



Brucellosis: A risk factor to human population at district Swat

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Brucellosis is a bacterial zoonotic disease transmitted from bovines and cattle to humans, predominantly in those people who are in close contact with the animal or using unpasteurized milk or products. The objective of the study was to point out the prevalence of brucellosis in the human population of two tehsils (Babozai and Charbagh) of District Swat. A total of 800 blood samples were collected from symptomatic people. A total of 476 samples were collected from females and 324 from males, in which the prevalence of brucellosis was found 34.4% and 19.7% respectively. The overall prevalence of the disease was 28.5% while the prevalence of *Brucella melitensis*, *Brucella abortus* and mixed cases were 70.17%, 15.78%, and 14.03% respectively. The prevalence of the disease was more in Charbagh (59.64%) than in Tehsil Babozai (40.36%). The prevalence rate was high in the age group of 31-40 years (29.82%) while lower in the age group of 1-10 years (1.75%). In conclusion, brucellosis is a real threat to human health and wealth.

Keywords: Brucellosis, Swat, *Brucella melitensis*, *Brucella abortus*, prevalence

INTRODUCTION

Brucellosis is a bacterial zoonotic and contagious disease mainly transmitted from animals to humans. Brucellosis is caused by many species of genus *Brucella* like *Brucella melitensis*, *B. abortus*, *B. suis*, *B. neotome*, *B. canis*, *B. ovis*, *B. ceti*, *B. pinnipedialis*, *B. microti* and *B. inopinata*. These species of *Brucella* affect many hosts such as *Brucella melitensis* causes disease in goats and sheep, *B. abortus* causes disease in bovine and bubaline, *B. suis* causes disease in swine, hares, reindeers and rodents, *B. neotome* causes disease in desert rat, *B. canis* cause disease in canines, *B. ovis* cause disease in ovine, *B. ceti* cause disease in cetaceans, *B. pinnipedialis* cause disease in pinniped, *B. microti* cause disease in wood mouse and most recently *B. inopinata* is the causative agent of disease in human (Soares et al. 2015). Mostly goats and sheep are affected by *B. melitensis* which is the most common causative agent of human brucellosis (Osoro et al. 2015).

Brucella is a small, non-motile, gram-negative coccobacillus, aerobic and facultative intracellular bacteria. *Brucella* has the ability to replication, persist in host cells and cause persistent disease (Gul and Khan, 2007). There are many names for brucellosis which are Rock of Gibraltar fever, Bang's disease, undulant fever

and Malta fever, Brucellosis was found in the eighteen century its history belongs to the Crimean War, the *Brucella* organism was first time found in carbonized cheese during Roman Era. In the 20th century, Brucellosis was first time known as a Disease which Infected humans on the Island of Malta (Capasso, 2002). Human is infected when they consume contaminated milk or dairy products or by Self contact with the affected animals and their products (Minas et al. 2007). The transmission to humans also occurs through inhalation of aerosolized secretions (Shahid et al. 2014). After the intaking of *Brucella* species by the human it crosses the intact gastrointestinal layer and is then engulfed by macrophages and neutrophils, they live in lymphatic system tissue and Peyer patches and rapidly spread throughout the body, surviving inside phagolysosomes (Lopes et al. 2010). *Brucella* causes significant reproductive losses in animals (Tibesso et al. 2014). In humans mainly these patients may be referred to as patients with PUO (pyrexia of unknown origin) or the signs and symptoms are confused with other diseases such as typhoid fever, rheumatic fever, spinal tuberculosis, pyelitis etc. (Smits and Kadri, 2005). Brucellosis is a cosmopolitan disease (Alavi et al. 2007) that infects more than 0.5 million people every year (Osoro et al. 2015). Out of ten, five countries in Asia

were reported with the highest occurrence of human brucellosis. Worldwide the highest annual incidence was reported in Syria reaching up to 1603 cases per million per year followed by Turkey, in 2004 about 15000 cases were reported. A national survey was conducted in Saudi Arabia in which the incidence rate of human brucellosis reached 40 cases per 100,000 (Al Ali and Alluwaimi, 2009). The overall incidence of brucellosis was reported to be 12.09% in India, especially in Punjab (Singh et al. 2014). Brucellosis is now emerging threat in Pakistan. Like in different part of the world It has been estimated that incidence of brucellosis in Pakistan is about 70% (Shahid et al. 2014) and (Mohmand et al. 2012).

