



Epidemiology of Brucellosis in Dehloran, Ilam Province, between 2015 and 2019, A cross Sectional, Epidemiologic Study

Gholamreza Kalvandi¹, Morteza Shams², Gholamali Nourmohammadi³, Saber Abbaszadeh^{4,5}, Parastoo Baharvand^{*6}, Afshin Hasanvand⁵, Nasser Abbasi³.

¹Department of Pediatrics Gastroenterology, Ilam University of Medical Sciences, Ilam, Iran

²Zoonotic Diseases Research Center, Ilam University of Medical Sciences, Ilam, Iran

³Biotechnology and Medicinal Plants Research Center, Ilam University of Medical Sciences, Ilam, Iran

⁴Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

⁵Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran

⁶Assistant Professor of Community Medicine School of Medicine, Department of Social Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran



CrossMark

Background & objective, Brucellosis is a zoonotic disease whose most common complications include intermittent fever, headache, fatigue, weight loss, night sweats, joint pain, osteomyelitis, spondylitis, peripheral arthritis, sacroiliitis, etc. In this study, the epidemiology of brucellosis in Dehloran, Iran between 2015 and 2019 was studied. **Methods**, This study was conducted from February 2015 to November 2018 in Dehloran, Ilam province, Iran. Patients with certain symptoms such as pain were selected and referred to the lab. The samples were collected and investigated by Wright test. **Results**, Brucellosis in Dehloran is an occupational disease with most cases occurring in livestock breeders followed by housewives. Most cases are due to the consumption of dairy products such as milk. **Conclusion**, In general, it can be argued that in spite of the high incidence of the disease in this region, adequate attention has not yet been paid to it. Due to the occupational nature of the disease in the region, vaccination, disease surveillance and slaughter of infected animals are also recommended. Livestock should also be purchased through the cooperatives of livestock breeders and transported to dairy factories so that contaminated milk will not be delivered to the public.

Keywords, Epidemiological studies, Incidence rate, Brucellosis, Dehloran, Iran

Introduction

Brucellosis is a zoonotic disease that is also called Malta fever, raging fever, and Mediterranean fever. Brucellosis is a bacterial infectious disease. Its etiologic agent is aerobic gram-negative coccobacilli of brucella species, whose species vary depending on the reservoir of infection [1]. The disease is a common bacterial

infectious disease in humans that is considered an occupational disease due to risk factors in some occupational populations such as veterinarians, butchers, livestock breeders, etc [2,3]. Brucellosis is globally prevalent. The incidence rate and prevalence of this disease in developed and developing countries are different [4-6]. The disease is completely different due to the lack of accurate and timely reporting, variation in clinical

symptoms, and lack of referral of mild cases [5-7].

Brucellosis is a zoonotic disease that is globally prevalent, with higher incidence rates in the lower Mediterranean region, the Arabian Peninsula, the Indian subcontinent, and certain regions of Central Asia, Mexico, and Central and South America [8].

Brucella has several species. *Brucella abortus* is prevalent in cattle, wild cow, buffalo, camel and Asian highland cattle. *B. canis* is prevalent in dogs and *B. melitensis* in goat, sheep and camel. Cows may also be the accidental host of this brucella in some circumstances. *B. suis* is prevalent in domesticated pig and wild boar. All these brucella may be transmitted to humans and develop the respective brucellosis [9-12].

Brucellosis is transmitted to humans as a result of exposure to the discharge of the infected breed, the consumption of raw milk, undercooked meat, or unpasteurized dairy products. Brucellosis is one of the major health issues in many countries of the world, including Iran [13]. Species of Brucella are intracellular organisms that are replaced in macrophages, monocytes, and in human organs such as the spleen, lymph nodes, liver and bone marrow as well as in the reticulo-endothelial system [14]. The most common side effects of brucellosis are intermittent fever, headache, fatigue, weight loss, night sweats, joint pain, osteomyelitis, spondylitis, peripheral arthritis, sacroiliitis, etc [15-17]. Considering the geographical location of Ilam province and its neighboring traditional livestock centers such as Khuzestan, Lorestan, Kermanshah, and nomadic migrations from the cities and neighboring provinces to this city, the transmission of Brucellosis and increase in the number of patients over time are likely. Because the geographical location of the province and its close proximity to the livestock breeding centers and nomadic

migrations in this area, the epidemiology of Brucellosis in the Dehloran between February 2015 and November 2018 was investigated.

