CLINICAL INVESTIGATIONS

Prevalence of Brucellozis in The Rural Area of Kayseri, Central Anatolia, Turkey*

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Abstract: This study was planned in order to make good the lack of information about population-based data on the prevalence of brucellosis in the Kayseri region.

This cross-sectional research was performed on 1850 individuals living in the rural regionaround Kayseri. People aged 15-85 in 9 districts in this rural areas were interviewed and blood samples were screened using the Rose Bengal Agglutination test.

The overall prevalence of brucellosis was 3.4%. Although the rate was higher in females (3.7%) than in males (2.9%), there was no significant difference. The lowest prevalence (2.0%) was observed in the 25-34 age group, and the highest prevalence (4.3% and 4.1%) were in the 35-44 and 15-24 age groups, respectively. The highest prevalence was observed in the illiterate group. The prevalence was much higher among people in close contact with sheep and/or cattle, those making home made cheese, butter and cream and also in those who consumed butter and cream.

It was concluded that although the seroposivity rate is low in Turkey, health education and screening of people in rural areas is necessary.

Key Words: Brucellosis, prevalence, Rose Bengal agglutination test, rural area

Introduction

Of all the zoonoses with both public health and economic implications, brucellosis is the most widespread disease, with an estimated half-million new cases every year (1,2). Brucellosis in humans and animals is increasing in many parts of the world, including the Mediterranean region, Western Asia and parts of Africa, Eastern Europe and Latin America (1-4). Millions of individuals are at risk worldwide, especially in countries where infection in animals has not been brought under control, procedures for heat treatment of milk (such as pasteurisation) are not routinely applied, and standards of hygiene in animal husbandry are low. However, the officially reported data are generally incomplete and the actual incidence in most cases is probably much higher than is shown in these tables. The Food and Agriculture Organization (FAO) and World Health Organization (WHO) assist countries in which brucellosis is endemic (1,5).

Although human brucellosis is a notifiable disease in this country, the true incidence is thought to be higher than the actual reported figures. Population-based studies are important for preventive policies against diseases, planning control programmes and carrying out management and educational services. Even though there have been a few epidemiological studies in Turkey, there

have been none on the prevalence of brucellosis in Kayseri. This study was planned in order to make good the lack of information on population-based data on the prevalence of brucellosis in Kayseri.

Materials and Methods

This cross-sectional research was carried out in the rural regions of Kayseri between January, 2000, and July, 2001. Kayseri is one of the largest municipalities in the centre of Turkey with a population of nearly 1 million, of whom approximately 40.0% are located in rural areas. Sheep raising for commercial purposes and raising small numbers of cattle and sheep for their own needs in people living in rural area is common.

In the preliminary of the study, a 5% prevalence of brucellosis was presumed and it was calculated that at least 1950 people should be included in the study group for a 99% confidence level. The research group was chosen in two steps. In the first step, the Kayseri rural area was separated into 9 regions based on different geographical areas and one village from each region was chosen by simple random sampling method. A sample of 2000 inhabitants who were 15 years of age and over were chosen by systematic sampling method in the second step.

Residents in the household were informed of the survey and invited to participate. The questionnaire was applied face to face by trained intern doctors. The questionnaire included questions about age, sex, occupation, educational level and condition if raising a livestock at home. It was also asked whether the individual was in physicial contact with animals or not, and the condition of the production of milk and dairy products.

In the study, 1850 of these selected respondents were reached. Some people were excluded either because they refused to give information, nobody was at home, they refused to give blood sample or the data was incomplete. The participation rate was 92.5 %. There was no difference in age distribution between the participants in the screening phase and the eligible individuals.

Rose Bengal test is an appropriate scanning method which is an applicable, practical, easy and economical diagnostic method in population-based studies.

The participants were tested for brucellosis using Lam Agglunation Test (Rose Bengal Test) (6).

The answer given to the question " How long do you boil of raw milk" was, "I continue boiling at least five minutes after the milk starts boiling and I stir milk while boiling" is considered the person knowing the answer (7). Cheese is considered fresh for 2 months after its production date (8).

The results were stored and processed using SPSS. The chi-square test was used to determine the significance in prevalence according to the variables.

