

Epidemiological Study of the Brucellosis in Iran, Andimeshk, 2001-2016

Seyyed Mansour Kashfi¹,
Nahid Hatamian², Tayebeh
Rakhshani³

¹Research Center for Health Sciences, Institute of Health, Department of Public Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran;

²MSC of Societal Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran;

³Research Center for Health Science, Institute of Health, Department of Public Health, School of Health, Shiraz University of Medical Science, Shiraz, Iran

Correspondence:

Tayebeh Rakhshani,
Nutrition research center, School of Health, Department of Public Health, School of Health Shiraz University of Medical Sciences, Shiraz, Iran

Tel: +98 71 37251001

Email: healthacademic2014@gmail.com

Received: 20 October 2017

Revised: 8 November 2017

Accepted: 19 December 2017

Abstract

Background: Despite the provision of health care in Iran, brucellosis is still an endemic disease, so this study was carried out to determine the epidemiology of brucellosis in Andimeshk city during 2001-2016.

Methods: This cross-sectional study was conducted on patients with brucellosis, which were reported by governmental and non-governmental departments and received relevant diagnostic and laboratory information after receiving reports from patients. The obtained information was entered in the survey form. Sampling was done by census. SPSS version 20 was applied for analysis of data using descriptive statistics as well as the chi-square and independent t-test; a significant level of 0.05 was considered.

Results: In the study period, there were 713 patients with brucellosis in Andimeshk. There were 390 males and 324 females with a male to female ratio of 1.02:1. The age of the patients ranged from 1 to 74 years with a mean of 31.19±17.03 years. The annual incidence rate per 100,000 persons was 24.42. There was a statistically significant association ($P<0.05$) between sex and exposure to infected milk and cattle. Also, the results showed that there was no statistically significant association ($P>0.05$) between the infected milk and job, year, season and month.

Conclusion: In conclusion, the findings of this study showed that the incidence of brucellosis was higher among males, young people, and dairy farmers. Therefore, continuous surveillance and efforts are required to further decrease the cases of brucellosis.

Please cite this article as: Kashfi SM, Hatamian N, Rakhshani T. Epidemiological Study of the Brucellosis in Iran, Andimeshk, 2001-2016. *J Health Sci Surveillance Sys.* 2018;6(1):23-28.

Keywords: Brucellosis, Andimeshk –city, Epidemiology

Introduction

Brucellosis is a zoonotic disease which is transmitted to humans through infected animals and their products.^{1,2} According to the World Health Organization, about 500 human cases of brucellosis are reported annually, and it is even about 4 to 10 percent in developed countries.³⁻⁶ In Iran, despite having a health care system, brucellosis is still an endemic disease, and this country is ranked the fourth in terms of the incidence of brucellosis (5.7) which is about 132 in one hundred thousand.⁷ The prevalence rate of brucellosis is not the same in different parts of Iran. According to the results of the conducted research on the mean annual cases of the disease, the country can be divided into provinces with very severe infection

(151-180 per 100000 people) such as Chaharmahal Bakhtiari; those with severe infection (121-150 per 100000 people) such as Lorestan and Hamadan; the provinces with high infection (91-120 per 100000) such as Kermanshah, Markazi and Gilan; those with moderate infection (61-90 per 100000) such as East Azerbaijan, Zanjan and Ilam; those with low infection (31-60 per 100000) such as Khorasan, Fars, Mazandaran, West Azarbaijan, Kurdistan, Ardabil, Qazvin and Semnan; and the provinces with very low infection (0-30 per 100000) such as Sistan and Baluchestan, Kerman, Khuzestan, Yazd, Isfahan and Qom.⁸ The reasons why brucellosis is a major disease are not only reduced fertility and increased abortion among dairy cattle, but also a dramatic decline in the nations' economic

