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Original Article

Trends in the Epidemiology of Brucellosis Cases in Iran during the Last Decade

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Abstract

Background: Brucellosis is one of the most important zoonotic diseases that impose a serious public health burden on some countries in the world. Annually, the WHO reports more than 500000 new cases of human brucellosis. The disease is endemic in most parts of Iran; especially, in areas where people live in close contact with infected animals. According to data from the Iranian Ministry of Health, the average incidence of brucellosis in Iran was 22 cases per 100000 population, with a decreasing trend of surveillance.

Methods: This cross-sectional survey was carried out within 2011-2020 in all provinces of Iran and from patients with clinical symptoms.

Results: During the last decade, a total of 173526 cases were reported from different provinces of Iran, with a higher frequency of occurrence in males (58.2%) living in rural areas (77%), as compared to those in urban areas (23%). Moreover, brucellosis was more common in the summer season (June) and most of the cases were via contact with infected livestock (91%) and consumption of unpasteurized dairy products (78% in rural areas and 76% in the urban areas).

Conclusion: The failure to effectively control brucellosis may be attributed to lack of knowledge about the disease, consumption of unpasteurized dairy and raw meat, lack of proper and safe vaccines for prevention and eradication programs, lack of rapid detection systems, and ineffective methods of isolating infected animals. Therefore, education and advancement of people's knowledge are key to the prevention and control of the disease

Keywords: Brucellosis; Epidemiology; Iran

Introduction

Brucellosis is one of the most important zoonotic diseases that impose a serious public health burden on some countries in the world (1) widely known as waxy fever, Mediterranean fever, or Malta fever. The agent of brucellosis is a gram-negative, intracellular, non-motile, non-sporulating, non-toxigenic, non-fermenting, facultative coccobacillus (2, 3). Its genus, *Brucella* has

different species and is classified into over ten species, based on host preferences and phenotypic variations (4-6). The disease is defined by symptoms like fever, weakness, tedium, excessive sweat and weight loss in humans, and abortion in livestock (7). According to the WHO, the disease is common in many parts of the world, especially in the Mediterranean region, Arabian Peninsula, Indian sub-continent, and parts of central and southern United States (8, 9). Annually, more than 500,000 new cases of human brucellosis are reported by the WHO (10). In different countries, the contamination rate varies from 3.5 to 10.5 per thousand population (11).

In Iran, diseases are relatively common and some published systematic reviews have estimated the annual incidence of brucellosis to be 1/100,000, with the highest incidences reported from the west and north-west regions of the country (12). The disease is endemic in most parts of Iran, especially areas where humans live in close contact with infected animals. According to the Iranian Ministry of Health (MOH) (13), all provinces of Iran are categorized into the following four main types, according to the incidence of diseases in humans: very high incidence rate (31-41 per a 100,000 population) (East Azerbaijan Hamedan, Markazi, Lorestan, Kermanshah, West Azerbaijan, and South Khorasan), high incidence rate (21-30 per a 100,000 population) (Kordestan, Razavi Khorasan, and Zanjan), moderate incidence rate (11-20 per a 100,000 population) (Golestan, Ilam, Qazvin, Semnan, Chaharmahal and Bakhtiari, Ardabil, Kerman, Mazandaran, Yazd, North Khorasan, and Fars) and low incidence rate (0-10 per a 100,000 population) (Bushehr, Khuzestan, Kohgiluyeh and boyerahmad, Alborz, Tehran, Gilan, Hormozgan, Sistan and Baluchistan and Qom).

