

# Potential Risk Factors of Brucellosis in Dairy Farmers of Peri-urban Areas of South West Delhi

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## Abstract

**Background:** Brucellosis is a bacterial disease caused by various *Brucella* species, which mainly infect cattle, swine, goats, sheep, and dogs. Humans generally acquire the disease through direct contact with infected animals, by eating or drinking contaminated animal products, or by inhaling airborne agents. The majority of cases are caused by ingesting unpasteurized milk or cheese from infected goats or sheep. **Objective:** The objective of the study was to identify the exposure to potential risk factors of brucellosis among the dairy farmers of South West Delhi. **Materials and Methods:** This cross-sectional study was carried out in Jhuljhuli village of Najafgarh division in South West Delhi from January 2017 to April 2017. One hundred individuals were selected through snowball sampling method. A semistructured questionnaire was designed to conduct interviews for data collection. **Results:** On analysis, it was found that only 36% of the respondents get their animals vaccinated regularly. Regarding the treatment of the animals, 70% of the individuals said that they treat their animals on their own. 72% of the individuals' animals had cases of abortion in the last 1 year. 100% of the respondents reported assisting their animals during reproduction without using any protective gear. Almost half (57%) of the respondents consumed raw milk at their home on different occasions. **Conclusions:** The study concluded in bringing out the contributing risk factors for brucellosis. The study concluded that treating animal infection on their own and helping animals during reproduction without using protective gear, as major contributing risk for brucellosis. Other factors includes, keeping animals in close proximity during sleep, irregular vaccination, etc.

**Keywords:** Brucellosis, peri-urban area, prevention, risk factors, zoonosis

## INTRODUCTION

Brucellosis, also known as undulant fever, Mediterranean fever, or Malta fever, is a zoonotic infection transmitted by direct or indirect contact with infected animals or their products.<sup>[1]</sup> The WHO considers brucellosis to be a neglected zoonosis, because despite its widespread distribution and effects on multiple species, it is not prioritized by national and international health systems.<sup>[2]</sup> It is caused by Gram-negative bacteria of the genus *Brucella* which show strong host preference. The species of *Brucella* which infect livestock and their primary hosts are *Brucella melitensis* (sheep and goats), *Brucella abortus* (cattle), *Brucella suis* (pigs), and *Brucella ovis* (sheep). Brucellosis decreases the productivity of infected livestock by causing abortions, reducing fertility, and decreasing milk yield, resulting in substantial economic losses in the livestock industry because of abortions, decreased milk production, sterility, and veterinary care and treatment costs. Brucellosis was first reported in Egypt in 1939. Control

programs for brucellosis in Egypt have used two methods: vaccination of all animals and slaughter of infected animals with positive serologic results. The difficulty of accurately detecting all infected animals, especially carriers, is a major limitation of these programs. To enhance the efficiency of brucellosis-specific prophylaxis, early detection of brucellosis by highly sensitive and specific methods is needed.<sup>[3]</sup> In humans, brucellosis is often easily misdiagnosed as other febrile syndromes such as malaria and typhoid fever, thereby resulting in mistreatments and underreporting.<sup>[4]</sup> It affects people irrespective of age groups and gender. Although there has been great progress in controlling the disease in many

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countries, there remain regions where the infection persists among domestic animals and, consequently, transmission to the human population frequently occurs.<sup>[1]</sup> The disease is also associated with chronic and debilitating infections in humans and reproductive failure in domestic animals.<sup>[2]</sup>

Globally, over 500,000 human cases of brucellosis per year are reported. In Sub-Saharan Africa, brucellosis prevalence is unclear and poorly understood with varying reports from country to country, geographical regions, as well as animal factors. Less has been reported in humans than in animals. It is an important public health problem worldwide, particularly in Mediterranean region, including Iran, Turkey, the Arabian Peninsula, the Indian subcontinent, Mexico, and parts of Central and South America.<sup>[5]</sup> The true incidence of human brucellosis is unknown for most countries with no data are available for India, but it estimated that the true incidence may be 25 times higher than the reported incidence due to misdiagnosis and underreporting. Several publications have indicated that human brucellosis can be a fairly common disease in India.<sup>[6]</sup>

The general objective of the study was to identify the exposure factors contributing to the potential risk of brucellosis among dairy farmers of South West Delhi. Specific objectives of the study were to identify the animal husbandry practices that contribute to the risk of infection of brucellosis in dairy farmers of South West Delhi and to identify the behavioral practices that contribute to infection of brucellosis in humans.

