

## Epidemiology and Risk Factors of Childhood Brucellosis in West of Iran

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### Abstract

#### Background

In Iran, Brucellosis mainly is transmitted from animals to humans of non-occupational ways, thus its prevalence in children is equal to adults or higher than them, thus in view of etiology and public health studying the epidemiological pattern of Brucellosis in children is important. Present study aimed to investigate the epidemiologic characteristics of brucellosis in children under 15 years old in Hamadan province.

#### Materials and Methods

This cross – sectional study was carried out on children under 15 years old in Hamadan province during 2012-2014. 460 patients in this period were investigated. Data were analyzed using by descriptive statistics and incidence rate as an analytic statistics with Stata software version 12. P-value $\leq$ 0.05 considered as statistically significant.

#### Results

Overall 460 Brucellosis cases were detected in children during the studied period, among them N (%) of boys and reside in rural area were 317 (68.9) and 404 (87.8) respectively. Incidence rate of brucellosis was 41.4 per 100,000 populations. 103 cases (22.4%) had a history of consumption of raw or unpasteurized milk products and 170 (37%) had direct contact with domestic animals.

#### Conclusion

Age and gender pattern of transmission of brucellosis in children in Hamadan province was similar to the pattern of endemic countries and prevalence in children was comparable with adults.

**Key Words:** Brucellosis, Child, Epidemiology, Iran.

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## 1- INTRODUCTION

Brucellosis is a common contagious disease that transmitted from domestic animals (1). Ingestion of raw milk, cheese or meat, or direct contact with infected animals, products of conception or animal discharges and inhalation of infectious aerosols are common ways for transmission of disease (2). Human brucellosis can be an acute or a chronic type and can has a variety of manifestations after an incubation period. Detection of Brucellosis due to difficulty to differentiate from other infections such as typhoid fever, tuberculosis or acute rheumatic fever may be difficult (3). The common symptoms of disease are fever, chills, headache, muscle and joint pains, malaise, nausea, night sweats and loss of appetite (4).

Brucellosis is widespread in the world, and it is prevalent in countries of the east Mediterranean countries, South America, and possibly Sub-Saharan Africa (1). According World Health Organization (WHO) report, there is estimated that 500,000 cases accrued worldwide annually, while this value is one-fifth of all cases (5). Although this disease is considered as an occupational disease in adults, but there are also some reports for incidence of brucellosis in children (6, 7). Evidence showed that in endemic regions of brucellosis, childhood brucellosis includes up to one-third of all cases of human brucellosis (8). Fever with unknown origin (FUO) among children mostly caused by brucellosis, especially in endemic countries (9).

Treatment course of Brucellosis in children is longer and it argued that rate treatment failure is high among children (10). Children older than 8 years should be treated with doxycycline for 45 days or 8 weeks plus gentamicin for 5 or 7 days respectively or doxycycline for 45 days and streptomycin for 14 days. Also doxycycline plus rifampin or

cotrimoxazole plus rifampin for 45 days may be alternative regimens. Cotrimoxazole plus rifampin for six weeks is the regimen of choice for the treatment of patients younger than 8 years old (8).

Some factors including increasing rate of Brucellosis in recent years, high rate of treatment failure, high rate of complication in children calls to study epidemiological pattern of Brucellosis in children. Thus, the aim of this study was to investigate the epidemiologic characteristics of brucellosis in children under 15 years of age in Hamadan province, Iran and to elucidate risk factors associated with incidence of brucellosis in children.

## 2- MATERIALS AND METHODS

### 2.1 study design and population

This cross – sectional study (descriptive - analytic) were carried out on children less than 15 years in Hamadan province, West of Iran during 2012-14. The province of Hamadan located in west of Iran and covers an area of 19,546 km<sup>2</sup> and according to the National Census held in 2011 the population of the Province was 1,758,268 people. In the studied period 460 cases were detected (2012=127, 2013=163, 2014=170).

### 2-2. Measuring tools

Based on the national surveillance of brucellosis, the inclusion criteria were as follows, suspected clinical symptoms, Wright test titer of  $>1/80$ , positive Coombs–Wright's test or titer of 2-mercaptoethanol (ME) test  $> 1/40$ , and having records at one of the health centers during 2012 and 2014 (11).

Data collection was done using a standard questionnaire in current use by the health surveillance system. The checklist of variables includes information on age, gender, place of residence, history of contact with animals and consumption of dairy product were used.