Materials and Methods

This study was conducted between February 2015 and November 2018 in Dehloran, Ilam province, Iran. The process was that a suspect (a resident of a village or a resident of the city) referred to a health unit. After initial examination by health personnel and it having symptoms of brucellosis and initial confirmation of the disease, the person was referred to a physician. The physician examined the suspect person. In case of confirmation, the patient was referred to the laboratory and the malt was tested. For sampling, the samples were collected from the patients with certain symptoms such as pain, and investigated by Wright test. Data were recorded in researcher-developed checklists and analyzed using descriptive statistics.

Sample criteria

The criteria for entering the study were all people who had early symptoms of brucellosis and visited the health centers and clinicians and were tested.

Statistics

Statistics were based on expert forms and checklists, and disease registration and registration of data in Excel

Results

Based on the results of diagnostic tests for brucellosis in the years 2015-2018, 33 cases of human brucellosis were reported in the city under purpose. The results of this study showed that brucellosis in Dehloran city is an occupational illness that occurs most frequently in livestock breeders followed by housewives. Besides, most cases are due to the consumption of dairy products such as milk (Table 1-4).

TABLE 1, The Number of Brucellosis Tests in 2015-2018

The number of brucellosis tests performed at the holistic health centers of the County				
Place of testing (Region)	2015	2016	2017	Total
Meymeh	14	14	18	46
Dehloran Dept. of Clinic 1	358	231	163	752
Dashteh Abbas	525	514	554	1593
Pahleh	223	125	163	511
Mosian	6	6	7	19
Total	3133	890	905	2921

TABLE 2. The statistics of vaccination-based program conducted based on questionnaire for Brucellosis in 2015-2018

Questionnaire / Vaccination	2015	2016	2017	2018
Yes	13	6	17	6
Unknown	2	9	4	6
No	7	5	4	2
Lack of completion	7	10	13	4
Total	29	30	38	18

TABLE 3. The number of brucellosis cases in different occupational subpopulations in 2015-2018

Occupational subpopulation	2015	2016	2017	2018
Unemployed	2	6	1	-
Housewife	9	9	12	7
Livestock breeder	9	5	14	6
Farmer-livestock breeder	1	4	4	2
Student	3	2	1	3
Driver	1	1	2	-
Manual worker	1	2	4	-
Employee	2	1	1	-
Child	1	6	12	-
Total	29	30	38	18

TABLE 4. Number of cases of brucellosis based on the cause of incidence due to food in 2015-2018

Case	2015	2016	2017	2018
Colostrum	1	-	1	-
Colostrum, Sarshir*, Cheese	1	-	-	-
Milk	15	10	9	7
Butter	-	1	-	-
Colostrum and Milk	1	-	2	-
Cheese and milk	1	-	1	-
Milk, Cheese, Cream, Colostrum, Your head	1	-	1	-
Milk, Cheese, Cream, Sarshir	1	-	1	-
Milk, sarshir	1	-	1	-
Milk, butter	1	2	-	-
Milk, butter, colostrum	1	-	-	-
Unknown	5	17	22	11
Total	29	30	38	18

*Sarshir, Fat extracted from boiled milk

Discussion

A study in the city of Talesh on 202 suspicious samples of brucellosis revealed the seroprevalence of the disease was 4.95% and its incidence 0.49%. In this study, the dominant occupations were livestock breeding and farming.

The history of local cheese consumption was also found in half of the subjects [18]. In this study, there is a close relationship between disease and livestock (exposure to livestock and dairy consumption), which is consistent with the study of Parvin in Jahrom [19], Katingawa in Turkey [20], and Shelling in Chad [21]. This highlights the importance of vaccination of livestock and the health of dairy products. The results of epidemiological studies conducted in different parts of Iran showed that the incidence rate of brucellosis in Kazeroon was 7.8% [22], in Bushehr 10.8% [23], in Kerman 3.2% [24], in Isfahan 31.2% [25], in rural areas of Gilan 9.8% [26], Mazandaran 53.9% [27], and the total nomads of Iran 29.5% [28]. In a similar study, Shamsi Farahani *et al.* (2012) reported the prevalence of brucellosis in Arak to be 6% over the past 10 years, and the patients had the highest titres of 1.35 and 1.80 according to the Wright and 2ME (STANDS FOR WHAT) tests, respectively [29]. The ways of the disease transmission include the consumption of unpasteurized milk and dairy products such as cheese, ice cream and unboiled milk produced from the contaminated animal, as well as the contact of the injured skin with the blood, tissue, and urine of contaminated livestock, inhalation of contaminated air of corral, slaughterhouse and laboratory, as well as accidental inoculation of the livestock vaccine [30-32].