The disease is usually transmitted via direct contact with contaminated domestic animals such as sheep, goat, cow, and their products, with occasional transmission through contaminated blood products (14). In animals, the disease is caused by abortion and weight loss (15). The prevalence of brucellosis is directly affected by different factors such as the infection rate of animals, food habits, and conditions of socio-economic and unfavorable health situations, among others (16). In Iran, brucellosis is common across all seasons, with the majority of cases usually reported in summer and spring. Furthermore, the case number of diseases is more prevalent in younger people than in adults. Over the last decade, the surveillance system in Iran has developed and this enables easy detection of a number of cases that were previously undiagnosed in some remote areas. According to data from the MOH, the average incidence of brucellosis in Iran was 22 cases per 100,000 population and the trend has shown a decreasing range. Based on a recent study on patients from 30 provinces of Iran, the mean incidence of brucellosis was estimated at 29.83 in a 100,000 population and this rate was higher in males (55%) than in females (45%) (17).

We aimed to investigate different aspects of the epidemiology of brucellosis in Iran, during the last decade.

Materials and Methods

This cross-sectional survey was carried out between 2011-2020 in all provinces of Iran and from patients with clinical symptoms. The patients with laboratory diagnostic criteria were defined as definite cases, while suspicious cases included all patients with clinical symptoms relating to brucellosis, with a suspected or definite animal with brucellosis. Epidemiological data information for both groups was recorded. In addition, all patients with positive serology (Wright> 1/80 and 2ME ≥1/40) were recorded. Usually, the diagnosis was carried out by specialists via monthly laboratory examination, then the cases were recorded by the health care center.

Data analysis and incidence of diseases were calculated using Excel 2013 software.

Results

Over the last decade, a total of 173,526 cases were reported from different provinces of Iran. The average incidence distribution of brucellosis

cases from 2011-2020 is shown in Fig. 1, and the high incidence and frequency of cases reported in 2014 were 20,211 cases (26 per 100,000 population) (Fig. 2). Also, the most contaminated provinces were Lorestan (74.8 per 100,000 population), Hamedan (71 per 100,000 population), and Kurdestan (62 per 100,000 population). In 2020, a total of 17,846 (21 per 100,000 population) cases were reported, with the highest incidence and cases observed in Lorestan, Hamedan, and Kurdistan provinces. In the last year, Hamedan province was the most contaminated province with the highest number of reported cases 1,689 (94.9 per 100,000 population) (Fig. 3).

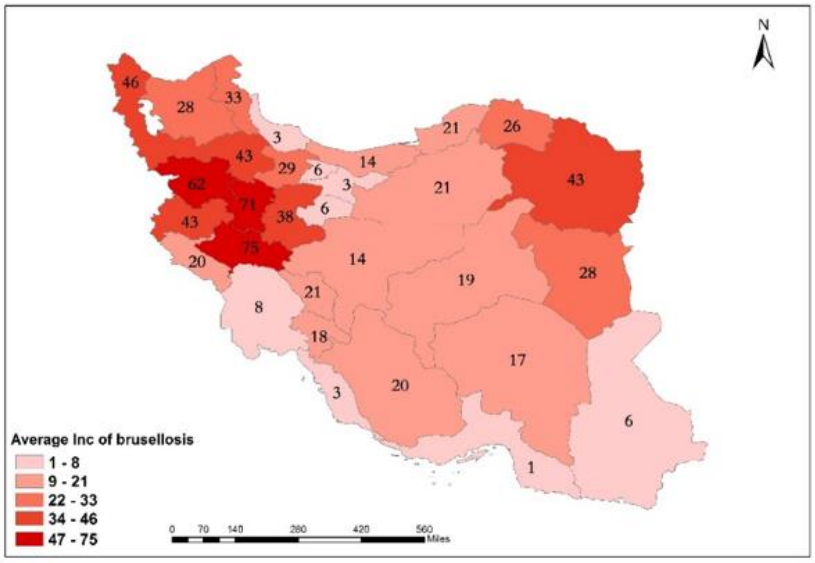

Fig. 1: The average incidence distribution of brucellosis cases in different areas of Iran, 2010-2020

