

KNOWLEDGE, ATTITUDE AND PRACTICE STUDY ABOUT BRUCELLOSIS IN OCCUPATIONALLY EXPOSED HIGH RISK GROUPS- VETERINARIANS, MILKMEN AND MEAT HANDLERS - IN TERTIARY LEVEL HOSPITAL OF WESTERN RAJASTHAN

Clinical Microbiology

Dr. Usha Verma PhD Student, Department of Microbiology, Dr. S.N. Medical College, Jodhpur, Rajasthan

Dr. Prabhu Prakash* Sr. Professor & Head of Department, Department of Microbiology, Dr. S.N. Medical College, Jodhpur, Rajasthan *Corresponding Author



ABSTRACT

Background:-Brucellosis is recognized as a significant zoonotic infection globally. Improving the occupational worker's Knowledge, Attitude, and Practice (KAP) is a key factor in the effective prevention and control of brucellosis. This study is aimed to analyze knowledge, attitude and practice for brucellosis among high-risk populations (Veterinarians, Milkmen and Meat handlers). **Material and Method:-**A cross-sectional study was conducted on 510 high risk population (220 milkmen, 90 veterinarians & 200 meat handlers) chosen randomly from Jodhpur, Rajasthan. A self-administered pre-tested questionnaire was used to access KAP study and their responses were collected and the data were entered into Microsoft Excel and analyzed using SPSS. **Result:-** 67.68% milkmen, 83.71% veterinarians & 62% meat handlers had knowledge about causes and modes of transmission of brucellosis through consumption of raw milk, pasteurized cheese, raw meat, prevention of brucellosis through exposure to aborted fetuses, placental fluid and vaccination. A positive attitude towards brucellosis was observed in 174 (79.09%) milkmen, 89 (98.88%) veterinarians, and 147 (73.5%) meat handlers. When data about practice were analyzed their response level ranges from 2-100% in veterinarians and 0-100% in milkmen and meat handler both. All participants in subgroup milkmen and meat handlers had zero practice about wearing mask, eye gears, while handling animal's excreta and during deliveries. Whereas 24(12%) and 18(9%) meat handlers were wore gown and gloves respectively. During gestation, most veterinarians do not use all the essential personal protective gears, only 53(58.88%) using gown, 25(27.77%) using gloves, 2(2.22%) using goggles, and 43(47.77%) using masks. 164 (74.54%) milkmen and 174(87%) meat handlers had practice of good hand washing whereas 53(24.09%) milkmen and 3(1.50%) meat handlers were disposed waste properly. In veterinarians 100% had proper hand washing technique practice while only 27(30%) had practiced for proper waste disposal. **Conclusion:-** Among the high-risk population, there is a lack of complete knowledge, attitude, and set of practices about Brucella infection. Regular Training and health education on Brucellosis is essential for high risk population as it is a preventable zoonotic disease with a high prevalence in Western Rajasthan.

KEYWORDS

KAP, Brucellosis, zoonotic

INTRODUCTION

In India, bovine brucellosis is widespread and appears to be on the increase in recent times, perhaps due to increased trade and rapid movement of livestock. The increase in bovine brucellosis increases the risk of spread of the disease to veterinary professionals, especially, the field veterinarians who treats the animals on the daily basis. Brucellosis prevalence varied widely across the livestock and human population in different states of India¹.

Accidental exposure of humans through the ingestion of dairy products made of raw milk, unprotected contact with infected animals or contaminated biological materials, and accidental exposure to anti-Brucella spp. vaccines used in veterinary practice are the major forms of disease transmission, which has a strong occupational feature.² The worker groups most exposed to the pathogen are breeders and animal handlers, butchers, laboratory workers, veterinarians and veterinary assistants, and hunters.³

The slaughterhouse workers are more prone to acquire infection as compared to other occupations because they are exposed to carcasses and viscera of infected animals and get infected through cuts and wounds and splashing of infected blood and other fluid in the conjunctiva.³

Purifying milk is a viable way to eradicate Brucellosis. This precautionary measure isn't routinely practiced even in well developed countries as a result of social norms and malpractices, and unawareness of the risks.⁴

