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Knowledge of Brucellosis among Patients in a Family Medicine Outpatient Clinic in Eastern Turkey

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What's known on the subject: Brucellosis is a prevalent zoonotic disease in Turkey, and public knowledge gaps hinder its prevention and control.**What does the study add:** This study demonstrates insufficient awareness of transmission, prevention, and treatment among patients, emphasizing the need for targeted public health education in primary care.

Abstract

Aim: Brucellosis is a common zoonotic disease in Turkey with significant public health implications. This study aimed to evaluate the knowledge levels of patients attending a family medicine outpatient clinic regarding brucellosis.

Methods: This cross-sectional study was conducted at the Family Medicine Outpatient Clinic of Kafkas University Medical Faculty Research Hospital between July 1, 2023, and September 30, 2023. A total of 345 participants were included. Data were collected using a structured questionnaire assessing socio-demographic characteristics and knowledge about brucellosis transmission, symptoms, prevention, and treatment.

Results: Of 345 participants (mean age 33 years, 52.8% female), 66.1% had heard of brucellosis, but only 29.3% recognized it as zoonotic. Knowledge of transmission was limited (unpasteurized dairy 56.2%, animal contact 31.3%, aerosols 14.5%), and 15.9% believed in person-to-person spread. Awareness of symptoms (45.5%) and complications (21.4%) was low; 40.9% knew treatment involved antibiotics. Among animal owners (23.2%), preventive practices included vaccination (68.8%), burial of aborted materials (67.5%), and avoiding consumption of products from aborted animals (83.8%).

Conclusion: The findings indicate that knowledge levels regarding brucellosis among patients were insufficient, particularly concerning transmission and prevention. Public health interventions, including education and awareness campaigns, are essential to improve knowledge and reduce the burden of brucellosis in endemic regions.

Keywords: *Brucellosis; Health Knowledge, Attitudes, Practice; Primary Health Care; Family Practice*

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Introduction

Brucellosis is one of the most prevalent zoonotic infections worldwide and remains a significant public health problem, particularly in Mediterranean countries, the Middle East, and Central Asia [1,2]. It is caused by Brucella species, gram-negative bacteria transmitted to humans primarily through the consumption of unpasteurized dairy products, direct contact with infected animals, or inhalation of contaminated aerosols [3].

Despite advances in diagnostics and treatment, brucellosis continues to cause considerable morbidity due to its non-specific clinical presentation, which often includes fever, fatigue, arthralgia, and hepatosplenomegaly [4]. Chronic disease may lead to severe complications such as osteoarticular, cardiovascular, or neurological involvement, resulting in long-term disability and increased healthcare burden [5].

Turkey is an endemic country where brucellosis poses a persistent challenge, especially in rural regions where livestock farming is common and the traditional consumption of unpasteurized dairy products continues [6]. Official surveillance data indicate that the incidence of brucellosis in Turkey remains higher than in most European countries, highlighting the importance of preventive measures and public health education [6, 7].

Knowledge and awareness of brucellosis among the general population are crucial for effective prevention and control. Studies from endemic regions have shown that misconceptions about transmission routes and inadequate awareness of preventive measures contribute significantly to the persistence of the disease [8, 9]. Family medicine clinics, as the first point of contact for patients, provide a strategic opportunity for health education on zoonotic diseases and for promoting preventive practices [10].

Therefore, this study aimed to evaluate the knowledge levels of patients attending a family medicine outpatient clinic in Eastern Turkey regarding brucellosis, with the objective of identifying knowledge gaps and informing future public health interventions.

Methods

This cross-sectional descriptive study was conducted at the Family Medicine Outpatient Clinic of Kafkas University Medical Faculty Research Hospital, located in Eastern Turkey, between July 1 and September 30, 2023.

The study population included patients aged 18 years and older who attended the Family Medicine Outpatient Clinic during the study period. During the three-month data collection period, a total of 345 participants were recruited using a consecutive sampling method. Patients with communication difficulties or those who declined participation were excluded.

Data were obtained using a structured questionnaire developed from the existing literature and reviewed by subject experts to ensure content validity [11, 12]. The questionnaire comprised two sections: Socio-demographic data (age, sex, education, occupation, residence, etc.) and knowledge about brucellosis, including transmission routes, symptoms, complications, prevention, and treatment.

