence of brucellosis in 1989 and the disease had an upward trend until 2004, with a decline afterwards.¹⁵ Given the prevalence of this disease in the country and the economic costs and complications, reviewing various aspects of the disease especially its epidemiology in different areas of the country is of great importance.³

This study was to determine the prevalence of brucellosis in the cities of Isfahan and distribution of demographic characteristics of these patients.

Materials and Methods

Design and Participants

Recruitment for this cross-sectional study occurred from 2010 to 2015. A total of 3245 brucellosis patients were recruited from Isfahan province using the disease registry database. In this registry database, all human brucellosis patients from Isfahan province were identified with the approval of physicians and health experts working in health centers.

Assessments

In the current surveillance system to detect brucellosis after clinical suspected diagnosis, the necessary tests are done for the detection of the disease in a person. The definite diagnostic criteria were Wright and Coombs test greater than 1/80 and 2ME test $\geq 1/40$.¹⁶

Statistical Analysis

Continuous variables are expressed as mean \pm standard deviation, and categorical variables are presented as numbers and percentages. Chi-square test and *t* test were used for the analysis of the data, and a *P* value less than 0.5 was regarded as statistically significant. All data analyses were performed using SPSS software version 21.0 (IBM

Corp, Armonk, NY).

Results

A total of 3245 human brucellosis patients were interviewed for this study. The mean age \pm standard deviation (SD) of participants was 35.29 ± 18 (range 1-92) years. The socio-demographic characteristics and number of participants involved in this study are shown in Table 1.

There was a statistically significant association ($P < 0.01$) between gender and exposure to contaminated milk and infected animals (Table 2).

There was a statistically significant association ($P < 0.05$) between age and exposure to infected animals; moreover, the results showed that there was no statistically significant association ($P > 0.05$) between the age and exposure to contaminated milk (Table 3).

According to the results, the annual incidences of brucellosis for years 2010, 2011, 2012, 2013, 2014, and 2015 were 6.50, 6.25, 11.40, 13.90, 15.00, and 12.25 per 100 000 people, respectively. From 2011 to 2014, the incidence of the disease has increased and reached from 6.25 to 15 per 100 000 people, but it decreased to 12.25 per 100 000 people in 2015. Additionally, the highest incidence of the disease belonged to the year 2014 with 755 cases (Figure 1).

On the basis of monthly incidence, the highest frequency of the disease was reported in June, with 506 (15.59%) cases and the lowest in November with 140 (4.31%) cases (Figure 2).

Discussion

Based on a previous study, Isfahan province has a moderate prevalence of brucellosis (about 15 000 people).¹⁷ The present study is a cross-sectional descriptive study

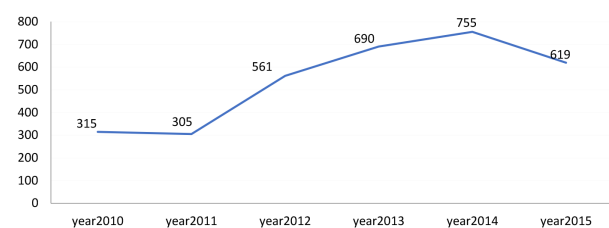


Figure 1. The Distribution Brucellosis in Isfahan Province From 2010 to 2015 by Year.

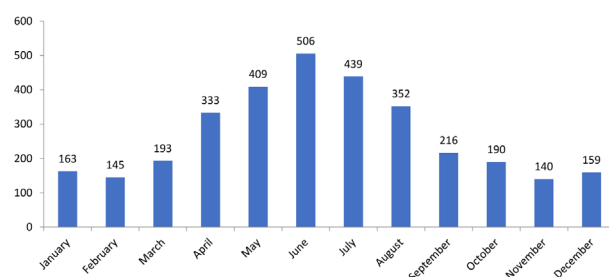


Figure 2. The Distribution of Brucellosis in Isfahan Province From 2010 to 2015 by Month.

Table 1. Demographic Characteristics of Study Population in Isfahan Province from 2010 to 2015

Variable	No. (%)
Age group (y)	
< 5	73 (2.20)
5-15	281 (8.70)
15-25	773 (23.80)
25-35	741 (22.80)
35-45 years	472 (14.5)
45-55	397 (12.2)
55-65	292 (9.00)
> 65	216 (6.70)
Gender	
Male	2231 (68.80)
Female	1014 (31.20)
Residence	
Urban	1345 (41.40)
Rural	1868 (57.60)
Nomads	32 (1.00)
Total	3245 (100.00)
Occupation	
Housewife	742 (22.90)
Animal husbandry	562 (17.30)
Animal husbandry and farmer	498 (15.30)
Student	376 (11.60)
Farmer	163 (5.00)
Other	904 (27.90)
Nationality	
Iranian	3205 (98.80)
Non-Iranian	40 (1.20)
Exposure to animals	
Yes	2550 (78.60)
No	677 (20.60)
Unknown	18 (.050)
Consuming milk product	
Yes	2199 (67.00)
No	962 (29.60)
Unknown	84 (2.60)
Type of milk product	
Milk	556 (30.30)
Cheese	208 (11.40)
Milk-cheese	294 (16.00)
Others	2034 (33.10)
Unknown	153 (8.40)
History of morbidity in family members	
Yes	762 (22.40)
No	2295 (70.70)
Unknown	224 (6.90)
Type of brucellosis cases	
New case	2990 (91.00)