Results

Of the 1850 people in the research group, 46.3% were male and 53.7% were female. 9.9% were in the 15-19 age group, 18.5% were in the 20-29 age group, 22.6% were in the 30-39 age group, 17.0% were in the 40-49 age group, 13.0% were in the 50-59 age group and 19.2% were older than 60. The mean age was 41.1 ± 16.81. Of the research group, 22.7% were illiterate, 6.1% were literate, 49.9% had completed primary school, 14.0% had completed secondary school, and 7.3% were graduates from high school or higher education. While the distribution of occupations among males was 31.3% farmers, 22.7% manual workers, 15.5% tradesmen, 7.6% retired, 6.1% civil servants, 5.8% butchers and 5.5% students, the vast majority of women (92.0%) were housewives.

In the study, 3.4% (n = 62) of the 1850 participants were LAT positive. In the towns of Gömürgen and ?ncesu seroprevalence was exceptionally high, at19.6% and 5.0%, respectively.

Of the group 5,4% stated that they had been exposed to brucellosis before. Regarding seropositivity, although there was no statistical difference between the age groups, the prevalence was highest in the 35-44 age group. While women had a slightly higher prevalence than men (3.9% and 2.7%, respectively), the difference was not significant. The prevalence of brucellosis was twice as common in cases with a family history of the disease (P < 0.05). The prevalence of brucellosis decreased as educational levels increased. People with higher levels of education had lower brucellosis prevalence than those with lower educational levels (P < 0.01) (Table 1).

Table 1. Prevalence of brucellosis according to several variables.

VARIABLES	n	Number	%	x^2	P
TOTAL	1850	62	3.4		
Regions					
Gömürgen	224	44	19.6	236.26	<0.001
Incesu	181	9	5.0		
Tuzhisar	314	5	1.6		
Develi	164	1	0.6		
Others*	967	0	0.0		
Age groups					
15-24	345	14	4.1	3.62	>0.05
25-34	394	8	2.0		
35-44	376	16	4.3		
45 and over	735	24	3.3		
Gender					
Male	857	23	2.7	2.19	>0.05
Female	993	39	3.9		
History of brucellosis in the family					
Present	183	12	6.6	6.44	<0.05
Absent	1667	50	3.0		
Educational level					
Illiterate	532	29	5.5	11.09	<0.01
Primary school	923	26	2.8		
Secondary school and ↑	395	7	1.8		

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In the research group, 55.2% of people raised livestock at home; 90.7% raised cattle, 13.7% sheep and 6.2% goats. Of the animal owners, 77.8% marked the animals, 77.5% were involved with stable cleaning and 57.7% were involved with preparing dried cow dung for fuel. Of those who stated that they had direct contact with animals, 17.1% used gloves while working with them. Of the research group, 14.3% stated that there was a common entrance to both the stable and quarters living. Raising livestock and having a common entrance to the stable and home significantly increased prevalence (P < 0.01). Dealing with livestock, cleaning stables and preparing dried cow dung also increased prevalence (P < 0.05) (Table 2).

The rate of raising live stock was high in the 35-44 age group and low in the 25-34 age group. Of the research group who raised livestock, 56.1% stated that their animals had been innoculated against brucellosis, 35.9% had not and 7.9% did not know; 65.3% knew how long milk needed to be boiled in order to prevent diseases. Of the group 44.3% stated that their cheese was made from unboiled milk, 20.6% their butter, and 13.6% their cream. Of the total, 66.0% stated that they consumed fresh cheese, 40.6% consumed unsalted butter and 14.9% consumed cream made from raw milk.

The brucellosis rate was higher in people who stated that they made cheese, butter and cream from untreated milk and/or who consumed unsalted butter and cream. There was no significant difference between consumption of fresh cheese and brucellosis (Table 3).

Discussion

Brucellosis is an important health problem in rural areas in this country. However, due to insufficient reporting the true dimensions of the problem are not known exactly.

Table 2. Prevalence of brucellosis in people in contact with animals.

VARIABLES	n	Number	%	x^2	P
Raising livestock at home					
Yes	1021	47	4.7	11.02	<0.01
No	829	15	1.8		
Using common entrance for stable and home					
Yes	146	16	11.0	14.03	<0.01
No	875	31	3.5		
Direct contact with livestock					
Yes	825	45	5.5	6.12	<0.05
No	196	2	1.0		
Method of milking (n = 830)					
With bare hand	794	42	5.5	0.33	>0.05
With gloves or machine	66	2	3.0		
Cleaning of stables					
Yes	791	43	5.4	4.74	<0.05
No	1059	4	0.4		
Preparing dried cow dung					
Yes	589	36	6.1	6.43	<0.05
No	1261	11	0.9		

Table 3. Prevalence of brucellosis in terms of preparing and consuming daily products from raw milk.

