

# Knowledge, Attitude and Practice for Brucellosis amongst Migratory Animal Handlers: A Cross-sectional Study in Maharashtra, India

SATISH L GHUGEY<sup>1</sup>, MANINDER SINGH SETIA<sup>2</sup>, JYOTSNA S DESHMUKH<sup>3</sup>

## ABSTRACT

**Introduction:** Brucellosis is a highly infectious zoonosis affecting humans and animals. It is a multi-burden disease leading to severe economic losses due to disability in humans, and it also causes abortion, infertility, and reduced milk production in animals. An essential element for effective prevention and control of brucellosis is to improve Knowledge, Attitude and Practice (KAP) of the community.

**Aim:** To evaluate KAP for human brucellosis to determine the risk factors among Migratory Animal Handlers (MAH) in Nagpur and Chandrapur district of Maharashtra state in India.

**Materials and Methods:** A cross-sectional study was conducted on 143 subjects chosen randomly from Nagpur and Chandrapur districts, Maharashtra. A structured and validated questionnaire was used for demographic characteristics and KAP. Data was entered in Microsoft Excel and analysed by SPSS. Descriptive statistics accustomed to demographic feature and KAP.

**Results:** All 143 respondents (87 from Nagpur and 56 from Chandrapur) were males. Age ranged from 20 to 50 years. The majority of 139 (97%) respondents were married. Of 143 respondents, none had heard of brucellosis, 125 (87%) consumed unpasteurised milk, 37 (26%) assisted during calving, and 34 (24%) milking the animal. None of the respondents used protective clothing while assisting in animal delivery or handling birth products. One hundred and thirty six (95%) respondents informed that they treated the animal without consulting a veterinarian.

**Conclusion:** This study showed poor knowledge and high-risk behaviours and self-reported practices for brucellosis among MAH. Public health education for MAH should be enhanced with full capacity as an integral part of the National Control Program on Brucellosis in India.

**Keywords:** Awareness, Education, National control program, Occupational disease, One health, Public health

## INTRODUCTION

Brucellosis is known as a zoonosis [1]. Brucellosis is caused by *Brucella* species and is widespread in several low-income countries and causes low mortality rate in people [2]. However, brucellosis infection can turn into a chronic disease with an osteoarticular appearance, which is a common complication [3]. In many low-income countries, including India [4,5], animal and human brucellosis incidence are increasing and lack of awareness, strategies, or proper use of assets are causal factors to this expansion [6]. Nevertheless, human brucellosis is often unrecognised and frequently goes unreported [7,8]. The most common transmission routes of *Brucella* species contamination in humans are the straight contact with diseased livestock, handling animal birth products, or consuming its unpasteurised milk or milk products [9,10].

Additionally, brucellosis is enormously under-diagnosed and under-reported among MAH because of inaccurate diagnosis of disease and lack of surveillance system [11-13]. Long-term sustained control of brucellosis in MAH setting is challenging because of unapproachability of competent public health and veterinary health amenities, adjacent contact of animal and their holders, and consumption of unpasteurised dairy products [11-13]. Also, the mobile nature of MAH livestock production is unfavourable for the control of animal movement, which is required for this disease control. Therefore, it has a stable transmission level and tends toward persistent and endemic stability [12]. Despite the inadequacy of information on disease status, numerous studies divulge high prevalence and incidence of brucellosis in MAH [11-17].

Similarly, Kathiyawadi population, known for their migration behaviours, dominantly reside in Gujarat and Rajasthan state of India and travel with animals for animal trading and dairy production, from one state to another state or from one district to another [18,19]. This migration

habit is an opportunity for the MAH to advance their income through animal trading and dairy farming. However, this type of livelihood can be hazardous for livestock and public health, due to zoonotic pathogens like *Brucella* species. Upgradation of KAP among MAH might have a significant influence on the reduction of the burden of brucellosis [20]. For effective implementation of the National Control Program on Brucellosis (NCPB), it is essential to understand indigenous KAP about brucellosis to advance information distribution and institute related control methods. It might also be useful to improve the output of NCPB by spreading knowledge about brucellosis infection and education among community members [6]. A study on KAP conducted in India [21] and Kenya [22] among people who had more contact with livestock inferred that the lack of knowledge and awareness about brucellosis was an occupational risk for acquiring infection.