Face-to-face interviews were carried out by trained healthcare professionals. All participants were informed about the study objectives, and verbal as well as written consent was obtained prior to questionnaire administration.

Statistical Analysis

Data analysis was conducted using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables such as age were summarized as mean ± standard deviation, while categorical variables including socio-demographic characteristics and knowledge responses were presented as frequencies and percentages.

In addition, descriptive graphical representations were created to illustrate participants' knowledge of transmission routes, symptoms, and treatment, complementing the tabular data.

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Kafkas University Medical Faculty

prior to study initiation. Written informed consent was obtained from all participants.

Results

A total of 345 patients participated in the study. Of these, 52.8% (n=182) were female and 47.2% (n=163) were male. The mean age of participants was 33.05 ± 13.05 years (range: 18–93 years). Regarding educational status, 59.7% had a high school education or less, while 40.3% had completed university-level education. In terms of residence, 67.2% of participants lived in the city center, 10.7% in district centers, and 22.0% in rural areas (villages or small towns) (Table 1).

Table1. Sociodemographic characteristics of the participants

Variable	n	%
Gender		
Female	182	52.8
Male	163	47.2
Age (years)		
Mean ± SD (Range)	33.05 ± 13.05 (18–93)	-
Education level		
High school or less	206	59.7
University and above	139	40.3
Place of residence		
City center	232	67.2
District center	37	10.7
Rural (village/town)	76	22.0

Overall, 66.1% of the respondents reported that they had previously heard of brucellosis. However, when asked whether brucellosis is a zoonotic disease, only 29.3% gave the correct answer, while 70.7% were unaware of its zoonotic nature. Regarding transmission routes, more than half of the participants (56.2%) correctly identified the consumption of unpasteurized dairy products as a risk factor, while 43.8% did not recognize this association. Contact with infected animals was acknowledged as a transmission route by 31.3% of respondents, whereas 68.7% were unaware of this risk. Awareness of inhalation as a possible mode of transmission was particularly low, with only 14.5% providing the correct response (Table 2; Figure 1).

In terms of misconceptions, 15.9% of participants believed that brucellosis could spread from person to person, while 27.8% correctly rejected this statement and 56.2% indicated that they did not know.

Less than half of the respondents (45.5%) reported that they were aware of the clinical symptoms of brucellosis.

Table2. Knowledge of brucellosis among participants

Knowledge Item	Correct (%)	Incorrect / Misconception (%)	Did not know (%)
Heard of brucellosis	66.1	-	33.9
Identified as a zoonotic disease	29.3	70.7	-
Unpasteurized dairy products (risk factor)	56.2	43.8	-
Contact with infected animals	31.3	68.7	-
Inhalation of aerosols	14.5	85.5	-
Person-to-person transmission	27.8	15.9	56.2