OBJECTIVES:

The objectives of the study were as follows (1) To bring awareness about the prevalence of brucellosis infection in the people. (2) To find out the seroprevalence of brucellosis in the human population of district Swat, Khyber Pakhtunkhwa, Pakistan.

MATERIALS AND METHODS

Study area:

The valley of Swat is situated in the north of Khyber Pakhtunkhwa Pakistan, (35° 12' 0" N, 72° 29' 0" E). Gilgit and Chitral are situated in the north, Mardan in the south and Dir in the west, while Indus separates it from Hazara in the east. The average temperature of District Swat is varying, like the summer in Lower Swat Valley is short and moderate while it is cool and refreshing in the upperpart. The maximum temperature of Swat in June is 33°C and 16°C, respectively. The coldest month is January with mean maximum and minimum temperatures of 11°C and -2°C, respectively. The total area of District Swat is 5337 sq. km. The estimated population of Swat was 1,811,425 in 2009 (Bangash, 2012; Ullah et al. 2020; Ullah et al. 2023). The district is divided into seven tehsils but the present study was conducted in two tehsils of District Swat named as Tehsil Babozai and Tehsil Charbagh.

Materials:

Materials used in the present study were clean slides, slide tray, cotton, sterilized syringes and water, freezer, micropipette, tips, EDTA tube, centrifuge, forceps, gloves, droppers, stirrer, second book and stationery.

Sample collection:

A total of 800 samples were collected from symptomatic people from two tehsils of District Swat (Babozai and Charbagh). The blood collection points were the laboratory, health center, participants at home or any other place. A properly designed questionnaire

was filled in from each person which was comprised of information about the disease.

Procedure:

For the diagnosis of brucellosis, first, 2ml blood was taken from the suspected or symptomatic patient through a disposable syringe and then putted into an EDTA tube. In the laboratory, the blood was centrifuged at 5000rpm for 7-10 minutes for extraction of serum. Two slides were taken and one drop of serum was poured on each slide for the detection of antibodies produced against the two species of *Brucella*. (*Brucella abortus* and *Brucella melitensis*). One drop of *Brucella abortus* antigen was poured on one slide while one drop of *Brucella melitensis* antigen was poured on another slide.

RESULTS

The present research was based on the prevalence of brucellosis in the human population of two Tehsils (Babozai and Charbagh) of Swat. 800 samples were collected from both tehsils 400 from each. Sampling was done from symptomatic people. Samples were collected from both males 324(40%) and females 476(60%) (Figure 1).

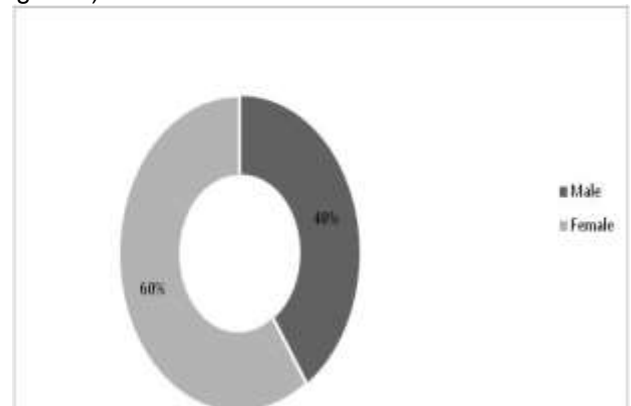


Figure 1: Total gender-wise sample collection

In 800 cases, 28% were positive while the remaining were negative (72 %) (Figure 2).

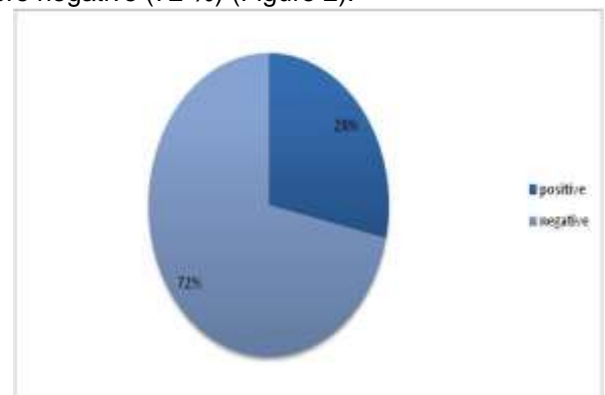


Figure 2: Overall prevalence of brucellosis

The species identified in the infected cases were

Brucella abortus and *Brucella melitensis*. A total of 160 (70.17%) cases were infected by *B. melitensis* followed by *B. abortus* (15.71%) and mixed (both *B. abortus* and *B. melitensis*) (14.03%) (Figure 3).