status,⁹ so that it is considered an important economic and public health issue in many parts of the world.¹⁰ ¹¹ This disease can be prevented by avoiding contacts with infected animals or consumption of contaminated animal products, and, if possible, by the prevention of animal diseases.^{12, 13} Information about the prevalence of brucellosis in animals and, if feasible, in the human population, must be obtained before any control of the implementation of programs. This initial examination depends on the availability of personnel, transportation, diagnostic facilities, and willingness to cooperate.¹⁴⁻¹⁶ Andimeshk is a city located in the southwest of Iran in the north of Khuzestan province and near the slopes of Zagros mountain with an area of 3116 km². In this city, it is hot and humid in summer and cold and dry in winter. According to the census of 2015, the population of Andimeshk was over 194,000, and the surveys showed that more than 80% of the inbound traffic in the province is through this city. The nomads migrate to the province through Andimeshk. Non-pasteurized dairy products are also sold and consumed in the city. Given that brucellosis is an indigenous disease in Andimeshk and some new cases of the disease are found there every year, we decided to identify the most important epidemiological factors such as age, sex, season, job, etc. Therefore, the present study was conducted with the aim of evaluating the epidemiology of brucellosis in Andimeshk during 2001-2016.

Materials and Methods

Population, Sample Size, and Sampling Method

This is a cross-sectional study on the epidemiology of brucellosis in health care, health house and Ashayers mobile health centers in Andimeshk due to brucellosis during 2001-2016. Samples were collected using the census technique.

The inclusion criteria were suspected clinical symptoms, wright titer ≤ 1.80 , and positive Coomb's wright titer or ME ≤ 1.40 .

Diagnosis of Brucellosis

The diagnosis of brucellosis was based on the presence of clinical signs and symptoms of fever, sweating, fatigue and other symptoms as well as a positive reaction to a serologic test used for the diagnosis of brucellosis (standard agglutination test, enzyme linked immunosorbent assay (ELISA)) according to the World Health Organization (WHO) and CDC definitions, as well as a positive blood culture for *Brucella* spp. A standard Wright titer of ≤ 1.80 and positive Coomb's wright titer or ME ≤ 1.40 were used.

Data Collection Tool

A pre-designed questionnaire was distributed

among all the participants to collect information about socio-demographic characteristics (sex, age, job, month, year) and hypothesized factors (exposure to animals, milking, slaughtering, consuming milk products, and consuming raw milk) to detect their influence on the spread and persistence of brucellosis.

Statistical Analysis

The data were analyzed through SPSS, version 20, using descriptive statistics and chi-square and independent t-test. The significance level was considered 0.05 in all tests. To determine the incidence rates of brucellosis in the years under the study, the population of Andimeshk in the beginning of the year (according to Andimeshk Health Statistics Center Report) was considered as the denominator and the number of people suffering from the disease in the same year was considered.

Ethical Considerations

The present study was approved by the Ethics Committee of Shiraz University of Medical Sciences with the code of IR.SUMS.REC. 95-1-4-11885.

Results

A total of 713 patients participated in the present study with a mean age of 31.19 ± 17.03 years, ranging from 1 to 74 years old. The socio-demographic characteristics and number of participants involved in this study are shown in Table 1.

According to the results shown in the table, the overall incidence rate in the 15 years of study was 24.42 in one hundred thousand. The highest incidence rate was found in 2008 with a frequency of 42.49 per 100,000 people, and the lowest one was observed in 2006 with an incidence rate of 6.77 per 100,000. Diagram 1 shows the incidence rate of brucellosis during the years 2001-2016 (Figure 1).

The results of independent T-test showed that there was a significant relationship between the mean age of the patients and exposure to contaminated milk ($P=0.05$). The results also showed that there was a significant relationship between age and exposure to infected animals ($P=0.02$) (Table 2).