Recurrent case	178 (5.40)
Unknown	77 (2.30)
History of animal immunization	
Yes	1952 (59.40)
No	835 (25.40)
Unknown	457 (13.90)

investigating the epidemiology of human brucellosis in Isfahan province from 2010 to 2015. The descriptive results of this study showed that the mean age of the patients was 35.29 years, which is consistent with studies conducted by Zemestani et al,¹⁸ Mohammedan,¹⁹ Sahargahi et al,²⁰ and Esmaeilnasab et al.²¹

More than 45% of brucellosis patients belonged to two age groups of 15-25 and 25-35 years. Considering that these age groups are involved in labor force and production, the risk of brucellosis is regarded as large financial loss to the community. More than 45.00% of patients were in two age groups of 15-25 and 25-35 years, and since this age group consisted of labor force and production, the risk of brucellosis brought large financial losses to the community. The studies conducted by Esmaeilnasab et al,²¹ Sahargahi et al,²⁰ and Mohammedan¹⁹ showed that brucellosis was mostly seen in second and third decades of life.

The prevalence of brucellosis was higher in males (68.80%) as compared to females (31.20%). Similar results were also recorded in Andimeshk,²³ Pakistan,²⁴ and Uganda.²⁵ In the present study, most of the brucellosis cases were residents of rural areas in the region, which is in agreement with previous studies.²³ Because the prevailing job of the people living in rural areas is animal husbandry, this group of people have frequent contacts with livestock.

The present study reported that 67% of the patients had consumed milk products, in such a way that milk was the most frequent (30.30%) and cheese ranked the second (11.40%). In various studies, the consumption of unsanitary milk and unhealthy cheese was shown to be an effective factor in brucellosis. This finding is consistent with the study conducted by Kashefi et al in Andimeshk²³ and other studies.^{26,27}

The highest prevalence of brucellosis was found in housewives (22.90%), people working in animal husbandry (17.30%), and farmers (15.30 %) as compared to others, which is in agreement with the results of other studies.^{26,28}

In this study, it was reported that 78.60% of patients had exposure to animals. This finding is consistent with that of previous studies.²³

The results of this study showed that there was a significant relationship between the patients' gender and infected animals as well as exposure to contaminated milk; this finding was consistent with the results of the study conducted by Kashefi et al²³ and other studies.^{5,11}

The results of this study showed that there was a significant relationship between the mean age and exposure to infected animals; this finding was consistent

Table 2. Difference Between Gender and Exposure to Contaminated Milk and Infected Animal

	Gender		P Value
	Male	Female	
Exposure to contaminated milk, No. (%)			<0.01
Yes	1469 (65.80)	730 (72.00)	
No	709 (31.80)	253 (25.00)	
Exposure to infected animals, No. (%)			<0.01
Yes	1866 (83.60)	684 (67.5)	
No	365 (16.4)	330 (32.5)	

Table 3. Difference Between Age and Exposure to Contaminated Milk and Infected Animal

	Age (y)		P Value
	Mean	SD	
Exposure to contaminated milk			0.46
Yes	35.63	17.06	
No	35.14	18.34	

with the results of the study conducted by Kashefi et al.²³

This study showed that outbreaks are more common in spring and summer (from May to September). This is consistent with the results of other studies, including Mohammedan,¹⁹ Zemestani et al¹⁸, Soleimani et al²², and Maleki et al.²⁹ Moreover, since 2011 the number of infected people showed a strong upward trend and increased from 305 in 2011 to 755 people in 2014.

Based on the results of this study, 1526 (57/6%) of the patients were from rural areas, 742 were housewives, and 562 worked in animal husbandry. This result confirms the findings of other studies.^{19,21}

Conclusion

Brucellosis is an infectious disease that can be seen in an increasing number of people every year. Considering its incidence in recent years, it should be noted that preventive measures should be taken more effectively in cooperation with the related organizations including the Ministry of Health, Veterinary, and Agriculture. It is recommended that people be educated on preventive behaviors such as avoiding the consumption of unpasteurized milk products by educational and administrative departments. Moreover, livestock vaccination should be a priority.

Limitations

Because data from this study were collected from previous years, we did not have access to some patients' information such as history of contact with animals, consumption of contaminated dairy products, and so on.

Conflict of Interest Disclosures

None.

Ethical Approval

The study protocol was approved by the Ethics Committee of

Isfahan University of Medical Sciences (Code of Ethics: IR.MUI.RESEARCH.REC.1400.180).

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