DAIRY PRODUCTS	n	Number	%	x^2	P
Making cheese					
Yes	820	44	5.4	18.45	<0.001
No	1030	18	1.7		
Making butter					
Yes	382	24	6.3	12.77	<0.001
No	1468	38	2.6		
Making cream					
Yes	245	15	6.1	6.69	<0.05
No	1605	47	2.9		
Consumption of fresh cheese					
Yes	1221	41	3.4	0.00	>0.05
No	629	21	3.3		
Consumption of unsalted butter					
Yes	751	33	4.4	4.24	<0.05
No	1099	29	2.6		
Consumption of cream prepared with raw milk					
Yes	275	17	6.2	7.99	<0.01
No	1575	45	2.8		

Among the 1340 people who participated in this study, 3.4% (n = 62) were LAT positive. In a screening study carried out nation wide in 1989, 13 different regions were compared and 1.8% seropositivity was determined (9). The rate we found was higher than this, which was 11.0% in Adana (10), 12.7% in Erzurum (11) and 5.2% in Ankara (12). In another study in the Eski?ehir rural area, the prevalence was found to be 18.9% (13). The reason for the lower results in Kayseri than those in these other areas might be the fact that the other studies were probably conducted in regions where raising livestock for commercial purposes was widespread and the target population was farmers, who continuously interact with animals, and that the methods used in brucellosis diagnosis and evaluation criteria were different. Another reason for the lower prevalence might be the "Turkish Brucellosis Challenge Project" programme that has been in force since 1984 and is run by the Ministry of Agriculture (14). In some Middle East countries like Saudi Arabia, Iran, Kuwait, Lebanon and Jordan the prevalence of brucellosis in rural areas has been reported to be high (3).

There was no significant difference between sex and prevalence of brucellosis (15,16). However, the workforce in animal related jobs such as animal raising, veterinary medicine, health enforcement and the meat industry are generally men, which might be the reason for the higher brucellosis prevalence in men. The prevalence was higher in males in most studies (17,18). In our study, the prevalence was 2.7% in males and 3.9% in females, although the difference was no significant. In our research group, the fact that women mostly dealt with animal raising might explain the high female seropositivity rate, with women exhibiting the highest level of brucellosis (19).

Although brucellosis is seen in every age group, it is most common in the 15-35 age group (19,20). Although there was no difference in the distribution of infection between age groups in our research, the prevalence was higher in the 35-44 and 15-24 age groups. Taylor et al. (21) determined the highest seropositivity in the 20-49 age group. The high rate of animal raising in the 35-44 age group in our study group explains the high seropositivity rate in this age group. The raising of animals was especially low in the 25-34 age group, in which prevalence the rate was the lowest.

In our study, seropositivity rate was especially high in people who had a family history of brucellosis. This could be due to people sharing the same environment in the same family, dairy products production and consumption habits and veterinary checks on their animals. Seropositivity was especially high in the less educated groups. This could be related to the fact that people dealing with animals are often less educated and do not take preventive measures, and also to the higher prevalence and low education level in women in our research group.

People in contact with livestock are more likely to contract brucellosis than are the general population. Humans also contact brucellosis from ingestion of dairy milk or milk products prepared from the fresh milk of infected animals. In this study, the LAT positivity rate increased in people raising livestock at home, those using a common entrance for the stable and home, those in direct contact with livestock, and those cleaning stables and preparing dried cow dung. In many studies, the brucellosis rate is high in those who deal with livestock (3,22,23). The majority of our study group stated that they did not use gloves while dealing with animals.

Proper heat treatment of milk or milk products is important for the effective prevention of brucellosis in humans. In our research group 65.3% were aware of the fact milk has to be boiled for a certain period of time. Cheese making from raw milk levels were 44.3% in our research group. The prevalence was especially high in people who stated that they made cheese, butter and cream from raw milk. The consumption of raw milk and unpasteurised fresh cheese was found to be a risk factor for brucellosis in a study in Greek villages (24).

We concluded that although the seropositivity rate is low in the general population, exposure to brucellosis is high among people dealing with livestock and consuming raw milk and dairy products. The disease can be prevented in humans by avoiding contact with infected animals and also by avoiding consumption of raw milk and raw milk products. We think that health education is essential for the success of prevention and control measures, and should form an integral part of all phases of public health programmes.

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