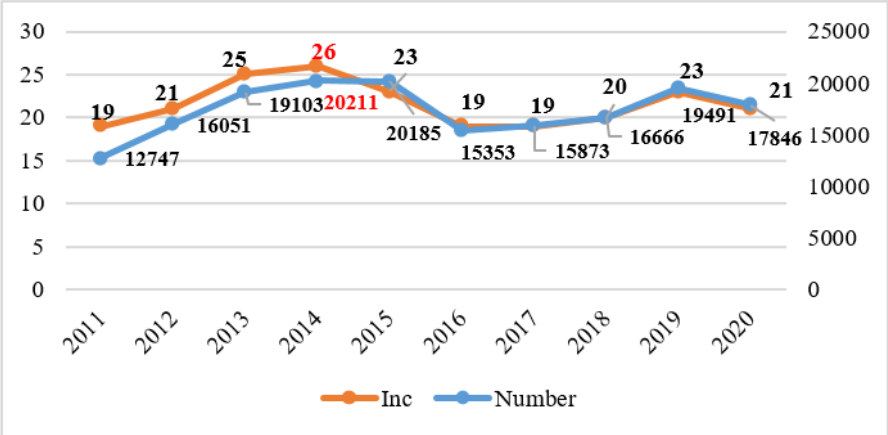

Fig. 2: The incidence and frequency of brucellosis cases in Iran, 2011-2020

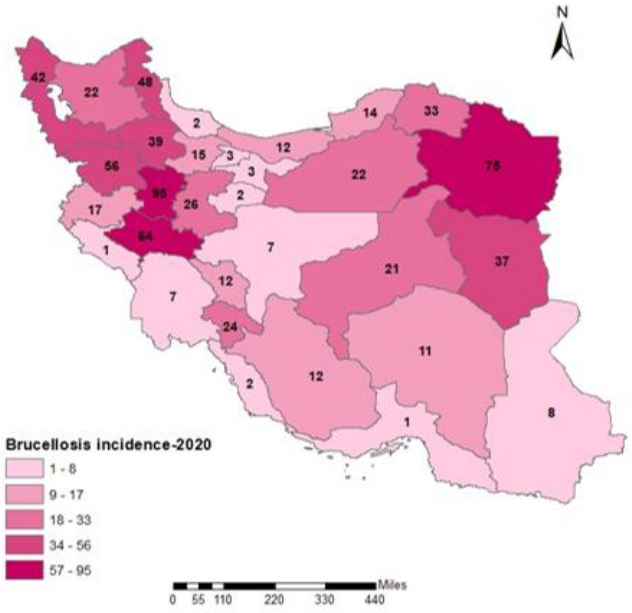

Fig. 3: The incidence rate of confirmed brucellosis cases in Iran, in 2020

Most patients were males (58.2%) with the average group between 20-30 years old (Fig. 4). In rural and urban areas, the age group distribution landscape was different. In rural areas, more cases were reported within the 20-30 age group, whereas in the urban areas, cases were for the 30-40 age range. The most common transmissions occurred via contact with infected animals and the use of unpasteurized dairy products in the rural and urban areas.