Therefore, this study was conducted to evaluate related areas in KAP for brucellosis among MAH in Chandrapur and Nagpur district in Maharashtra, India. Such data is crucial for urgent implementation of control programs and public health interventions.

## MATERIALS AND METHODS

This was a cross-sectional study conducted on subjects from peri-urban and rural areas of Nagpur district and Chandrapur district populated by approximately 4,653,171 [23] and 2,194,262 [24] people, respectively, Maharashtra, India, from July 2016 to August 2018 by verbal questionnaire. Subjects were selected randomly. Animal trading, milking, delivering, and caring were the dominant male occupations in this community. Therefore, all interviewed subjects were male. Throughout the interviews, the questions were continuously assessed to assure that the subjects understood them correctly. The pilot study was conducted and the authors performed all interviews.

At the time of data collection, all subjects were informed about the objective and method of the study and that data analysis would be anonymous and involvement in the research was voluntary. From all subjects, informed oral consent was obtained and documented in the questionnaire.

**Inclusion criteria:** A subject was included in the study if he was: 1) migrating; 2) the owner of domestic animals; 3) above 18 years; and 4) willing to participate in this study and were from Kathiyawadi population travelling with animals, for animal trading and dairy production, from Nagpur and Chandrapur district to another district or state.

**Exclusion criteria:** A subject was excluded from the study if he was not: 1) MAH; 2) above 18 years; 3) not willing to participate in the study.

**Sample size calculation:** For this cross-sectional study, considering 17% prevalence, 5% margin error, and a 95% confidence interval, the required calculated sample size was 143 [3]. Subjects were travelling for a limited period in small groups, therefore selected from two districts, Chandrapur and Nagpur, to achieve the required sample size.

As a reference questionnaire, all authors reviewed the World Health Organisation (WHO) library catalogue on brucellosis-2006 [25] and also reviewed the questionnaire from brucellosis KAP survey conducted in rural India [26].

Mahatma Gandhi Mission (MGM) Institute of Health Science, Navi Mumbai approved this study. MGM University Ethical Committee approved the study and verbal consent procedure. The study was conducted according to the ethical standards of MGM University at Navi Mumbai, India and in correspondence via the Indian Council of Medical Research (ICMR), the legislation of ethics in research involving humans [27].

All questionnaires were discussed to compile a suitable questionnaire for this study, and supplementary questions included for generating required evidence for KAP. The questionnaire was developed at first in English by all authors, and then it was translated into local language Marathi by a specialist. The first section for socio-demographic data consisted of the questions to collect information on age, sex, marital status, and educational level attained. The second section for respondent's KAP level included questions on the knowledge of the mode of disease transmission from animals and their products to humans, daily practices while handling animals and their birth products, and attitude of the respondent towards brucellosis. Two-point assessment (yes, no) for knowledge statement scored for yes (1), and no (0) was calculated as per the subject's response. Next, for evaluating the practice, each question was scored one or zero based on practiced/not practiced by the subject. For attitude, five-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) was applied.

A questionnaire was pretested to allow for refinement by 20 subjects and modified according to feedback received from the pretest. Cronbach's alpha of 0.72 was regarded as satisfactory for ensuring internal reliability. For evaluating the validity of the tools, the questionnaire was discussed among the public health specialists, including an epidemiologist and academic expert. Moreover, it was tested among a small group of subjects (n=20) who were not interviewed before.

## STATISTICAL ANALYSIS

Data collected from the surveys were entered in Microsoft Excel (version 2013). Statistical Package for the Social Sciences Windows version (SPSS-16, English) was used for analysis. The demographic variables of interest included age, gender, marital status, and education level attained. Categorical variables for KAP are described in the frequency table.

## RESULTS

Frequency table of 143 respondents reported 87 (61%) from Nagpur and 56 (39%) from Chandrapur. All respondents were male. The reported minimum age was 20 years and maximum age was 50 years. Maximum 69 (48%) respondents were in the age group 35-44 years and 4 (3%) respondents were in the range of 18 to 24 years, 45 (31%) had completed primary school. Of 98 (69%) illiterate subjects, 59 (60%) were from Nagpur district and 39 (40%) were from Chandrapur district. The majority of 139 (97%) respondents were married [Table/Fig-1].