### 2-3. Data analyses

Data were analyzed using descriptive statistics such as frequency distribution tables and percentage and incidence rate as an analytic statistics with Stata version 12 software.  $P \leq 0.05$  was considered significant level.

### 3- RESULTS

Overall 460 patients with brucellosis, 68.9% and 87.8% were boy lived in rural areas respectively; mean age of the patients was  $9.9 \pm 1.3$  years. According to (Table.1), the incidence rate was increasing (34.3 per 100,000 in 2012, 44.1 per 100,000 in 2013 and 45.5 per 100,000 in 2014).

As showed in (Table. 2) the boy/girl ratio in this study was 2.21. This proportion increase with age and in the age group 11-15 years was twice as age group 0-5 years. 103 cases (22.4%) had a history of consumption of raw or unpasteurized milk products; also 11.1% and 10.2% of them had a history of consumption unpasteurized cheese and butter respectively (Table.3).

In 44.8% of cases animal were kept in their residence, 37% had direct contact with domestic animals. 13.5% of patients not have any contacts with animals. Other results in detail presented in (Figure. 1)

**Table-1:** Distribution of patient according to residence place & gender in the years under study

Year	Number of Positive Case	Residence Place		Gender		IR*
		Urban	Rural	Boy	Girl	
2012	127	12	115	85	42	34.3
2013	163	21	142	110	53	44.1
2014	170	23	147	122	48	45.5
Total	460	56	404	317	143	41.4
Percent		12.2	87.8	68.9	31.1	-

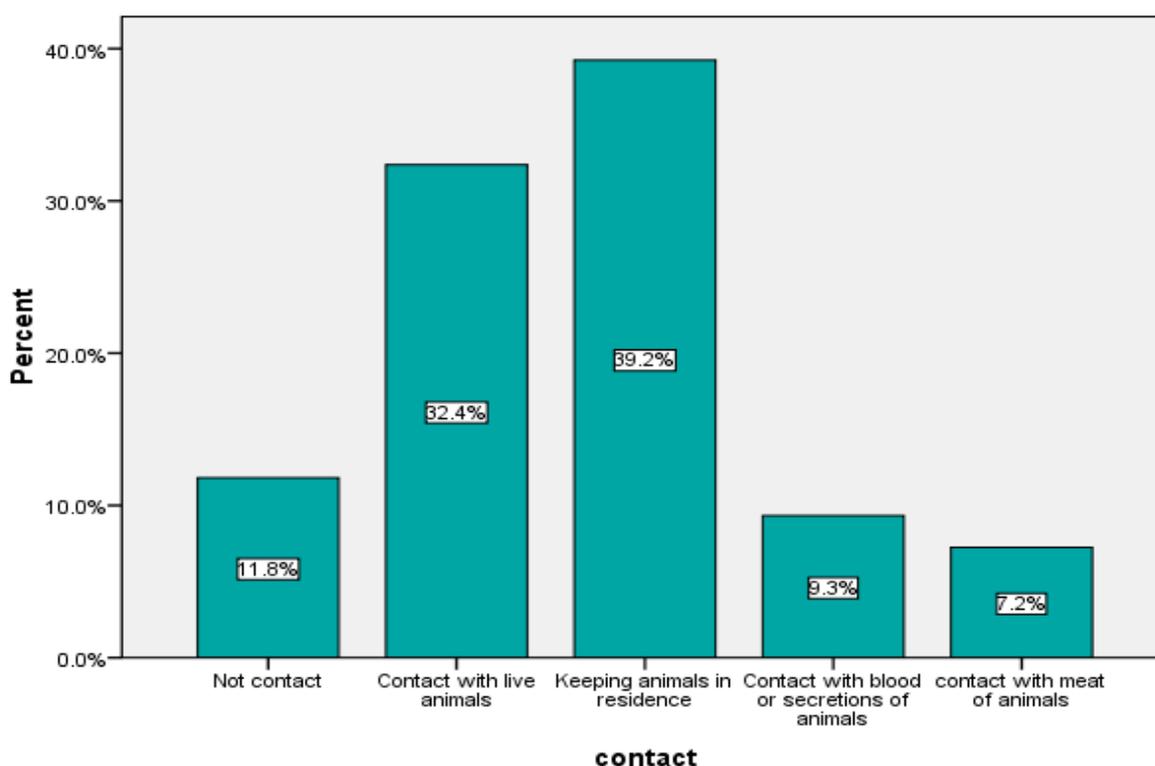
\*IR: Incidence Rate (Per 100,000).