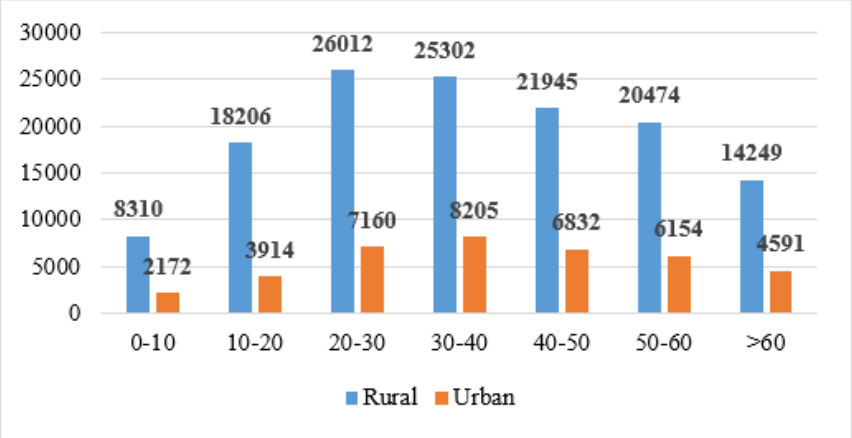

Fig. 4: The number of brucellosis cases in different age groups during 2011-2020

According to Fig. 5, the peak of diseases occurred from Apr to Aug, and most of the cases were reported in June. The trend of diseases increased from Apr in spring until July and then decreased in winter. The highest incidence was reported in June and July and the lowest incidence rate was detected in the month of Nov.

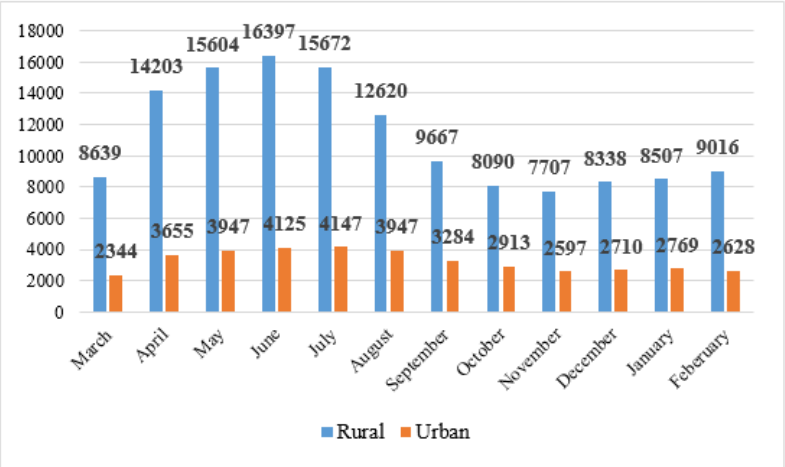

Fig. 5: Monthly records of the number of brucellosis cases in rural and urban areas

Discussion

Overall, 173526 cases of brucellosis were recorded within the last decade. The incidence rate was 22 per 100,000 population. According to global standards, the prevalence of brucellosis among humans depends mainly on its incidence among livestock (18). Brucellosis disease is still a serious public health problem in some regions of Iran and the incidence rate has increased recently, with higher prevalence occurring among men. There seems to be a decline in the number of cases during the covid-19 pandemic in Iran and the reasons may be attributed to the use of self-protection methods such as the wearing of masks and gloves by people of different job groups living in both rural and urban areas, especially those who are in close contact with infected livestock and their products. These measures reduce contact between people and the source of contamination.

Brucellosis is an endemic disease in Iran and it was first detected in 1932 (19). To completely eradicate this disease, the cultural, economic, social and general health conditions of people living with the disease are some key factors to consider. Many villagers, as well as urban dwellers, still maintain their traditional habits such as eating locally-prepared soft cheese and unpasteurized dairy products together. At the moment, there is no safe vaccine to protect humans and animals from brucellosis disease.

In the present study, the peak of brucellosis incidence was in June, whereas data from 26 papers indicated the incidence rates of the disease in Iran during spring, summer, autumn, and winter were estimated as 34.4%, 33.2%, 16.4%, and 14.9%, respectively (20). He showed that the most incidences occurred in spring and summer and the lowest was observed in autumn and winter. In Germany, the peak of brucellosis was reported in the months of July and August in summer, and the lowest cases were reported in January and February (winter) (21). The highest and lowest cases of brucellosis as recorded from different provinces of Iran (17) were found in spring and autumn. Findings from Karimi-Nazari (22) have shown that most cases of the disease were found in March (180 cases) and then the trend decreased to 39 cases in December. Also, a similar result was reported (23). Global studies of diseases have shown that the seasonal pattern of brucellosis is more prevalent in the first half of the year because it's accompanied by the reproductive season of livestock.