Demographic information			
Variables	Nagpur (n=87)	Chandrapur (n=56)	Frequency n (%)
Subject interviewed	87 (61%)	56 (39%)	143 (100)
<b>Age group in years</b>			
18-24	3	1	4 (3)
25-34	26	6	32 (22)
35-44	34	35	69 (48)
45-54	29	9	38 (27)
<b>Education level</b>			
None	59	39	98 (69)
Primary	28	17	45 (31)
<b>Marital status</b>			
Married	83	56	139 (97)
Single	4	0	4 (3)

**[Table/Fig-1]:** Distribution of demographic characteristics of respondents in the rural and peri-urban area of Nagpur and Chandrapur district of Maharashtra (N=143); ©Animal trading and caring are male-dominant occupations in this community. Therefore, all subjects were male.

**Self-reported practices:** Of 143 subjects, 125 (87%) consumed unpasteurised milk, 46 (32%) consumed dairy products made from unpasteurised milk, 26% assisted during calving, and 24% were involved in milking the animals. All respondents had neither slaughtered the animals nor handled raw meat or consumed uncooked meat [Table/Fig-2]. The practice of milking animals was reported more from Chandrapur (36%) than Nagpur (16%) district.

**Knowledge and attitude for brucellosis:** They had very poor knowledge about brucellosis in general, hence, knowledge and attitude could not be determined for brucellosis.

## DISCUSSION

In the present study, none of the MAH had heard about brucellosis. Almost similar findings were observed in the studies conducted in rural India, which reported that very few subjects (3/1773) had heard about brucellosis [26]. Outside India, in Senegal, none of the subjects had heard about brucellosis [28]. Other studies conducted in rural Maharashtra (2%), Assam and Bihar (3.4%), as well as in Sri Lanka (2.6%) also showed similar results [29-31].

Despite the NCPB launched in India in 2010, it is notable in this study that the awareness of brucellosis was insufficient among the subjects [32]. It might be explained by the lack of implementation of the education health component of the NCPB in this community.

Studies conducted in urban, peri-urban and rural areas of Assam and Bihar, India [28], Leylek and Kadam-jay districts, Batken Oblast of Kyrgyzstan [33] and Iran [34] revealed that knowledge about brucellosis transmission routes, such as consumption of unpasteurised milk and its dairy products was capable of preventing human brucellosis transmission. Animal handlers in this study might be exposed to more risk of contracting *Brucella* species infection because of not knowing the disease transmission route for brucellosis.

Surveys conducted in Punjab state of India and in Samarkand Oblast area of Uzbekistan revealed that consumption of the unpasteurised milk and dairy products made from it were a significant risk factor for

Practices of respondents (n=143)	Nagpur (n=87)	Chandrapur (n=56)	Total (N=143)
	n (%)	n (%)	N (%)
Consumption of unpasteurised milk	74 (85)	51 (91)	125 (87)
Consumption of product made from unpasteurised milk	23 (27)	23 (41)	46 (32)
Consume uncooked meat	0 (0)	0 (0)	0 (0)
Milking animal	14 (16)	20 (36)	34 (24)
Any sign and symptoms (other than abortion) observed in the animal; calling the veterinary physician to treat.	4 (5)	3 (5)	7 (5)
For abortion in an animal calling the veterinary physician to treat.	8 (9)	9 (16)	17 (12)
<b>Disposal of foetal materials (n=37)*</b>			
Assisted an animal during birthing/abortion/removal of retained placenta	22 (26)	15 (27)	37 (26)
Dumping	12 (14)	13 (23)	25 (68)
Burning	2 (3)	2 (4)	4 (11)
Burying	8 (9)	0 (0)	8 (22)
Use protective clothing	0 (0)	0 (0)	0 (0)
Handle raw meat	0 (0)	0 (0)	0 (0)

**[Table/Fig-2]:** Descriptive results of self-reported practices among migratory animal handler in the rural and peri-urban area of Nagpur (n=87) and Chandrapur (n=56) district, Maharashtra.

\*37 subjects assisted in animal delivery therefore only these 37 subjects were analysed for the disposal method of animal birth products like dumping, burning, and burying.

acquiring brucellosis [10,35,36]. In this study, almost all respondents consumed unpasteurised dairy products regularly. A similar finding was also observed in a study conducted in Ahmedabad district of India, where 71.2% of subjects consumed unpasteurised dairy products [37]. These are the reasons why human brucellosis incidence is increasing in India [35].