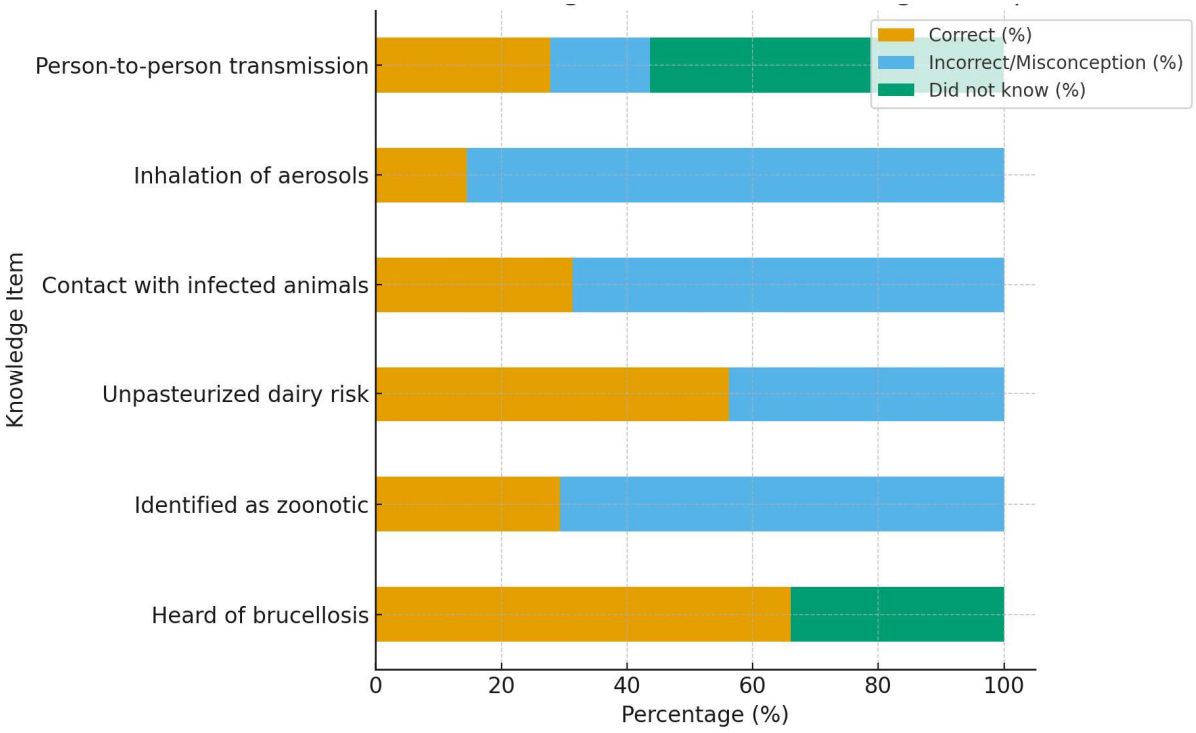

Figure1. Knowledge of brucellosis among participants (distribution of correct, incorrect, and unknown responses across key items).

Among specific symptoms, 43.8% identified fever, 33.9% recognized excessive sweating, and 28.7% acknowledged musculoskeletal pain as possible manifestations of the disease. Awareness of potential complications was limited; only 21.4% of participants indicated that they knew brucellosis could lead to serious health consequences (Table 3; Figure 2).

Table3. Knowledge of brucellosis symptoms and treatment among participants

Knowledge Item	Correct (%)	Incorrect / Misconception (%)
Aware of brucellosis symptoms	45.5	54.5
Recognized fever as a symptom	43.8	56.2
Recognized excessive sweating as a symptom	33.9	66.1
Recognized musculoskeletal pain as a symptom	28.7	71.3
Aware of potential complications	21.4	78.6
Knew that brucellosis is treated with antibiotics	40.9	59.1