The study of Alavi *et al.* (2004) indicated that the prevalence of brucellosis in the nomadic community of Khuzestan province was 8%, which is high. It seems that a large proportion of the population is exposed to contamination due to lifestyles such as close contact with animals such as goats and consumption of unpasteurized dairy products [33]. Due to the particular lifestyle and the lack of suitable access to health care services and close exposure to domesticated animals, especially goats, they are predisposed to developing zoonotic diseases, especially brucellosis. The lack of reliable health information and the lack of provision of health care services with acceptable time and place coverage, such as health care homes and health centers in these areas, have led to adverse health conditions in this region. Due to

the long borders of Iran and the lack of supervision on imports of livestock, large nomadic population, traditional methods of livestock breeding, lack of adequate supervision over the production and distribution of dairy products, and the lack of regular implementation of vaccination, testing and slaughtering of the livestock, many cases of the disease have been reported in the country [34]. In Iran, the prevalence of brucellosis in the year 1356 *H.S* in animals was 44%, which decreased to 5% in 1358 *H.S* due to control programs. But in 1977, as a result of the withdrawal from proceeding with such a program, the prevalence increased up to 17.4% [35]. This indicates the need for continuous and regular epidemiological studies of the disease. In Iran, human brucellosis is common in all seasons. However, most cases occur in the spring and summer, which is due probably to more exposure to livestock and dairy products during the processing and delivery of the livestock in these seasons. The prevalence of brucellosis in different parts of Iran ranges from 0.002% to 0.1% [35]. It has been established that the close life of the nomads with domestic animals such as goats and sheep, which may have an important role in the transmission of disease to humans, is one of the important factors in the prevalence of the disease in the nomadic community. And the consumption of dairy and livestock products, which are mostly eaten following unhealthy processing and undercooked, is one of the most important ways of spreading the disease in the nomadic community [36, 37]. Although brucellosis is endemic in many regions of the world, it has been eradicated in most countries of northern Europe, Australia, the USA and Canada [38]. Experiences in countries such as Portugal also show the fact that by systematic planning for testing and slaughtering livestock and vaccinating them, the disease can be controlled and even eradicated [39].

Conclusion

Therefore, health policy-makers in Iran can also root out Brucellosis by following the related policies implemented by these countries. In general, it can be argued that despite the high prevalence of the disease in this region, little attention has so far been paid to it. Regarding the occupational nature of the disease in the region, it is recommended that vaccination, disease surveillance and slaughter of infected animals be monitored by the Veterinary Office. Livestock should also be purchased through cooperatives of livestock breeders and sent to dairy factories so that contaminated milk is not delivered to the public.

Finally, in schools, mosques, and health care homes, attention should be directed to training of vulnerable groups.

Acknowledgment

We are grateful for supporting the Research and Technology Deputy of Shahrekord University of Technology.

Funds

No grant have been used for this study

Conflict of interest

The authors stated that there was no conflict of interest.

