



Seroprevalence of Brucella Infection among Students at Amran University- Yemen

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Received 24 May 2024; accepted in final form 16 September 2024.

Abstract

Background and Aim: Brucella infection in animals is considered a great problem in most countries around the world and is considered one of the important pathogenic zoonosis infections in humans. This study aimed to determine the prevalence of Brucella infection among students at Amran University, Yemen. Methods: It is a cross-sectional study carried out among 247 students between January 2023 and November 2023. Blood samples were collected and Brucella Antigen was detected using immunochromatographic technology. Results: Out of 247 human samples 17 samples (6.9%) were positive for brucella Antigen 2 (1.75%) were positive among males, and 15 (12.5%) were positive among females. Regarding the residence of students the results showed that 49 (19.8%) were from Amran City and 198 (80.2%) from rural areas, The risk factors for Brucella infection were ranching, drinking milk without pasteurization, and direct contact with livestock. Conclusion: The prevalence of brucellosis was low among the study's participants but it will become a serious problem that threatens the health care system in Yemen. So, awareness programs should be provided to students and the general population about Brucella infection and its risk factors.

Keywords: Prevalence, Brucellosis, Students, Risk factors, Amran University, Yemen.

المخلص: الخلفية والهدف: تعتبر عدوى البروسيلا في الحيوانات مشكلة كبيرة في معظم دول العالم وتعتبر واحدة من الأمراض الحيوانية المنشأ الهامة للإنسان والتي تسبب الحمى المالطية. هدفت هذه الدراسة إلى تحديد مدى انتشار عدوى البروسيلا بين طلاب جامعة عمران، اليمن. **الطرق:** دراسة مقطعية أجريت على 247 طالبًا في الفترة ما بين يناير 2023 ونوفمبر 2023. تم جمع عينات الدم والكشف عنها باستخدام تقنية التحليل الكروماتوغرافي المناعي. **النتائج:** من أصل 247 وجد أن معدل الإصابة كانت 17 عينه ينسبه (6.9%): 2 (1.75%) كانت إيجابية بين الذكور، و15 (12.5%) بين الإناث، واعتمادا على مكان الإقامة حيث كانت 49 (19.8%) هم من سكان مدينة عمران و198 (80.2%) من المناطق الريفية. وكانت عوامل الخطر للإصابة بالبروسيلا هي تربيته المواشي، شرب الحليب دون بسترة، والاتصال المباشر بالماشية. **الاستنتاج:** كان معدل انتشار داء البروسيلات منخفضا بين المشاركين في الدراسة ولكن قد تصبح مشكلة خطيرة تهدد نظام الرعاية الصحية في اليمن. لذا يجب توفير برامج توعية للطلاب وعامة السكان حول عدوى البكتيريا المسببة للحمى المالطية وعوامل الخطر المرتبطة بها.

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Introduction

Brucellosis is a widespread zoonotic infection caused by *Brucella* spp., Gram-negative facultative intracellular pathogens, often leading to abortion or reproductive disorders in domestic and wild mammals [1–2].

The genus *Brucella* includes several species that were classified with respect to phenotypic characteristics, pathogenicity, and host preference, including *Brucella melitensis* (goats and sheep), *Brucella abortus* (cattle), *Brucella canis* (dog), *Brucella ovis* (sheep), *Brucella neotomae* (desert woodrat), and *Brucella suis* (swine) [3–4]. Its distribution is worldwide, apart from the few countries where it has been eradicated from the animal reservoir.

Although brucellosis commonly presents as an acute febrile illness, its clinical manifestations vary widely, and definitive signs indicative of the diagnosis may be lacking. Thus, the clinical diagnosis usually must be supported by the results of bacteriologic and/or serologic tests [2].

Consuming unpasteurized milk or cheese from infected sheep or goats is the primary source of the majority [5–8]. Every year, more than 500,000 new instances of the illness are recorded [9–14]. The World Health Organization (WHO) asserts, however, that this number has been exaggerated [15]. *Brucella* infection is a risk for people of all ages. However, some research revealed that men were more likely than women to contract *Brucella*, and it was determined that this was probably because they worked as butchers and slaughterhouse employees [16].

Yemen is one of the emerging nations lacking policies and plans in place to manage or stop the spread of harmful microbes among their populace [17–18]. Information on the frequency of *Brucella* infection among Amran University students is scarce. Thus, the goal of the current investigation was to ascertain the incidence of *Brucella* infection among students at Amran University, Yemen.

Materials and Methods

Study area and period

It is a cross-sectional study carried out among students at Amran University located in Amran governorate during the period from January 2023 to November 2023.

Data collection

Data were collected from each student through a standard predesigned questionnaire designed for this study, which includes; demographic information (name, age, gender, Type of residence) and risk factors.