Our results have indicated that brucellosis disease was more prevalent in men (58.2%) than women (41.8%). This pattern is the same in both rural and urban areas. Previous studies conducted in Turkey (55.7%), Arab Saudia (66.5%), and Iran have shown similar results (49.5-54.2%) (23-26).

Brucellosis was more distributed in men than women (29-30), whereas information from data collected in the western part of Iran described the incidence of the disease as 59.31 per a 100,000 population; cases were more common in males (34.9%) than females (65.1%) and almost 95.2% of the cases were detected in rural areas (32). In another study, 55.3% of patients were males and 44.7% were females (with the mean age of 33.37±21.3) (33). In contrast to our results, findings have shown that brucellosis is more prevalent in women than men (34). One of the reasons why the disease is relatively common among Iranian women can be explained by the fact that women have close collaboration in ranching and farming with men.

In our study, the majority of patients lived in rural areas (77%) and 23 percent of them were urban dwellers. This finding is consistent with the observations of other researchers (26, 34, 36). Studies conducted show the same results and indicated that brucellosis disease is more predominant in rural areas (82.2%) than in urban (17.8%) areas. Studies have also shown that more cases lived in the villages (28, 31). In another study, 82.87% of the cases were reported from urban areas and 85.44% in rural areas, and both areas had the history of non-pasteurized dairy consumption (37). Also in the rural (91%, 78%) and urban areas (54%, 76%), brucellosis cases were spread via contact with infected animals and the use of unpasteurized dairy products such as fresh milk and unpasteurized butter and cheese, respectively (37). The ratio of brucellosis disease would increase due to the consumption of unpasteurized dairy products (33, 38). The use of cottage cheese (76%) and fresh cow milk (30%) were seen among the patients (39). Nabavi et al (30) described contact with infected livestock and the use of unpasteurized dairy as the most common routes to transmit brucellosis. According to an investigations (40) in the south of Khorasan province in Iran, 57.4% of brucellosis cases were due to the consumption of unpasteurized milk (40). Some studies established a significant relationship between the incidence of brucellosis and factors such as contact with infected livestock or their waste and the use of unpasteurized dairy products (22, 41). The distribution of brucellosis is more common in men than women and is also more endemic in rural areas than in urban areas. It seems it is related to the type of occupation and people's contact with the source of infection.

In this study, the majority of the cases in the rural areas were detected among the 20-30 age groups, but in the city, more cases were among the 30-40 age groups. In Isfahan, this pattern was more common among patients within the age group of 15-20 years (7). In southwest of Iran (30), the mean age of brucellosis patients was 39.5±17.28, whereas a range of age groups was reported 40-49 in Eastern Saudi Arabia (25). In another study the majority of brucellosis cases were found in patients of the 20-30 age group in Isfahan province (22). It seems the young men in this group were more in contact with livestock-related activities such as slaughterhouse workers, veterinarians, and shepherds (22). Regarding the prevalence of brucellosis by age, the average age of the disease was 31.3 years, as reported in the Zeinalian Dastjerdi (42).

The data obtained from this study helps to correctly identify and implement strategies to control of Brucellosis in high-risk areas. The limitation of this study was that the cases of patients who refer to the private sector may not be recorded correctly and there may be under-reporting.

Conclusion

Brucellosis is endemic in most parts of Iran. In livestock, the disease is usually transmitted via abortion. This causes annual economic burden and public health threats to society. The disease is very dangerous to people who are in close contact with infected livestock and those who consume unpasteurized dairy products. There are many factors that contribute to the failure of brucellosis disease control; they include lack of knowledge about the disease, bad social habits and behaviors in the use of unpasteurized dairy and raw meat, lack of proper and safe vaccination for prevention and eradication programs, lack of

the rapid detection system and the failure to isolate an infected animal. According to the above objectives, education and advancement of people's knowledge are the principles that can be employed to control the disease. Also, the immunization of livestock and the use of surveillance systems to detect and eradicate infected livestock are essential.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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