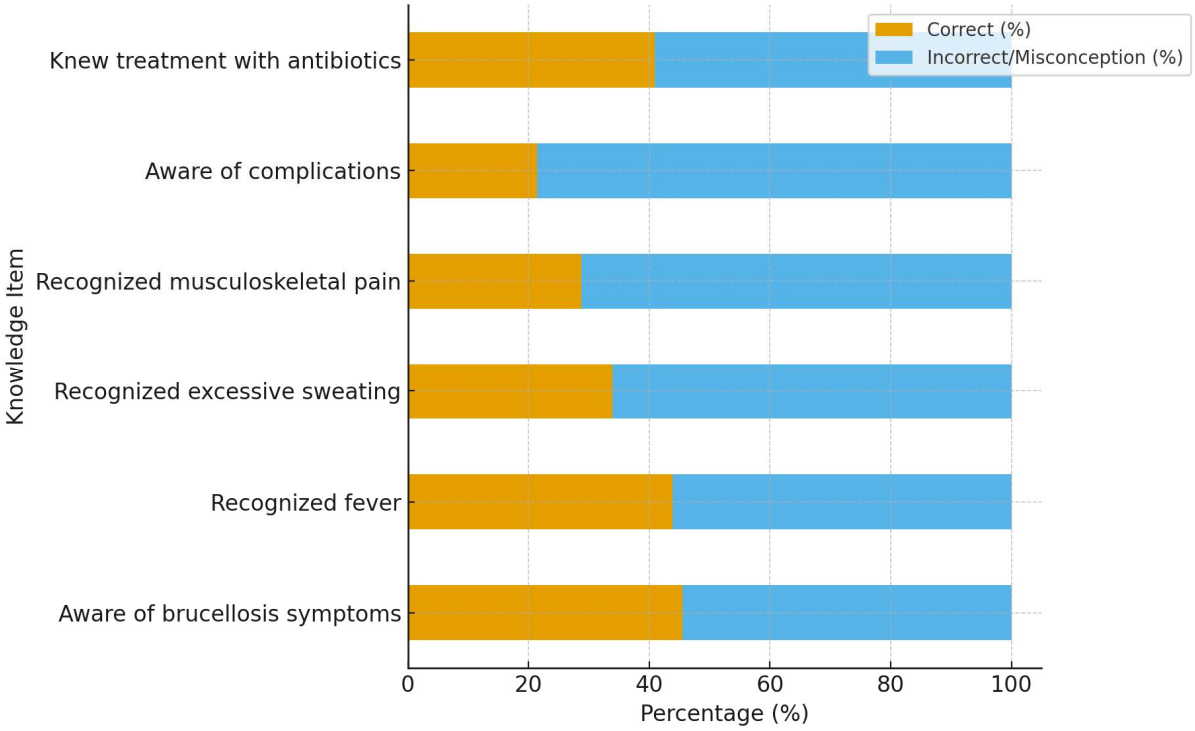

Figure2. Knowledge of brucellosis symptoms, complications, and treatment among participants

With regard to treatment, 40.9% of respondents correctly stated that brucellosis is treated with antibiotics, whereas 59.1% either did not know or held misconceptions about its management. These results highlight substantial knowledge gaps in both recognition of clinical features and awareness of effective treatment options for brucellosis (Table 3; Figure 2).

Among the respondents, 23.2% (n=80) reported owning animals. Regarding milking practices, 38.8% stated that they used gloves, 33.8% milked by hand, and 27.5% used a machine. When asked how they protected their animals from brucellosis, 68.8% reported vaccination, 13.8% said they would treat sick animals, and 17.5% stated that they did not know. Nearly half of the animal owners (46.3%) reported a history of abortion in their animals.

In terms of waste management, 67.5% disposed of aborted materials by burial, 31.3% discarded them in garbage, and 1.3% fed them to other animals. When asked about their actions toward aborted animals, 32.5% reported informing the provincial/district agriculture office, 27.5% would call a veterinarian, 11.3% would sell the animal, 5.0% would do nothing, and 23.8% did not know what action to take. Finally, 83.8% of animal owners stated that they would not consume the meat or milk of aborted animals, while 16.3% reported that they would (Table 4).

Table4. Knowledge of preventive measures and treatment options among animal-owning participants

Item	Response	n	%
Method of milking	With gloves	31	38.8
	Bare hands	27	33.8
	By machine	22	27.5
Protection against brucellosis	Vaccination	55	68.8
	Treat sick animal	11	13.8
	Do not know	14	17.5
History of abortion in animals	Yes	37	46.3
	No	43	53.8
Disposal of aborted materials	Burial	54	67.5
	Feeding to animals	1	1.3
	Disposing in garbage	25	31.3
Action for aborted animal	Do nothing	4	5.0
	Inform provincial/district agriculture office	26	32.5
	Call veterinarian	22	27.5
	Sell the animal	9	11.3
	Do not know	19	23.8
Consumption of meat/milk from aborted animal	Yes	13	16.3
	No	67	83.8

Discussion

In this study, patients' overall knowledge of brucellosis was limited, particularly regarding transmission routes, complications, and preventive measures. Although most participants had heard of the disease, only a minority correctly recognized its zoonotic nature and main sources of infection such as unpasteurized dairy products and direct animal contact. Awareness of symptoms was also incomplete: while fever and fatigue were frequently mentioned, more specific complications like osteoarticular and neurological involvement were rarely identified. Misconceptions, especially the belief in person-to-person transmission, were common. Preventive knowledge was poor, with fewer than half of participants recognizing the importance of pasteurization and animal vaccination. Many also believed the disease could not be effectively treated. These findings highlight a clear gap between awareness and accurate knowledge, emphasizing the need for targeted education in endemic regions.