Sample collection and Examination

A total of 5 mL of whole blood was collected aseptically by venipuncture from each student, and then serum was separated by centrifugation after blood clotting. The samples were transported to central Laboratories at Amran University and stored at -20°C for analysis. All separated serum samples were screened for *Brucella* antigen by using a cassette test (Evan Care, China).

Laboratory test

The brucella antigen rapid test cassette is a qualitative lateral flow immunochromatographic assay for the detection of brucella antigen in human serum or plasma specimens. Positive and negative control was used to ensure the test accuracy according to standard procedure.

Statistical analysis

The data were analyzed using the SPSS program (version 22.0). Categorical variables were reported as frequencies and percentages in tables and figures.

Results

A total of (247) samples were collected and the rate of incidence by brucellosis was 17/247 (6.9%) and the rest 230/247 (93.1%) were negative for the *Brucella* antigen test (Figure 1).

According to the socio-demographic information, the results showed that; the majority of specimens were collected from males 127 (51.4%) and 198 (80.2%) in the age group 24–30 years old single students was 158 (63.9%), and who come from rural area was 198 (80.2%) as listed in Table 1.

Table 1. Socio-demographic parameters of study subjects

Variables		Frequency	Rate (%)
Gender	Male	127	51.4
	Female	120	48.6
Age group	18–23	49	19.8
	24–30	198	80.2
Marital status	Single	158	63.9
	Married	89	36.8
Residence	Urban	49	19.8
	Rural	198	80.2

The study showed that the 17 (6.9%) specimens were recorded as positive for the Brucella antigen test, while

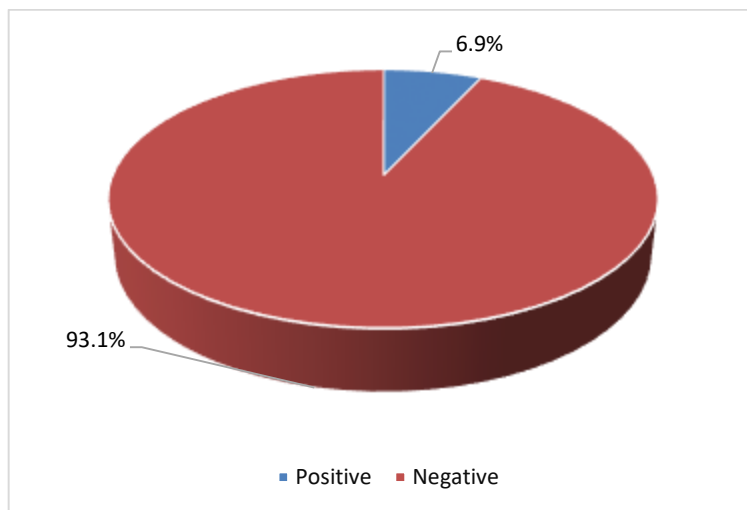


Figure 1. Prevalence of Brucella antigen among study subjects

The study results revealed that the Brucella infections were significantly higher among females (12.5%) compared to males (1.57%). Also, the age group of 24–30 years had a higher rate of Brucella infections (57.9%) than the age groups of 18–23 years (12.4%) with a significant difference ($P < 0.05$). In addition, a high rate of Brucella antigen was observed among single students (22.6%) and individuals coming from rural areas (57.9%) with a significant difference ($P < 0.05$), as shown in Table (2).

Table 2. Distribution of Brucella infections based on socio-demographic parameters of study subjects

Variables	Frequency	Infected No. (%)	Non-infected No. (%)	χ^2	CI 95%	P-value
Gender	Male	127 (51.4)	2 (1.57)	0.198	1.443-1.569	0.656
	Female	120 (48.6)	15 (12.5)			
Age group	18–23	49 (19.8)	6 (12.4)	89.88	1.75-1.85	0.000
	24–30	198 (80.2)	11 (57.9)			
Marital status	Single	158 (63.9)	7 (22.6)	19.275	1.899-1.963	0.000
	Married	89 (36.8)	10 (11.2)			
Residence	Urban	49 (19.8)	6 (12.4)	89.883	1.75-1.85	0.000
	Rural	198 (80.2)	11 (57.9)			

χ^2 =Chi-square test; 95% CI= 95% Confidence Interval; Significant statistics at p -value < 0.05 .

The high rate of Brucella infection was reported among individuals who had a family medical history (30.0%), ranching (22.2%), direct contact with livestock (10.5%), drinking water before pasteurization (8.9%), and washing their hands before eating (7.7%). The statistical results showed there is a significant difference between Brucella prevalence and study risk factors, including ranching, direct contact with livestock, and family medical history, as listed in Table 3.