South West Delhi is one of the 11 administrative districts of the National Capital Territory of Delhi in India. The suburb of Dwarka serves as the administrative headquarters of South West Delhi. The district comprises three subdivisions, Vasant Vihar, Najafgarh, and Delhi Cantonment, and is composed of urban and peri-urban areas with a population of 2,292,363.<sup>[7]</sup> The population density is 5445/m<sup>2</sup> with a literacy rate of 88.81% and total area stretching around 421 km<sup>2</sup>. Najafgarh comprises 39 villages, of which Jhuljhuli village was selected for the study. According to the decadal census 2011, total 300 families reside in the village with a total population of 1662 (884 are male and 778 are female).

## MATERIALS AND METHODS

### Study area

This study was carried out in Jhuljhuli village of Najafgarh division of South West Delhi.

### Study design

This was a cross-sectional descriptive study.

### Study population

The study population consisted of households with livestock. Individuals spending maximum time in cattle work were approached to participate in the study. A total of 100 households were selected for data collection as per convenience. Snowball sampling technique was used for data collection. The

interviewer visited the area along with the questionnaire, and those who were willing to participate were interviewed.

### Data collection

The data were collected through interviews with the help of a questionnaire. This questionnaire consisted of a combination of open-ended and close-ended questions. It also included questions on sociodemographic factors and various animal husbandry practices such as vaccination of cattle, proximity of animals with humans at night, handling of aborted material and retained placenta, assistance in reproductive procedures, contact of cattle with other animals during grazing, person involved in milking, gender roles and responsibility. In addition, the way in which milk was being consumed within the family was also assessed along with the frequency of consumption of dairy products.

### Data analysis

The data collected were edited; were screened for errors, omission, accuracy, uniformity, and completeness; and were then arranged to enable coding, and tabulation before analysis was carried out. The analysis was done using the SPSS (IBM Cognos, SPSS statistics, Version 22, Ottawa, Canada), and percentages were displayed using tables and graphs. Scoring of risk was also done on the scale of 0–14 (as out of the 22 questions in the questionnaire, there were 14 questions related to risk practices), where “0” meant “no risk” and “14” meant “on high risk.” For every risky practice followed by the respondent which is a risk factor of transmitting disease, a score of 1 was given or else score of 0 was given if following healthy practices.

### Ethical clearance

Ethical waiver certificate was taken from the Ethic Committee, IIHMR, New Delhi. Furthermore, the respondents were informed about the confidentiality, voluntary participation, and right to leave anytime during the study.

## RESULTS

A total of 107 households were approached to meet the required sample size of 100 households (response rate was 93.74%). 36% of the population were in the age group of 31–40 years. It was found that mostly females were responsible for cattle rearing (94%). The expected responses were tabulated. The responses were divided into two parts: Part A consisting of animal husbandry practices and Part B had questions on risk factors for brucellosis [Table 1].

### Risk score

Risk scoring was done according to 0 and 1 score: 0 for no risk and 1 for practicing risky practices. From the questionnaire, 14 such questions were chosen for risk scoring, such as consumption of raw milk, animal urine, proximity of animals during sleep, assistance during reproduction, use of protective gloves during assistance in reproduction of animals, sharing of water sources of animals with humans, contact of animals with other animals outside during grazing or watering, vaccination