To control and prevention of brucellosis, it is essential to raise awareness and knowledge about the acquisition, transmission, clinical manifestations and complications of the disease and identifying misinformation and malpractices associated with it.⁵ In developing nations, prevalence emerge from underreporting and deficient surveillance programs. All add to brucellosis becoming a national health problem.⁶

Public health education is a difficult and extremely complex task, which includes culture, beliefs, traditions, educational level, social status, occupation, and age. Therefore, health education programs should primarily target physicians, veterinarians, farmers, and meat handlers. These initiatives should focus not only on specific preventive

measures but also emphasize the importance of personal and community safety. This includes helping these groups identify and define their own challenges, understand how to address these issues using both internal resources and external support, and determine appropriate solutions. Secondly, it is essential to engage the broader community through health education efforts, incorporating schools, workplaces, and the general population (WHO, 2009).⁷

However, before determining the appropriate training and education, farmers, meat handler's knowledge, attitudes, and practices (KAP) regarding brucellosis control and surveillance in the field must be assessed.

This study is aimed to analyze knowledge, attitude and practice for brucellosis among high-risk populations (Veterinarians, Milkmen and Meat handlers)

MATERIAL AND METHODS

This is a cross-sectional study to determine the knowledge, attitude and practice of the study population towards brucellosis in Jodhpur, Western Rajasthan. The study population Veterinarians, Milkmen and Meat handlers (participants) who gave their consent were included in the study and those who denied were excluded from the study. Total 510 participants were included 220 milkmen, 90 veterinarians, and 200 meat handlers. All subjects were selected randomly.

All the participants were asked with a pre-designed questionnaire consisting of education, knowledge about brucellosis as a disease, its routes of transmission, preventive measures to be followed, signs, symptoms and attitude of the respondent towards brucellosis. For veterinarians past history of brucellosis, present clinical symptoms and practice of preventive measures were included in the questionnaire. Two point assessment (yes, no) for knowledge statement as per the subject's response.

It was done according to predesigned proforma and response of Milkmen, Veterinarians and Meat handlers were recorded and entered in Excel sheet. All responses (about Knowledge, Attitude and Practice) were analyzed statistically according to each group. To determine the relationship between associations two or more variables was used with a chi-square test with p value of 0.05 considered as the level of significance.

RESULTS

Out of 510 participants, including 220 milkmen, 90 veterinarians, and 200 meat handlers, all reported a history of contact with animals. Among them, 140 (45.16%) milkmen and veterinarians, and 74 (37%) meat handlers had consumed raw milk. Additionally, 38 (12.25%) milkmen and veterinarians, and all 200 (100%) meat handlers had consumed meat. (Table 1&2)

All participants responded to basic questions related to their knowledge of diseases transmitted from animals to humans, including clinical features and preventive measures. Our study revealed that all participants were heard about of brucellosis (100%).

Among milkmen, 15 (6.81%) had complete knowledge, 156 (70.90%) had partial knowledge, and 49 (22.72%) had no knowledge about the modes of transmission of brucellosis. Among veterinarians & veterinarian staff 72(80%) had complete knowledge, 14(15.55%) had partial knowledge and 4(4.44%) had no knowledge about the modes of transmission of brucellosis. Among meat handlers 8(4%) had complete knowledge, 144(72%) had partial knowledge and 48(24%) had no knowledge about the modes of transmission of brucellosis. (Table 3)

The next questions targeted the “beliefs” of respondents in cooking

Table No.1- Distribution of cases of brucellosis according to Exposure of Subject based on Contact with Animals, Raw Milk Consumption & Undercooked or uncooked meat consumption in Milkmen& Veterinarians.

Name of group	History of contact with animals					History of Raw Milk Consumption					Undercooked or uncooked meat consumption				
	P	%	N	%	T	P	%	N	%	T	P	%	N	%	T
Milkmen & Veterinarians															
Yes	58	100	252	100	310	38	38	102	40.47	140	17	29.31	21	98.3	38
NO	0	0	00	00	00	20	20	150	67.46	170	41	70.68	231	91.66	272
Total	58	100	252	100	310	58	100	252	100	310	58	100	252	100	310
P value	NA					<0.0001					<0.0001				

Table No.2- Distribution of cases of brucellosis according to Exposure of Subject based on Contact with Animals, Raw Milk Consumption & Undercooked or uncooked meat consumption in Meat handlers patients