Table 3. The major risk factors of *Brucella* infection

Variables		Frequency	Infected No. (%)	Non-infected No. (%)	P-value
Washing hands	Yes	130	10 (7.7)	120 (92.3)	0.598
	No	117	7 (6.0)	110 (94.0)	
Ranching	Yes	40	9 (22.5)	31 (77.5)	0.000
	No	207	8 (4.0)	199 (96.0)	
Drink milk without pasteurization.	Yes	124	11 (8.9)	113 (91.1)	0.217
	No	123	6 (4.9)	117 (95.1)	
Direct contact with livestock	Yes	87	10 (10.5)	77 (88.5)	0.035
	No	160	7 (4.4)	153 (95.6)	
Family medical history	Yes	64	14 (30.0)	50 (70.0)	0.000
	No	183	3 (1.6)	180 (98.4)	

Significant statistics at *p*-value <0.05

Discussion

Brucellosis is a bacterial zoonosis transmitted directly or indirectly to humans from infected animals, predominantly domesticated ruminants and swine. The disease is known colloquially as undulant fever because of its remittent characteristics [19].

The rate of prevalence by brucellosis was (6.9%), this result was similar or lower than previous studies in Yemen (7.9–29%), [20–21], Saudi Arabia (23%) [22], Ethiopia (31.5%) [23], India (22.5%, 29.4%) [24, 25], Pakistan (10.1%) [26], south-western Uganda (14.9%) [27], and Nigeria (14.9%) [28]. In contrast, the current result was higher than that reported in Yemen (6.7%) [29] and Bangladesh (2.0%) [30]. The discrepancy in the prevalence rate of *Brucella* infection could be attributed to a variety of factors, including geographical location, survey duration, study subject characteristics, diagnostic approach, sample size, and use of control and prevention measures.

In the current study, the proportion of *Brucella* antibodies among females was 12.5%, while this rate in males was 1.57% lower than in females. Similar results were also recorded in Iraq [31]. In contrast, this result differs from previous studies in Yemen and India, where the incidence among males is higher [24–25, 32].

Current data indicate that most females were housewives and exposed to brucellosis risk factors as they directly handled milk or meat or looked after animals [32]. The results showed 49 (19.8%) from Amran city, while 198 (80.2%) were from rural areas, and the prevalence of Brucellosis was higher among students in the age group of 24-to-30 years. This is in contrast to the higher risks for the 20-year-old group, which were found in Egypt (62%) [33], Ethiopia (48.1%) [23], and northern Tanzania (46%) [34].

Currently, there is a clear need for doctors in Yemen to be made aware of the frequency of this infection and the means available for clinical and laboratory diagnosis and effective treatment, and the health authorities should recognize these efforts by researchers and be prepared to help them with more studies in infectious diseases, particularly brucellosis, in the future.

There are various explanations behind Yemen's high prevalence of infections, particularly in the Amran governorate. These challenges encompass living situations, economic and environmental factors, a lack of public health awareness, a lack of sanitary facilities and infrastructure, a lack of pasteurization of milk, and a lack of access to safe drinking water [35–40].

Limitations of the study

The limitations of this study include a small sample size, serologic tests performed using rapid assays, and a lack of more advanced diagnostic techniques such as Enzyme-linked Immunosorbent Assay (ELISA), which is highly accurate and reliable due to limited resources.

Conclusion

These findings revealed a low prevalence of human brucellosis among students of Amran University in Amran governorate and will become a serious problem that threatens the health care system in Yemen. So, awareness programs should be provided to students and the general

population about Brucella infection and its risk factors. Awareness of brucellosis transmission routes can guide the community and prevent further infection.

Conflict of Interest

The authors have no conflict of interest.

Acknowledgments

The authors would like to thank the team investigators, including Afaf A. Al-Dali. Zayed H. Al-Jaara. Iman M. Al-Qahali. Fouad M. Al-Haiti. Bakil S. Hajj. Ibrahim Al-Jathim. Tayseer M. Naji. Hassan A. Al-Kabsh. Loza Q, Al-Shayba. Widad Y. Al-Zaarour. Hussain H. Al-Jahali and Sadam H. Al-Hamdi for their generous help in collecting data and specimens. All authors would like to gratefully express their gratitude to the students of Amran University, teachers, and doctors for their contribution and support during the various aspects of the study.

Author Contributions

Al-Hadheq and Al-Mahbashi Conceived and designed the experiments. Al-Hadheq performed the experiments: Al-Hadheq and Al-Wajeeh analyzed the data and wrote the first draft of the manuscript. Al-Haj contributed to the writing of the manuscript. Al-Hadheq and Edrees agree with the manuscript results and conclusions. All authors have read, revised, and approved the final manuscript.

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