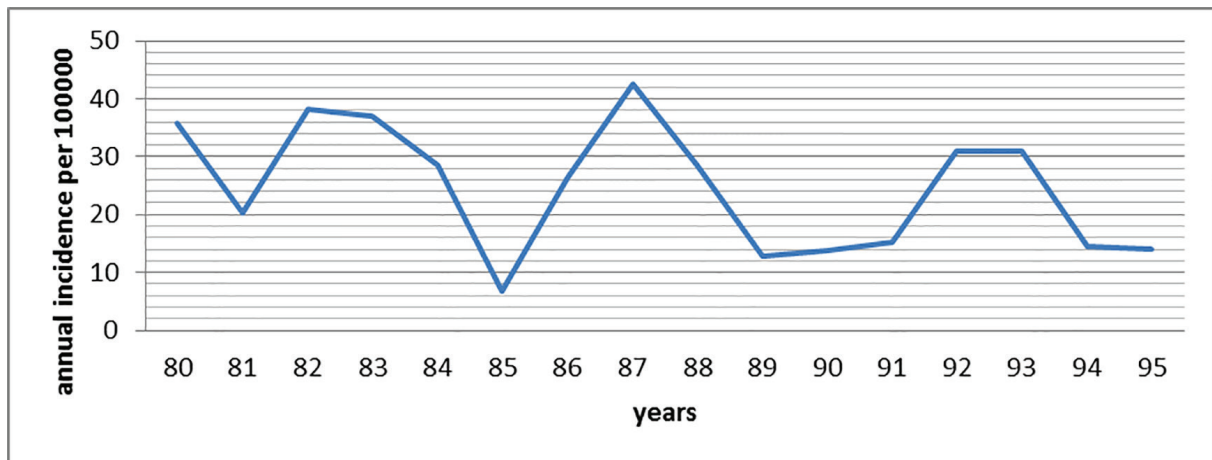
There was a statistically significant association ($P<0.05$) between sex and exposure to infected milk and infected animals; also, the results showed that there was no statistically significant association ($P>0.05$) between the infected milk and job, year, season and month.

Discussion

The present study aimed at evaluating the epidemiology

Table 1: Demographic characteristics of the participants

Variable	Category of variable	Frequency (%)
Age	Age group under 15 years	114(16)
	Age group 15-25 years	168(23.5)
	Age group 25-35 years	149(20.9)
	Age group 35-45 years	114(16)
	Age group 45-55 years	91(12.7)
	Age group over 55 years	77(10.8)
Gender	Male	390(54.6)
	Female	324(45.4)
Job	Rancher	259(36.3)
	Housewife	234(32.8)
	Farmer	8(1.1)
	Student	121(17)
	Employee	3(0.4)
	Other (child/ soldier/ self-employed/ worker)	67(12.4)
Infected population	Urban population	69(9.7)
	Population covered by health house(rural population)	501(70.2)
	Population covered by mobile teams (nomadic population)	144(20.1)
Exposed to infected animals	Exposed	580(81.3)
	No exposure	133(18.6)
Exposed to contaminated milk	Exposed	572(80.2)
	No exposure	141(19.7)
Kind of Exposed	Cheese	121(16.9)
	Ice cream	12(1.7)
	Cream	9(1.3)
	Ice cream and cheese	3(0.4)
	Cream and cheese	1(0.1)

**Figure 1:** Crude incidence rate of brucellosis during 2001-2016**Table 2:** Difference between age and exposure to contaminated milk and infected animals

Age	Exposure	Mean	Standard deviation	P value
Exposure to contaminated milk	Exposed	28.7	16.1	0.05
	Non-exposed	31.8	17.1	
Exposure to infected animals	Exposed	31.8	17.3	0.02
	Non-exposed	28.5	15.1	

Independent t-test

of brucellosis in Andimeshk city during the years 2001-2016. The finding of this study showed that the incidence rate in the 15 years of the study was 24.42 per 100,000, and according to the classifications, the incidence rate was very low (0-30 in 100,000 people per year). The

highest incidence rate was in 2008 (42.49) and the lowest in 2006 (6.77). This finding is consistent with that of the study conducted by Farahani et al in Arak;¹⁷ in this study, the incidence rate was 60 per 100,000 during 2003-2012.¹⁸ Our finding is not in the same line with that

of the study conducted by Mohammadian et al.¹⁷ The reason for this inconsistency is probably the duration of the study.

In the present study, the crude incidence of brucellosis in the years under the study did not have a significant increasing or decreasing trend. It was mainly sinusoid and, in some years, it increased with a decrease in the following year. This finding is not consistent with the result of previous studies.^{8, 19, 20} Some studies were conducted in Saudi Arabia and Georgia on the incidence of brucellosis and it was shown that the disease had a decreasing trend in these countries.^{19, 20} Furthermore, a study by Mostafavi et al. in Iran with the aim of determining the incidence rate of brucellosis in this country showed that the disease had a decreasing trend,⁸ which is not consistent with the results of the present study. It should be noted that despite previous studies, in the present study the population consisted of three groups (urban, rural and Ashayer populations) and the incidence rate was calculated in the years under the study based on these three groups, so the sinusoid state of the disease may be justified.