Name of group	History of contact with animals					History of Raw Milk Consumption					Undercooked or uncooked meat consumption				
	P	%	N	%	T	P	%	N	%	T	P	%	N	%	T
Meat handlers															
Yes	64	100	136	100	200	22	35.38	52	37.77	74	64	100	136	100	200
NO	0	0	00	00	00	42	64.61	84	62.22	126	0	0	00	00	00
Total	64	100	136	100	200	64	100	136	100	200	64	100	136	100	200
P value	NA					0.863					NA				

Table 3- Knowledge and attitude regarding brucellosis among occupationally exposed individuals

Name of groups	Milkmen (220)		Veterinarian (90)		Meat handlers (200)		P value
	No.	%	No.	%	No.	%	
Knowledge regarding Mode of transmission							x ² =272.21; d.f.=4, p<0.0001
Complete	15	6.81	72	80	8	4	
Partial	156	70.90	14	15.55	144	72	
No Knowledge	49	22.72	04	4.44	48	24	
Knowledge regarding Clinical features							x ² =25.17; d.f.=4, p<0.0001
Complete	14	6.36	15	16.66	18	9	
Partial	128	58.18	63	70	105	52.5	
No Knowledge	88	40	12	13.33	77	38.5	
Knowledge regarding Preventive features							x ² =104.02; d.f.=4, p<0.0001
Complete	10	4.54	33	36.66	24	12	
Partial	100	45.45	52	57.77	59	29.5	
No Knowledge	110	50	5	5.55	117	58.5	
Attitude	174	79.09	89	98.88	147	73.5	

Table 4- Preventive practices followed by occupationally exposed individuals

Name of groups	No. Screened	Use of personal protective equipment's				Proper hand washing	Proper waste disposable
		Gown	Gloves	Eye wear	Mask		
Milkmen	220	00	00	00	00	164	53
Veterinarian	90	53	25	02	43	90	27
Meat handlers	200	24	18	00	00	174	3

DISCUSSION

Knowledge of clinical signs is important to suspect a case of brucellosis. In our study, Out of 510 participants, including 220 milkmen, 90 veterinarians, and 200 meat handlers, all were reported by history of contact with animals. Among them, 106 (48.18%) milkmen, 34(37.77%) veterinarians, and 74 (37%) meat handlers had consumed raw milk. Additionally, 30 (13.63%) milkmen, 8(8.88%) veterinarians, and all 200 (100%) meat handlers had consumed undercooked or uncooked meat.

practices, the personal hygiene, and the specific knowledge, on brucellosis (Table 3). A positive attitude towards brucellosis was observed in 174 (79.09%) milkmen, 89 (98.88%) veterinarians, and 147 (73.5%) meat handlers.

Most of the veterinary officers and staff assumed that brucellosis can be prevented by using personal protective equipment. On the contrary milkmen and meat handlers did not feel so. When data about practice were analyzed their response level ranges from 2-100% in veterinarians and 0-100 % in milkmen and meat handler both. All participants in subgroup milkmen and meat handlers had zero practice of wearing mask, eye gears, while handling animal's excreta and during deliveries. Whereas 24(12%) and 18(9%) meat handlers were wore gown and gloves respectively. During gestation, most veterinarians do not use all the essential personal protective gears, only 53(58.88%) using gown, 25(27.77%) using gloves, 2(2.22%) using goggles, and 43(47.77%) using masks. 164(74.54%) milkmen and 174(87%) meat handlers had practice of good hand washing whereas 53(24.09%) milkmen and 3(11.50%) meat handlers were disposed waste properly. In veterinarians 100% had proper hand washing technique practice while only 27(30%) had practiced for proper waste disposal. (Table No. 4)

Name of group	History of contact with animals					History of Raw Milk Consumption					Undercooked or uncooked meat consumption				
	P	%	N	%	T	P	%	N	%	T	P	%	N	%	T
Milkmen & Veterinarians															
Yes	58	100	252	100	310	38	38	102	40.47	140	17	29.31	21	98.3	38
NO	0	0	00	00	00	20	20	150	67.46	170	41	70.68	231	91.66	272
Total	58	100	252	100	310	58	100	252	100	310	58	100	252	100	310
P value	NA					<0.0001					<0.0001				