References

- Dennis, k. Tinsley Randolph Harrison. Harrison's principles of internal medicine. Vol. 1. McGraw-Hill, Medical Publishing Division, (2005).
- Goldman, L., and J. C. Bennett. "Cecil textbook of medicine 21st ed." 1263-1264 (2002).
- Mandell, Gerald, Raphael Dolin, and John Bennett. Mandell, Douglas, and Bennett's principles and practice of infectious diseases. 7thed., Elsevier, 2009.
- Van Bresseem, M. F., Van Waerebeek, K., Raga, J. A., Godfroid, J., Brew, S. D., and MacMillan, A. P. Serological evidence of Brucella species infection in odontocetes from the south Pacific and the Mediterranean. *Veterinary Record.*, **148** (21), 657-661(2001).
- McDermott, J., Grace, D., Zinsstag, J. Economics of Brucellosis impact and control in low-income countries. *Rev. Sci.Tech.* , **32** (1), 249–261(2013).
- Whatmore, A.M., Perrett, L.L., and MacMillan, A.P. Characterization of the genetic diversity of Brucella by multilocus sequencing. *BMC Microbiol.*, **7** (1), 34 -38 (2007).
- Fosgate, G. T., Carpenter, T. E., Chomel, B. B., Case, J. T., DeBess, E. E., and Reilly, K. F. Time-space clustering of human brucellosis, California, 1973–1992. *Emerging infectious diseases.*, **8** (7), 672 (2002).
- Samaha, H., Al-Rowaily, M., Khoudair, R. M., & Ashour, H. M. (2008). Multicenter study of brucellosis in Egypt. *Emerging infectious diseases.* 2008, **14** (12), 1916.
- Al-Nassir, Wafa, Michelle V. Lisgaris, and Robert A Salata. "Brucellosis." eMedicine Web site, <http://emedicine.medscape.com/article/213430-overview>.
- Collier, L. Topley & Wilson's Microbiology and microbial infections. **2** (9), 829 (1998).
- Collier, L. Topley & Wilson's Microbiology and microbial infections. **3** (9), 819 (1998)
- Young, E.J. Brucella species. In, Mandell G, Bennett J, Dolin R, editors. Principles and practice of infectious disease. 7th ed. Churchill, Livingstone, 3-76 (2010).
- Mohraz, M., Kariminia, A., Sarafnejad, A., Almaee, Z. Evaluation of DOT-ELISA in diagnosis of brucellosis in Imam Khomeini hospital. *Iran J. Infect. Dis. Trop. Med.*, **23** (8), 10-13(2000).
- Turatbek, B., Kozukeev, S., Ayeilat, E., Maes, M. Favorov. Risk Factors For Brucellosis – Leylek and Kadamjay districts, Bakten oblast Kyrgyzstan jan-Nov 2003. *MMWR*, **55** (0-1), 31-34. (2006).
- Moreno, S., Ariza, J., Espinosa, F.J. Brucellosis in patients infected with the human immunodeficiency virus. *Eur. J. Clin. Microbiol. Infect. Dis.*, **17**, 319-326 (2002).
- Corbel, M.J. Brucellosis, an overview. *Emerg Infect. Dis.*, **3**, 213 (1997).
- Cesur, S., Ciftci, A., Sozen, T.H., Tekeli, E. A case of epididymo-orchitis and paravertebral abscess due to brucellosis. *J Infect*, **46**, 251-253 (2003).
- Yosefi-Digesaraei, M., Asmar, M., Faezi-Ghasemi, M. Seroepidemiology of brucellosis in Talesh city. *Journal of Life Sciences of Lahijan*, **2** (4), 89-98 (2008).
- Parvin E., and Rahmanian, K. Epidemiologic study of brucellosis patients referring to Jahrom Health Center during 2002-2005. Second Brucellosis Symposium, Research Deputy of Shahid Beheshti University of Medical Sciences (Infectious Diseases and Infectious Disease Research Center). 2007, 14.
- Cetinkaya, F., Nacar, M., Aydin, T., Koç, N. and Gökahmetoğlu, S. Prevalence of brucellosis in the rural area of Kayseri, Central Anatolia, Turkey. *Int. J. Infect. Dis.*, **10**, 179-181 (2006).
- Schelling, E., Diguimbye, C., Daoud, S. Nicolet, J., Boerlin, P., Tanner, M. and Zinsstag, J. Brucellosis and Q-fever seroprevalences of nomadic pastoralists and their livestock in Chad. *Prev. Vet. Med.*, **61**, 279-293 (2003).