The descriptive results of this study showed that the mean age of the patients was 31 years and most of the affected people were in the age groups of 15-25 years and 25-35 years, respectively. Most of them were male, and 36% of the patients were rancher; also, 81% of them had been exposed to infected animals, and the highest frequency belonged to the population covered by the health center. In other words, the rural population or the nomadic population was ranked second. This finding is consistent with that of previous studies.²¹⁻²³ In the study conducted by Ale Tofghi et al.,²¹ males had the highest incidence rates compared to women. In another study carried out by Zeinali and Shirzadi to investigate the 20-year brucellosis process, 79% of the patients were residents of villages.²² In the study conducted by Hassani et al.²³ in the north and northwest of Iran, the patients had a history of contact with livestock. Given that in our study the most brucellosis cases were residents of villages and the nomads in the region, and considering the fact that the prevailing job of the people in villages was animal husbandry, this group of people have a frequent contact with livestock, and this indicates the need to educate them about brucellosis in order to reduce their contact with livestock.

The results of the present study showed that 80% of the patients had reported milk consumption, and cheese consumption was ranked the second. In various studies, the use of unsanitary milk and unhealthy cheese were shown to be effective factors in brucellosis. This finding is consistent with the study conducted by Hadjichristodoulou et al. in Greece.²⁴ Given that the majority of the patients in our study

were rural dairy farmers, and they used milk and cheese as two of the most important food sources, contaminated milk or cheese would certainly increase their risk of infection.

The highest frequencies during the 15 years of the study were found in spring and summer; this finding is consistent with those of previous studies.²⁵⁻²⁹ In the study done by Hamzavi et al. in Kermanshah, the highest frequencies of the disease were observed in spring and summer.²⁵ In a systematic review by Musazadeh et al. with the aim of examining the seasonal pattern of brucellosis in Iran in 2015 through the study of all available domestic and foreign data, the incidence rates of brucellosis in different seasons in Iran were as follows: 34% in spring, 33% in summer, 16% in autumn, and 14% in winter;²⁹ this is in the same line with the present study. One of the reasons for the high prevalence of brucellosis in the spring and summer is the breeding of livestock in these seasons and, consequently, contact with aborted pregnancy remains.

The results of this study showed that there was a significant relationship between the mean age and exposure to contaminated milk and infected animals; this finding was consistent with the results of the study conducted by Shoraka et al.,² who reported a significant relationship between age and contact with livestock.²

In this study, there was no significant relationship between the patients' jobs and exposure to infected animals; this finding is inconsistent with that of the study conducted by Shoraka et al.² Shoraka et al. reported a significant relationship between the patients' jobs and contact with livestock.²

In the present study, there was a significant relationship between the patients' sex and exposure to contaminated milk and infected livestock, which is consistent with the result of previous studies.³⁰⁻³³ Adamu et al. reported a significant relationship between sex and contact with livestock,³⁰ this also is consistent with the results of the present study.

Strengths

Our research is one of the first studies on the epidemiology of the factors affecting brucellosis in Andimeshk city, and this can be considered the strength of this study. The second strength of this study was the long study period.

Limitations

Although the status of case reporting and timeliness of the surveillance system in public sectors providing medical services is clearly better than that of the private sectors,³⁴ patients referred to the private sector were not investigated.

Conclusion

Our study revealed that there was no significant change in the incidence of brucellosis during the years of study and the frequency of brucellosis was higher among men, young people and rural population. Educational programs should be held for the rural population about the disease and its associated risk factors. Consumption of unpasteurized milk and products should be highly discouraged and personal care should be taken for dealing with the animals.

Acknowledgment

This paper was extracted from Nahid Hatamian M.Sc. thesis. The thesis was approved and financially supported by the research vice chancellor of Shiraz University of Medical Sciences (proposal No. 95-1-4-11885). They are also grateful for the professors and officials of the school of health, colleagues and participants for their kind cooperation in this study.

Conflict of Interest: None declared.