**Table-2:** Relationship between age group and gender in patients with brucellosis

Age group	Boy	Girl	Total	B/G Ratio*
0-5 year	48	31	79	1.55
6-10 year	76	50	126	1.52
11-15 year	193	62	255	3.11
Total	317	143	460	2.21

**Table-3:** The cases infected with Brucellosis in terms of consuming unpasteurized dairy products.

Variables	Not use	Unpasteurized milk	Unpasteurized cheese	Unpasteurized cream	Un Pasteurized butter	Colostrum	Top milk	Ice cream
Number	167	103	51	33	47	12	24	16
Percent	36.3	22.4	11.1	7.2	10.2	2.6	5.2	3.5



**Fig.1:** The cases infected with Brucellosis in terms of contact with animals

#### 4- DISCUSSION

Although brucellosis has been eradicated in many developed countries, but still is a public health problem in both humans and animals in some countries around the world including East Mediterranean region (8). This study aimed to investigate the epidemiological pattern of brucellosis in children < 15 years of Hamadan province. In this study, 460 children were registered as brucellosis patients in four-year period. Disease was more common among boys and rural dwellers. A small percentage of patients did not have a history of dairy consumption or animal contact.

Similar to others studies (9, 12, 13) brucellosis was more common among boys. It seems due to their adventurous spirits boys more than girls may have contact with animals and also consume insecure foods. At current study, the incidence rate of brucellosis in children was 41.4 per 100,000 populations, while

the incidence of brucellosis in the country was 15.9 cases per 100,000 populations in 2010 (14). Then incidence of disease in children in Hamadan province is more than double of the national average. According to the report of the Ministry of Health and Medical Education in 2009, Hamadan province was very high incidence regions of brucellosis in Iran (14). Climate condition lead to development of animal husbandry in Hamadan province so the contact of children with infected animal will be increased.

In contrast of a study was conducted in Tehran (6) in this study only 17% of patients were had 0-5 years of age, this contradiction may be due to a higher percentage of rural population in Hamadan province in compared with Tehran, therefore in rural areas contact with animals is inevitable. In fact in the societies with the high proportion of urban dwellers majority of children were infected by dairy products; so, younger kids tend to become ill more in compared with

communities with a dominant population of rural. Results of studies from Turkey (9) and Greece (15) were consistent with our study that people aged 11-15 years most infected with Brucellosis. As shown in our study, Human brucellosis majority affected people living in rural regions. People living in villages are more in contact with animals and, therefore, are more exposed to infected material. This result is consistent with other studies was conducted in the endemic area of brucellosis (16, 17). In the terms of consuming unpasteurized dairy products, unpasteurized milk was the common source of infection in children. Consistent with our results in other studies, as well as in Greece (15), Turkey (18), and Macedonia (14), the most common way of transmission was unpasteurized milk. Although 37% of patients had a close contact with animal, but other reports have also suggested that consumption of raw milk or dairy products is the main source of infection in children (12). According to the disease surveillance report, the major routes of transmission of brucellosis in Iran include: animal abortion materials, fresh white cheese and raw milk (19). Whereas control of the disease in domestic animals and pasteurization of milk have led to the scarcity of childhood cases in UK and US (3).

The main limitation of this study was that, the need to refer to the memory regarding infected dairy consumption or contact with animals by patients the results of the study can be susceptible to recall bias. Also due to the young age of patients under study, usually parents responded to questions and reporting of risk factor was susceptible to under reporting. However, few studies on the epidemiology of brucellosis in children were conducted in the country. It is recommended that in future studies, clinical and laboratory aspects of brucellosis in children be examined.

#### 4-1. Limitations of the study

Present study has some limitation that should be considered; the incidence rates estimated can be along with underreporting because there is not missing at random (NMAR) in surveillance data. In addition this data has been collected for a purpose other than research project. Using by advanced methods such as capture-recapture method can collect information from different sources to a valid estimation of incidence rate.

#### 5. CONCLUSION

The results showed an increasing trend in recent years. Boys, rural dwellers and children in aged 11-15 years more involved with Brucellosis. Animal keeping in residence location was most of causes of exposure to Brucella bacteria.

**6- CONFLICT OF INTEREST:** None.

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