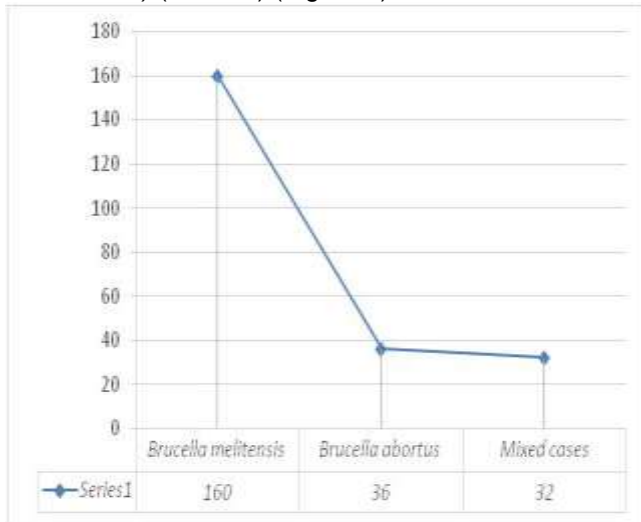


Figure 3: Specie-wise prevalence of brucellosis

The prevalence of brucellosis was higher in Tehsil Charbagh (57.8%) as compared to Babozai (42.1%) (Table 1). A total of 324 samples were collected from males in both tehsils of which 64 samples were positive while the 476 samples were collected from females in both tehsils in which 164 samples were positive. The seropositivity of brucellosis was higher in females (34.4%) as compared to males (19.7%) (Figure 4).

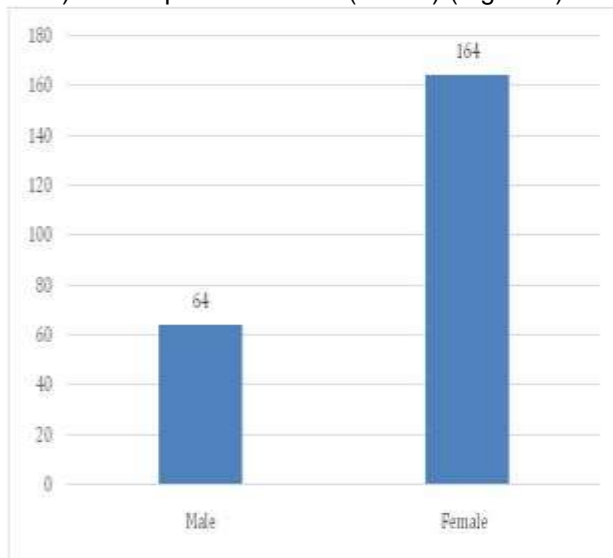


Figure 4: Gender-wise prevalence of brucellosis

The highest species-wide prevalence of *B. melitensis* in gender was observed in females as compared to males (table 2).

The percentage of brucellosis was observed in

different age groups of people. Based on age, the patient was classified into different groups. The prevalence was noticed in young to adult age of people. The highest rate of prevalence was noted in the age group of 31 to 40 years (29.82%) followed by the age group of 21 to 30 years (28.03%), 11 to 20 years (15.78%), 41 to 50 years (15.78%), 51 to 60 years (5.26%), 61 to 70 years (3.58%).

Table 1: Tehsil wise prevalence of *Brucella* specie

Tehsils	<i>Brucella abortus</i>	<i>Brucella melitensis</i>	Mixed cases	Total
Babozai	12	68	12	92
Charbagh	16	92	20	136
Total	28	160	32	228

Table 2: Gender-wise prevalence of *Brucella* species

Gender	<i>Brucella melitensis</i>	<i>Brucella abortus</i>	Mixed cases	Total
Male	36	20	08	64
Female	124	16	24	164
Total	160	36	32	228

Table 3: Age-wise percentage of positive cases

Age	Positive cases	Percentage %
1 to 10	4	1.75
11 to 20	36	15.78
21 to 30	64	28.03
31 to 40	68	29.82
41 to 50	36	15.78
51 to 60	12	5.26
61 to 70	8	3.58

Brucellosis is transmitted by different ways to human as shown in table 4.