References

- Kamal SH, Sadat Hashemi SM, Nasaji M, Moshiri E, Shahriyari R, Azizi A. Frequency of reported cases of Brucellosis to province health center from public and private sectors in Semnan 2006-2007. *Koomesh*. 2009;10(2):125-30.
- Shoraka H, Hossieni H, Sofizade A, Avaznia A, Rajabzade R, Hejazi A. Evaluate the epidemiology of brucellosis in the MANE and SOLEGHMAN city, North Khorasan between years 2009-2010. *Journal of North Khorasan University of Medical Science*;2011;2(3),65-72.
- Ali S, Akbar A, Shafee M, Tahira B, Muhammed A, Ullah N. Sero-epidemiological study of brucellosis in small ruminants and associated human beings in district Quetta, Balochistan. *Pure and Applied Biology (PAB)*. 2017;6(3):797-804.
- Lai S, Zhou H, Xiong W, Gilbert M, Huang Z, Yu J, Yin W, Wang L, Chen Q, Li Y, Mu D. Changing epidemiology of human brucellosis, China, 1955–2014. *Emerging infectious diseases*. 2017;23(2):184-194.
- Kanouté YB, Gragnon BG, Schindler C, Bonfoh B, Schelling E. Epidemiology of brucellosis, Q fever and Rift Valley fever at the human and livestock interface in northern Côte d'Ivoire. *Acta tropica*. 2017; 1(165):66-75.
- Mirnejad R, Jazi FM, Mostafaei S, Sedighi M. Epidemiology of brucellosis in Iran: A comprehensive systematic review and meta-analysis study. *Microbial pathogenesis*. 2017 ; 1(109):239-47.
- Ali S, Nawaz Z, Akhtar A, Aslam R, Zahoor MA, Ashraf M. Epidemiological Investigation of Human Brucellosis in Pakistan. *Jundishapur Journal of Microbiology*. 2018;11(7):2-5.
- Mostafavi A, Asmand M. The process of Brucellosis in Iran during 1370-1387. *Iranian Journal of Epidemiology*: 2013;8(1),94-101.
- Golshani M, Buozari S. A review of Brucellosis in Iran: Epidemiology, Risk Factors, Diagnosis, Control, and Prevention. *Iranian biomedical journal*. 2017; 21(6):349.
- Vahdat K, Jafari M, Hshemi M. Seroepidemiology brucellosis in livestock breeders the central rural area of Bushehr province 2004-2005. *South Medical Journal, Persian Gulf Health Research Center, Bushehr University of Medical Sciences and Health Services*; 2007;9(1):51-58.
- Mirnejad R, Jazi FM, Mostafaei S, Sedighi M. Epidemiology of brucellosis in Iran: A comprehensive systematic review and meta-analysis study. *Microbial pathogenesis*. 2017; 1(109):239-47.
- Heymann D, Association APH, Ref S, Systems TD. *Control of communicable diseases manual: American Public Health Association*; 2004.
- Ghasemi B, Mohammadian B, Sofi Majidpour M. An epidemiological study of human and animal disease brucellosis in Kurdistan province in between 1998-2002. *2005*;8(2):25-30.
- Najafi N, Davoudi A, Hassantabar SR, Haddadi R. Investigating the Epidemiologic, Laboratory, and Clinical Features of Brucellosis Patients Hospitalized in the North of Iran During 2009-2014. *Cough*. 2018;30:13-7.
- CDC. Case definitions for infectious conditions under public health surveillance. *MMWR* 2010;46 (RR10):7.
- Sofizade A, Ghorbani M, Selahi R, Mansourian M. The epidemiology of brucellosis in the city of stigma-province patients-years 2004-2008. *Scientific Journal of Nursing and of Midwifery, Golestan*;2009,5(2):8-15.
- Farahani Sh, Shahmohamadi S, Navidi I, Sofian S. An investigation of the epidemiology of brucellosis in Arak City, Iran, (2001-2010); *Arak Medical University Journal (AMUJ)*: 2012, 14(6, Suppl 3): 49-54.
- Mohammadian M, Salehiniya H, Kazaei S, Ramazanpour J, Mohammadian-Hafshejani A. Epidemiological Characteristics and Incidence Rate of Brucellosis in Isfahan Province, Iran, 2012 *J Isfahan Med Sch* 2015; 33(355): 1784-95.
- Al-Tawfiq JA, AbuKhamzin A. A 24-year study of the epidemiology of human brucellosis in a health-care system in Eastern Saudi Arabia. *Journal of Infection and Public Health*. 2009; 2(3): 81-5.
- T, Clark DV, Chubabria G, Zenaishvili O, Hepburn MJ. The changing pattern of human brucellosis: clinical manifestations, epidemiology, and treatment outcomes over three decades in Georgia. *BMC infectious diseases*. 2010; 10(1):346-357.
- Jaffar A. Al-Tawfiq, Abbas AbuKhamzin. A 24-year study of the epidemiology of human brucellosis in a health-care system in Eastern Saudi Arabia. *Journal of Infection and Public Health*. 2009; 2(2): 81–85.
- Zeinali M, Shirzadi MR. Effective ingredient in