22. Beheshti, S., Rezaian, G.R., Azad, F., Faghiri, Z., and Taheri, F. Seroprevalence of brucellosis and risk factors related to highrisk occupational groups in Kazeroon, South of Iran. *Int J Occup Environ Med.*, **1**(2), 62-8. (2010).
23. Vahdat, K., Jafary, S.M., and Hashemi, S.M. Seroepidemiological prevalence of brucellosis in livestock breeders of the central rural area of Bushehr province 2003-4. *Iran South Med J.*, **9**(1), 51-8 (2006)
24. Mohammadkhani, M., Sharifi, H., Rashidi, H., Nabipour, A. and Jahanshahi, M. Seroepidemiology of Brucellosis in Industrial and Semi-industrial Dairy Personnel and Veterinary Network Staff in Kerman, 2012. *Iran J Epidemiol.*, **10**(4), 54-61 (2015).
25. Sabbaghian, H, and Nadim A. Epidemiology of human brucellosis in Isfahan, *Iran. J Hyg (Lond)*., **73**(2), 221-8 (1974).
26. Nikokar, I., Hosseinpour, M., Asmar, M., Pirmohbateri, S., Hakeimeh, F. and Razavei, M.T. Seroprevalence of Brucellosis among high risk individuals in Guilan, *Iran. J Res Med Sci.*, **16**(10), 1366-1371 (2011).
27. Ebrahimpour, S., Youssefi, M.R., Karimi, N., Kaighobadi, M., Tabaripour, R. The prevalence of human Brucellosis in Mazandaran province, *Iran. Afr J Microbiol Res.*, **6**(19), 4090-4094 (2012).
28. Sharafi-Chegeni, A., Ezatpourob, B., Sakia, M., Mokhayeria, H., Adavic, S., and Nasiria, E., Seroepidemiology of human brucellosis in nomads in a rural area of Iran. *Asian Pac. J. Trop. Dis.*, **4**(4), 333-336 (2014).
29. Farahani, S., ShahMohamadi, S., Navidi, I., Sofian, M. An investigation of the epidemiology of brucellosis in Arak City, Iran, (2001-2010). *Arak. Uni. Med. Sci. J.*, **14** (7), 49-54 (2012).
30. Heymann, D.L. Control of communicable diseases manual (No. Ed. 19). American Public Health Association, 4-9. (2008).
31. Azizi, F., Janghorbani, M., and Hatami, H. Epidemiology and control of common diseases in Iran. Tehran, Khosravi, 665-70 (2006)
32. Gooya, M.M., Tabatabaei, S.M., Zahraei, M., Ahmadnia, H., Ghotbi, M., Rahimi, F. Principles of prevention and surveillance from diseases. Tehran, Roohe Ghalam, 173-6 (2006)
33. Alavi, S.M., Rafiei, A., and Nikkhoy, A.R. *Egypt. J. Vet. Sci.* **Vol. 50**, No.2 (2019)
- Seroepidemiological study of brucellosis in nomadic nomads of Khuzestan province in 2004. *Infectious Diseases and Tropical Medicine Quarterly*, affiliated with the *Association of Infectious Diseases and Tropical Medicine*, **11**(33), 41-47. (2005).
34. Sofian, M., Aghakhani, A., Velayati, A., Banifazl, M., Eslamifar, A., and Ramezani, A. Risk factors for human brucellosis in Iran, a case control study. *Int J Infect Dis.*, **12**(2), 157-161. (2008).
35. Sofian, H., Aghakhani, A., Velayati, AK., Banifazl, M., Eslamifar, A., Ramezani, A. Risk factors for human brucellosis in Iran, a case-control study. *Int J Infec Dis.*, **12**(2), 157-161 (2008).
36. Young, E.J. Brucella species. In Long SS, Pickering LK, Prober CG. *Principle and practice of Pediatric Infectious Diseases* . 2nd ed . New York, Churchill Livingstone, 2003, 876- 880.
37. Fosgotte, G.T., Carpenter, T.E., and Chomel, B.B. Time-space clustering of human brucellosis, California, 1973 – 1992, *Emerg. Infect. Dis.*, **8**, 672- 678 (2002).
38. Whatmore, A.M. Current understanding of the genetic diversity of Brucella, an expanding genus of zoonotic pathogens. *Infect. Genet. Evol.*, **9**(6), 1168-84. (2009).
39. Martins, H., Garin-Bastuji, B., Lima, F., Flor, L., Pina Fonseca, A., and Boinas, F. Eradication of bovine brucellosis in the Azores, Portugal Outcome of a 5-year programme (2002- 2007) based on testand slaughter and RB51 vaccination. *Prev. Vet. Med.*, **90**(1-2), 80-89. (2009).