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	P	%	N	%	T	P	%	N	%	T	P	%	N	%	T
Meat handlers															
Yes	64	100	136	100	200	22	35.38	52	37.77	74	64	100	136	100	200
NO	0	0	00	00	00	42	64.61	84	62.22	126	0	0	00	00	00
Total	64	100	136	100	200	64	100	136	100	200	64	100	136	100	200
P value	NA					0.863					NA				

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Veterinarian	90	53	25	02	43	90	27
Meat handlers	200	24	18	00	00	174	3

A study by Ramlawi⁸, 2000) revealed that only 46.6% participants had information about brucellosis, more than half (53.4% participants) consume raw milk and 89% of respondents consider the use of gloves while dealing with animals.

Another study done by Smits S. et al⁹ (2017) , observed that 8.1% of veterinarians had kept milking animals at home and had consumed raw milk. 53.7% of farmers consumed raw milk regularly. The major risk factors noted were both animal exposure as well as raw milk ingestion. In 46.2% of subjects, animal exposure alone was noted as the risk

factor. In the dairy workers group, raw milk ingestion and contact with raw milk (70.25%) were the major risk factors. History of both animal exposure either at work place or at home along with raw milk contact and consumption was seen in 29.75% of individuals.

In our study, among milkmen, 15 (6.81%) had complete knowledge, 156 (70.90%) had partial knowledge, and 49 (22.72%) had no knowledge about the modes of transmission of brucellosis. Among veterinarians & veterinarian staff 72(80%) had complete knowledge, 14(15.55%) had partial knowledge and 4(4.44%) had no knowledge about the modes of transmission of brucellosis. Among meat handlers 8(4%) had complete knowledge, 144(72%) had partial knowledge and 48(24%) had no knowledge about the modes of transmission of brucellosis (Table no. 3). Overall among 510 respondents including milkmen, veterinarians & butchers, only 67.68%, 83.71% & 62% respectively, knew the causes and modes of transmission of brucellosis through consumption of raw milk, pasteurized cheese, raw meat, or Prevention of brucellosis through exposure to aborted fetuses and placental fluid and vaccination.

According to a 2016 study by the Govindaraj et al.¹⁰, state-level results showed that in Assam, 60% of veterinarians had comprehensive knowledge (giving correct answers to all statements), while in other states (West Bengal, Uttar Pradesh, Punjab) was found to have comprehensive less knowledge). Overall, 32% (4 out of 4) of respondents answered all statements about brucellosis correctly, while 49% (3 out of 4) answered 15% of the statements correctly. Additionally, 4% (1 out of 4) of respondents provided correct answers for 75%, 50%, and 25% of the statements, respectively. In contrast to our findings, a study by Bilal et al.¹¹ (1991) in Saudi Arabia surveyed 337 people about their knowledge of brucellosis transmission, and 309 (92%) were found to be unaware.

In the Govindaraj et al.¹⁰ study, approximately 60%, 80%, 84%, and 76% of respondents from Assam, West Bengal, Uttar Pradesh, and Punjab knew all the important clinical symptoms. However, field veterinarians should receive complete training. In a different survey by Adesiji et al. (2005)¹², which included butchers, herdsman, meat merchants, milkers, and veterinarians, only 19.6% of 540 respondents were aware of the etiology, method of transmission, and prevention of brucellosis.

The next questions focused on the respondents' "beliefs" regarding their perceptions of personal hygiene, vaccination history, cooking methods, occupational exposure, and particular knowledge of brucellosis. They are considering wearing gloves and boiling milk as suitable precautions against *Brucella* exposure.

All participants in our study—milkmen, veterinarians, and meat handlers—demonstrated attitudes toward raw milk consumption, using gloves and masks, wearing protective gear, washing hands when handling animal excreta, assisting with deliveries, prevention, vaccination, and implementing control programs for better *Brucella* awareness. The attitude percentages were 79.09% for milkmen, 98.88% for veterinarians, and 73.85% for meat handlers.

A 2017 study by Awwad E. et al.¹³ (West Bank) found that the majority of participants (87.3%) expressed interest in learning more about public health and requested additional information. The respondents' strong interest in learning more about the topic is a positive indication for advancing animal husbandry and milk processing practices. It also helps reduce exposure to *Brucella* species and other zoonotic infections.