- accretion and reduction of brucellosis incidence in human in Iran in 1985 - 2005. Proceedings of 15th veterinary congress. 2008; Iran.
- 23 .Hasani J, Khorshidi A, Salehiniya H, Khazaie S, Mohamadian M, Mohamadian Hafashjani A. Factors affecting the delay in the diagnosis of brucellosis in northern and northwestern Iran. *Journal of Infectious Diseases and Tropical Medicine, Infectious Disease Specialists Association*. 2015; 20 (70): 15-23.
- 24 Hadjichristodoulou C, Papatheodorou C, Soteriades E, Panagakos G, Kastritis I, Goutziana G, et al. Epidemiological study of brucellosis in eight Greek villages using a Computerised Mapping Programme. *Europ J Epidemiol* 1999;15(7):671-680.
- 25 Hamzavi Y, Khademi N, Ghazi zade M, Janbakhsh A. Epidemiology of brucellosis in Kermanshah province in year 2012. *Journal of Kermanshah University of Medical Sciences*.2014; 18(2):114-121.
- 26 Fallah Rostami F, Borzoueisileh S, Ebrahimpour S. An overview of brucellosis epidemic in Iran. *Crescent journal medical and biological sciences*. 2016;3(1):35-36.
- 27 Esmaeili H. Brucellosis in Islamic republic of Iran. *Journal of medical bacteriology*. 2014;3(3-4):47-57.
- 28 Rostami H, Mehrabi Tavana A, Tavakoli HR, Tutunchian M. Prevalence study of brucellosis in Iranian military forces during 2001-2009. *Journal of health policy and sustainable health*. 2015;2(2):191-194.
- 29 Moosazadeh M, Abedi Gh, Kheradmand M, Safiri S, Nikaeen R. Seasonal Pattern of Brucellosis in Iran: A Systematic Review and Meta-Analysis. *Iran J Health Sci* 2016; 4(1): 62-72.<http://jhs.mazums.ac.ir>
- 30 S. G. Adamu, N. N. Atsanda, A. O. Tijjani, A. M. Usur, A. G Sule, I. A. Gulani. Epidemiological study of bovine brucellosis in three senatorial zones of Bauchi State, Nigeria. *Veterinary World*, EISSN: 2231-0916. Available at www.veterinaryworld.org/Vol.9/January-2016/9.pdf/
- 31 Kassiri H, Amani H, Lotfi M. Epidemiological, laboratory, diagnostic and public health aspects of human brucellosis in Western Iran. *Asian Pacific journal of tropical biomedicine*. 2013;3(8):589-594.
- 32 Sofian M, Aghakhani A, Velayati AA, Banifazl M, Eslamifar A, Ramezani A. Risk factors for human brucellosis in Iran:a case-control study. *International journal of infectious diseases*. 2008;12(2):157-161.
- 33 Beheshti S, Rezaian GR, Azad F, Faghiri Z, Taheri F. Seroprevalence of brucellosis and risk factors related to high risk occupational groups in Kazeroon, South of Iran. *International journal of occupational environment medicine*. 2010;1(2):62-68.
- 34 Kazerooni PA, Fararouei M, Nejat M, Akbarpoor M, Sedaghat Z. Under-ascertainment, under-reporting and timeliness of Iranian communicable disease surveillance system for zoonotic diseases. *Public health*. 2018;154:130-5.