Similar patterns have been reported in endemic areas such as Saudi Arabia and Iran, where general awareness did not translate into accurate understanding of transmission [9, 13]. Misconceptions, particularly about person-to-person spread, suggest that public health messaging remains insufficient and may contribute to stigmatization of patients [11]. The lack of recognition of unpasteurized dairy and animal contact as key transmission routes is concerning, as numerous studies in Turkey and neighboring countries confirm these as major risk factors [14, 15]. Community education programs focusing on food safety and livestock practices have proven effective in reducing infection rates [16], yet our results show that these messages have not reached the public effectively.

Recognition of clinical complications was also inadequate. While participants commonly mentioned non-specific symptoms such as fever and fatigue, they rarely identified more serious manifestations, including osteoarticular or neurological involvement. Similar findings have been reported by Zhang et al. [11] and Dean et al. [12], who showed that public awareness is often limited to early, flu-like signs. This lack of understanding may delay care-seeking, leading to underdiagnosis and chronic disease. Public education highlighting the disabling and systemic potential of brucellosis is needed to encourage timely treatment.

Preventive knowledge was strikingly low. Less than half of respondents identified pasteurization and livestock vaccination as effective measures, echoing findings from rural Turkey and Central Asia [17]. Misconceptions that the disease cannot be effectively treated were also common, reflecting fatalistic attitudes documented in previous research [5]. Such beliefs can reduce adherence to therapy and discourage care-seeking. Strengthening public messaging about prevention and the availability of effective antibiotics is therefore essential.

Interestingly, higher education and rural residence were associated with better knowledge. Similar paradoxical patterns have been reported in other endemic regions [18]. Rural residents, through direct contact with livestock, may develop practical knowledge, although often incomplete or based on traditional practices. Urban residents, in contrast, may have less exposure and fewer opportunities to learn about brucellosis. These results underline the importance of tailored interventions: urban populations require basic awareness campaigns, while rural groups may benefit from structured training in livestock practices and food safety.

This study has several strengths. It is one of the few investigations from Eastern Turkey to assess brucellosis knowledge in a family medicine outpatient setting, the first point of contact in the healthcare system. Including both urban and rural participants provides a broader view of public awareness, and the relatively large sample size enhances the reliability of the findings.

What distinguishes this study from previous research is its setting and scope. Earlier studies in Turkey and other endemic countries mostly focused on rural or high-risk groups such as livestock owners and farmers. By assessing both rural and urban patients in primary care, this study offers a more representative picture of public knowledge. Moreover, by documenting misconceptions such as person-to-person transmission and poor

awareness of prevention strategies, it identifies specific targets for community-based interventions not clearly addressed in earlier work. This adds novel evidence to the literature and highlights the strategic role of family medicine in zoonotic disease prevention.

Some limitations should also be noted. The cross-sectional design prevents causal inferences, and the single-center setting limits generalizability. Reliance on self-reported knowledge may have introduced recall or reporting bias. In addition, the questionnaire was not formally tested for validity and reliability, and the use of consecutive sampling could have introduced selection bias. As a result, the findings may not fully represent the wider population. Future research using probability-based sampling methods is recommended to improve external validity.

Despite these limitations, the study reveals an important public health challenge: persistent misconceptions and low awareness of prevention in an endemic area. Strengthening educational programs in family medicine clinics, integrating brucellosis awareness into community-based campaigns, and enhancing collaboration between veterinary and human health services within a “One Health” framework are essential steps to reduce the burden of this preventable disease.

In conclusion, this study demonstrated that while general awareness of brucellosis among patients was moderate, detailed knowledge of transmission routes, complications, and preventive measures was insufficient. Misconceptions such as person-to-person transmission and doubts about treatment efficacy were common. Higher education and rural residence were associated with better knowledge, underlining the need for targeted strategies.

Based on these findings, several concrete public health recommendations can be made. Family medicine clinics should play a central role in delivering structured education to patients during routine visits. Community-based health campaigns and school-based education programs should be developed to improve awareness among younger populations and families. Closer collaboration between physicians and veterinarians is also critical to ensure food safety, promote livestock vaccination, and reduce zoonotic transmission. Integrating these measures within a “One Health” approach would help to decrease the burden of brucellosis in endemic regions and improve overall public health outcomes.

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