Table 4: Different ways of transmission of brucellosis

Way of transmission	Positive cases
Pets presence	208
Unpasteurized milk	208
Uncooked meat	36
Direct contact	68

At all age groups, the lowest prevalence was found in 1 to 10 years (1.75%) (Table 3).

DISCUSSION

According to Gill et al. (2000), the seroprevalence of 790 professionals and 198 animal dealers in Punjab State were screened for *Brucella agglutinins* of which (26.11%) individuals had *Brucella agglutinins* and 215 (21.76%) had diagnostic titers. The current study shows a high degree of relevance to the study Gill et al. (2000). The higher prevalence rate may be due to several reasons. In both studies, the samples were diagnosed on the same method brucella agglutinin and also both the study areas show the same social and cultural values. Mangalgi et al. (2015) conducted a study on "Human brucellosis still an unfamiliar and misdiagnosed disease in India" In their study, the blood culture for brucellosis was positive in 44.76% of cases which is quite different from the current study. The study of Mangalgi et al. (2015) shows a higher rate of prevalence because of different climatic conditions. Prakash et al. (2012) conducted a study on "Epidemiology of brucellosis in a high-risk group and PUO patients of western Rajasthan" Total of 570 Samples were processed for anti-brucella antibody detection by agglutination test by stained febrile antigen, the maximum positivity rate was seen in veterinarians and milkman (37.14%) followed by meat handlers (26.66%) and in PUO Patients 108 (25.72%). Regarding the present study, it shows similarities, especially in the average prevalence of different professions. The study shows a resemblance to average prevalence because of the same protocol. Shahid et al. (2014) conducted a study on the "Prevalence of Brucellosis among the hospital patients of Peshawar, Khyber Pakhtunkhwa" in which farmers 32.90%, livestock breeders 32.67%, employees 29.2% and other patients 27.04% were diagnosed for brucellosis. This study also shows close resemblance to the current study because of the same climatic condition and same method of sampling.

Cetinkaya et al. (2005) conducted a study on "Seroprevalence of human brucellosis in a rural area of Western Anatolia, Turkey" in which they alarmed females a greater risk of infection as compared to males showed values of his study 6.3% and 3.1% respectively. This study strongly supports our experiments and comments, that the risk of brucellosis is higher in females because of handling of the dairy products which is a source of the disease transmission. According to Nasinyama et al. (2014), their study has shown that overall, the STAT "Sero-prevalence of human brucellosis among cattle keepers in Mbarara and consumers of milk in Kampala district" were high which is highly matched with our reports. The disease is transmitted by consuming unpasteurized milk which is proved by Capasso (2002) in his study about the "Prevalence of antibodies to *Brucella abortus* in marketed milk in Kenya and its public health implications" he points out that at consumer-level as diagnosed by both ELISA and MRT

were 4.9% and 3.9%, respectively indirect ELISA classified more consumer- and market-level samples as *B. abortus* positive than MRT. According to Prakash et al. (2012) in PUO Patient 80 Patients had a history of contact with animal, and 48 gave a history of consuming raw milk this study shows a high degree of resemblance to our current study and supports the evidence that the main source of infection to the human is the presence of cattle and use of unpasteurized milk.

CONCLUSIONS

It has been concluded that the overall prevalence of brucellosis was 28.5% in the two Tehsils of District Swat. The main causative agents were *Brucella abortus* and *Brucella melitensis* II. The age group at high risk to the disease was 31-40 years (29.82%). Brucellosis is a risk factor to the population of District Swat.

Supplementary materials

The supplementary material / supporting for this article can be found online and downloaded at: <https://www.isisn.org/article/>

Author contributions

Conceptualization, N.U.; methodology, O.H. and S.I.; software, N.U. and M.I.; validation, A.R.; formal analysis, N.U. and O.H.; investigation, N.U. and O.H. resources, M.Y.; data curation, N.U.; writing-original draft preparation, O.H. and S.I.; writing-review and editing, N.U. and S.I.; visualization, A.R. and M.I.; supervision, N.U.; project administration, A.R.; funding acquisition, O.H and N.U. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was approved by the Bioethical Committee of the University of Swat.

Informed Consent Statement

Not applicable.

Data Availability Statement

All of the data is included in the article/Supplementary Material.

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Conflict of interest

The authors declare no conflict of interest.

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