Most of the veterinary officers and staff assumed that brucellosis can be prevented by using personal protective equipment. On the contrary milkmen and meat handlers do not feel so. When data about practice were analyzed their response level ranges from 2-100% in veterinarians and 0-100 % in milkmen and meat handler both. All participants in subgroup milkmen and meat handlers had zero practice of wearing mask, eye gears, while handling animal's excreta and during deliveries. Whereas 24(12%) and 18(9%) meat handlers were wore gown and gloves respectively. During gestation, most veterinarians do not use all the essential personal protective gears, only 53(58.88%) using gown, 25(27.77%) using gloves, 2(2.22%) using goggles, and 43(47.77%) using masks. The majority stated they primarily use gloves and masks due to the unavailability of other protective equipment from the department.

164(74.54%) milkmen and 174(87%) meat handlers had practice of

good hand washing whereas 53(24.09%) milkmen and 3(11.50%) meat handlers were disposed waste properly. In veterinarians 100% had proper hand washing technique practice while only 27(30%) had practiced for proper waste disposal (Table no.4).

According to Madzingira, O et al.¹⁴, cattle farmers disposed aborted fetuses and membranes on pastures (29.9%, 79/264), burying (29.9%, 79/264) or burning to ashes (6.4%, 27/264). In contrast to our study abattoir workers were not permitted to handle meat or animals with bruised or injured hands as they were provided with full protective gear, while 7.0% and 38.0% of the butchers handled meat using bare hands and had no protective gear respectively.

A comparable study by Hannah et al.¹⁵ (2011) reported that only 21% of respondents used protective gear when dealing with cows experiencing abortions or handling aborted materials. Adesiji et al.¹³ (2005) also found that open wounds while handling diseased animals led to brucellosis in 3 out of 10 veterinarians surveyed.

Pre-set questionnaires were used to assess participants' practices, such as using pasteurized milk, boiling milk before drinking, wearing gloves during animal slaughter in slaughterhouses or hospitals, consuming undercooked meat, wearing gloves when handling animal excreta and during deliveries, sending clinical samples from suspected animals for confirmatory diagnosis, and purchasing animals after reviewing their history of brucellosis symptoms and vaccination. Veterinarians exhibited 100% adherence to practices such as consuming pasteurized milk or boiling milk before drinking, vaccinating animals, wearing gloves when handling animal excreta, sending clinical samples from suspected animals for confirmatory diagnosis, and advising farmers to purchase animals only after assessing their history of brucellosis symptoms. In contrast, only 114(51.81%) of milkmen consumed pasteurized milk & 106(48.18%) consumed raw milk. Among meat handlers, 126(63%) consumed pasteurized milk and 74(37%) consumed raw milk, with 9% unaware of their cattle's vaccination status (Table no. 1 & 2).

Hence, there is a necessity to spread awareness among veterinarians on the repercussions of non-using protective gear besides ensuring the regular supply of protective gears by the Government. Sending clinical samples of the suspected animals for confirmatory diagnosis is not practiced by all veterinarians due to the non-availability of testing facilities. It may also accentuate the disease spread to many animals and humans in the long run.

The study identified education level as a key predictor, with a positive correlation to the adoption of preventive practices. Similar findings have been reported in various KAP surveys (Xiang et al., 2010; Holt et al., 2011; Khan et al., 2013; Lindahl et al., 2015).¹⁶⁻¹⁹ The insights from this research can support the development of policies aimed at enhancing farmers' knowledge and practices in areas such as sanitation, hygiene, and waste management.

CONCLUSION

Among the high-risk population, there is a lack of complete knowledge, attitude, and set of practices about *Brucella* infection. Regular Training and health education on Brucellosis is essential for high risk population as it is a preventable zoonotic disease with a high prevalence in Western Rajasthan. Overall, this research contributes to our understanding of brucellosis diagnosis and underscores the need for continued surveillance and monitoring to fight this infectious disease effectively. For humans, there is no vaccine to prevent brucellosis. Cattle brucellosis can be effectively controlled, eventually lowering the spread of infection to human populations, by mass vaccination programs combined with other interventions including screening and quarantining diseased live animals.

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