**Table 1: Total number of responses (master table)**

Serial number	Question	Expected answer	n = 100 (n is total number of participants)	Percentage
<b>A Animal husbandry practices</b>				
1	If you buy new cattle, do you take any action to assure it is healthy?	Yes	45	45
2	If yes for above question, what action do you take for assuring that cattle is healthy?	Use veterinary inspection	1	1
3	Do you get your cattle vaccinated regularly?	Yes	34	34
4	Who mainly does the milking of animals in your household?	Men	21	21
		Women	79	79
5	What action do you take if your cattle are sick/show signs of disease?	Always call veterinarian	19	19
6	Have you had cases of abortions in your cattle in the last 1 year?	No	28	28
7	How do you handle aborted material?	Buried	84	84
8	What do you do with dead cattle fetuses?	Bury	72	72
9	In the last 1 year, have you had any cases of retained placenta after abortions?	No	91	91
10	Do your livestock have contact with other peoples' livestock during grazing and/or watering?	No	53	53
<b>B Risk factors of brucellosis</b>				
1	Do we have occasions when raw milk is taken?	No	43	43
2	Do you keep your animals close to your sleeping area overnight?	No	56	56
3	Do you assist your animal during reproduction?	No	0	0
4	Who assists your animal during reproduction?	Always call doctor	0	0
5	During assistance of reproduction in your animals do you put on protective gloves?	Yes	0	0
6	Do you share water source with animal's water source?	No	91	91
7	Do you consume animal urine?	No	80	80

of cattle, assurance of healthy cattle before buying, action taken when animal fall sick, handling of aborted material, and handling of dead fetuses.

- a. Mean score: With maximum score of 12 and minimum of 3, the mean score was 8.08 (standard deviation – 1.835)
- b. Classification of risk score: For comparative analysis of scores in different groups, the percentage score has been divided into majorly three categories (Category I of 0%–50%, Category II of 50.01%–75%, and Category III of 75.01%–100%).

The frequencies of three different categories were Category I: 33, Category II: 59, and Category III: 8.

Comparing the mean score with the sociodemographic profile did not show any marked difference in the mean score of any category.

**DISCUSSION**

**Animal husbandry practices**

Selection of health animal before purchase: In a study conducted in Punjab (India) in 2014, it was reported that careful

selection of animals before purchasing from *Brucella*-free herds, prepurchase tests, and quarantine needs to be followed to keep the herd free of brucellosis.<sup>[8]</sup>

- a. Similarly, in the current study, it was found that people never get any prepurchase test done before the selection of animal before purchase
- b. Vaccination of animals: The current study reveals that people do not vaccinate their animals on a regular basis, which could lead to increased risk of brucellosis and other zoonotic diseases
- c. Personal protection: The study concludes that assisting animals during reproduction without using protective gear contributes to high risk of disease transmission.

**Behavioral and dietary practices**

*Consumption of raw milk*

There are many studies which support that consumption of raw dairy products is one of the major risk factors of developing brucellosis in humans. Furthermore, it was seen in the current study that the majority of the study population consume raw milk for any reason or no reason.

### Gender roles and responsibilities

A study conducted by Alusi reveals that males are responsible for the assistance of animals during reproduction, whereas females have a major role in performing daily work of animals including milking of animals.<sup>[9]</sup>

A similar finding was seen in the current study that the majority of the study population were female and were involved in daily activities of livestock. Males are more responsible for assistance in the reproduction of cattle.

As the ultimate source of human brucellosis is direct or indirect exposure to infected animals or their products, the prevention must be based on the elimination of such contact. The obvious way to do this, elimination of the disease from animals, is often beyond the financial and human resources of many developing countries.<sup>[1]</sup>

### Limitation of study

This study provides information about risky practices among dairy farmers of South West Delhi, indicating increased risk factors for brucellosis. Because the study population was selected conveniently, the results cannot be generalized. The data were collected only through questionnaires and no observation checklist was developed. Chances of bias (especially recall) during several instances are a possibility.

### CONCLUSIONS

The study concludes that animal husbandry practices such as keeping animals in close proximity of humans during sleep, irregular vaccination of cattle, contact of animals with other animals during grazing or watering, treating animals on their own when they fall sick, and assistance during reproduction without wearing protective gloves are contributing to the risk of brucellosis among the community of village Jhuljhuli. Dietary practices such as consumption of raw milk are contributing to the risk of brucellosis among the community. The women were found to be responsible for milking, whereas men were found to be responsible for reproduction assistance.

### Recommendations

- Sociocultural and behavioral facts of human brucellosis should be incorporated into information, education and communication (IEC) material of currently running programs of zoonotic diseases

- The sensitization and awareness creation campaigns that include potential risk factors of human brucellosis as well as other zoonotic diseases should be carried out in the community
- A study on community's knowledge on brucellosis and the linkages between their practices and brucellosis needs to be carried out.

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### Conflicts of interest

There are no conflicts of interest.

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