In this study, since none of the subjects had heard about brucellosis, indicates that educational attainment was not related to brucellosis knowledge level. Similar findings were observed in studies conducted in rural India, Assam and Bihar state of India [26,30].

Trading, milking, assisting in animal delivery, and caring for animals are male dominated occupations in the subjects' community. Therefore, all the participants in this study were male. However, one study conducted in the Nile Delta, Egypt showed that there was no discrepancy about brucellosis information between male and female subjects [38].

A study conducted on self-reported selected zoonotic diseases among animal handlers in urban Ahmedabad, India reported that 8.2% animal handlers wore hand gloves [37]. On the other hand, in this study, none of the respondents used protective clothing while assisting in delivery of calves or handling aborted birth products. The possibility for this behaviour is not only poor knowledge, but also a lack of understanding of disease transmission risk with such kinds of practice, as well as the unmet need of protective gear. Not using protective gear is considered as one of the hazards of human brucellosis [35]. This may be due to communication gaps between the veterinarians and this subject community population, as well as lack of implementation of health education in this community.

In the present study, a few subjects visited a veterinarian to treat their animals, in case of any signs and symptoms of abortion. Therefore, those subjects who didn't consult a veterinarian, missed the opportunity to receive health education on brucellosis. Similar observation was reported in another study conducted in India [37]. However, in this study, those subjects who consulted a veterinarian, were also not aware about brucellosis, indicating the need to improve communication and community education programs for the same in such a community.

One of the known modes of brucellosis transmission from animals to humans is handling uncooked meat and slaughtering animals [39]. Some studies reported a high prevalence of brucellosis among animal slaughterers and meat handlers [40,41]. However, in the present study, none of the respondents handled raw meat or slaughtered animals or consumed cooked/uncooked meat because they were strict vegetarians due to their religious beliefs. This routine

lifestyle of these subjects eliminates exposure to meat, which is a known source of infection for brucellosis.

### Limitation(s)

Less than 18 years of subjects were not recruited because they were non-competent to give informed consent. Therefore, our results cannot be generalised to the whole population of MAH in India. As this is a cross-sectional study, causation of brucellosis among subjects cannot be proven. Each MAH group was visited only one time and as many subjects as possible were interviewed to reduce selection bias. Therefore, this study reflects the results of local knowledge and practice appropriate to brucellosis among MAH population.

### CONCLUSION(S)

As an integrated part of NCPB, the robust implementation of mobile health education unit is required for MAH. Since the majority of the subjects are illiterate, written words, pamphlets, and newspapers are consequently of little value. Milking animals, drinking unpasteurised milk, and assisting in animal delivery were identified as significant risk factors among MAH in the rural and peri-urban areas of Nagpur and Chandrapur district in the Maharashtra, India. In this situation, education on radio, small discussion groups and lectures, posters reminding of various dangers or precautions they have to take to prevent brucellosis, animal immunisation for brucellosis, and action team formation in collaboration with a local team would be beneficial to educate this community to prevent brucellosis. The economic benefit expected from controlling brucellosis should be brought out fully in educational materials. Although considerable gain in knowledge and health education practice has been achieved in combatting the disease, a One Health approach is required to drive the brucellosis control program more effectively and successfully. Expansion of core interdisciplinary strategies is essential for concrete One Health-based efforts to counter this illness.

Further studies are required to know the seroprevalence in this population and their animals. This would help to design cost-effective strategies for minimising the risk of exposure to *Brucella* species in India, where brucellosis is indigenous and not under control.

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#### PARTICULARS OF CONTRIBUTORS:

1. Student, Department of Community Medicine, Mahatma Gandhi Mission Institute of Health Sciences, Navi Mumbai, Maharashtra, India.
2. Epidemiologist, Department of Epidemiology, Mahatma Gandhi Mission Institute of Health Sciences, Navi Mumbai, Maharashtra, India.
3. Associate Professor, Department of Preventive and Social Medicine, Indira Gandhi Government Medical College and Hospital, Nagpur, Maharashtra, India.

#### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Jyotsna S Deshmukh,  
Indira Gandhi Government Medical College and Hospital, Nagpur, Maharashtra, India.  
E-mail: [jyotsnan1967@gmail.com](mailto:jyotsnan1967@gmail.com)

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