

A Study of Knowledge, Attitude and Practices Associated to Brucellosis among Cattle Keepers of Jalaun district, Uttar Pradesh, India

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(Received: 18 February 2023; Revised: 12 March 2023; Accepted: 18 March 2023; Published: 20 April 2023)

(Published by Research Trend)

ABSTRACT: The magnitude and ubiquitous nature of brucellosis occurrences in cattle throughout the India remains to be animal and public health concern. In humans, the disease is mainly transmitted through the ingestion of raw/unpasteurized milk or unhygienic practices during handling their cattles. India has the greatest cattle population in the world; consequently, the risk of brucellosis incidences grows exponentially in India compared to other nations. In addition, the knowledge of brucellosis among cattle keepers is limited; therefore, comprehending the knowledge, attitudes, and practises (KAP) of cattle keepers is a primary objective of the present study. A cross-sectional study was performed on brucellosis in Jalaun districts of Uttar Pradesh. Cattle keepers (n=500) were interviewed on the basis of a standard structured questionnaire (41 questions). It was found that the farmer's educational status was strongly correlated with their knowledge of the zoonotic risk of brucellosis ($p<0.001$). More than 60% of the participants did not consider unpasteurized milk as possible contamination sources. The current investigation showed that cattle keepers had limited education of brucellosis, which might enhance the zoonotic risk. Awareness has to be encouraged, and significant control measures should prioritize in rural and underdeveloped sections of the country to prevent the spread of the disease from animals to humans.

Keywords: Brucellosis, KAP, Zoonosis, SPSS, Vaccination.

INTRODUCTION

Brucellosis is the widespread zoonotic disease affecting livestock and people worldwide (Franco *et al.*, 2007). Each year, over five million human cases are documented, making it one of the most severe zoonoses in the world (Gusi *et al.*, 2019; Hull and Schumaker 2018). Brucellosis, despite its high prevalence, is not receiving adequate attention and has been categorised by the World Health Organisation as one of the "most neglected tropical diseases" (WHO, 2006). Brucellosis is endemic in many countries like Mediterranean, Asian, Middle Eastern, Latin American, and African nations including India. The highest prevalence of brucellosis has been reported in countries, such as West Asia, India, the Middle East, Southern Europe, and Latin America (Khoshnood *et al.*, 2022). India boasts the highest population of cattle globally, and as a result, the livelihoods of many individuals in the country are heavily reliant on cattle husbandry. Consequently, these individuals are at an increased risk of contracting diseases associated with this occupation. Brucellosis is previously known as Undulant fever, Malta fever, and Bang's disease. The disease incurs significant economic costs across all regions of India, amounting to approximately \$3.5 billion (Renukaradhaya *et al.*, 2002; Singh *et al.*, 2015). The aetiology of brucellosis can be attributed to a gram-negative bacterium that falls under the genus *Brucella*. Specifically, *B. abortus* is known to infect cattle, *B. melitensis* is known to infect goats and

sheep, and *B. suis* is known to infect pigs (Diez and Coelho 2013). The *B. abortus* species poses potential hazards to livestock reproductive health, manifesting in a range of adverse outcomes such as high rates of abortion, reduced fertility, diminished milk production, as well as the onset of orchitis and arthritis in cattle (WHO, 2006; Olsen and Tatum 2010). The transmission of brucellosis from ruminants to humans can cause symptoms such as weakness, fever, discomfort, and in severe cases, mortality (Buzgan *et al.*, 2010). The primary modes of human infection are through the consumption of raw or undercooked milk products (Galinska and Zagorski 2013) or via direct contact with infected cattle, their aborted foetuses, or placenta (Zhou *et al.*, 2020). There is lack of awareness regarding KAP among impoverished farmers and cattle keepers pertaining to brucellosis in India. Thus, the primary objective was to enhance KAP awareness among cattle keepers through educational interventions and examine the Knowledge, Attitudes, and Practises of individuals regarding perspectives on the aetiology, clinical manifestations, mode of transmission, vaccination, management, and preventive measures of brucellosis.

MATERIALS AND METHODS

A. Study area, design and selection of participants

Based on the 2011 census, the state of Uttar Pradesh occupies an area of 2,43,286 square kilometres and has

a literacy rate of 69.72%, with male literacy at 79.24% and female literacy at 59.26%. According to the 19th Livestock Census conducted in 2012, the livestock population comprising of buffaloes, sheep, goats, camels, pigs, Mithun, yaks, mules, horses, ponies, asses, and poultry, has made a significant contribution of 67.8 million. Among the various types of livestock, bovine species, namely cattle and buffalo, made a

significant contribution of 18.8 and 33.0 million, respectively. A survey associated to the brucellosis disease was carried out in the Jalaun district of Uttar Pradesh, India, as illustrated in Figure 1. The research has incorporated a sample of 500 individuals, comprising both small and large-scale cattle keepers and dairy farmers residing in villages, rural regions, and urban areas.

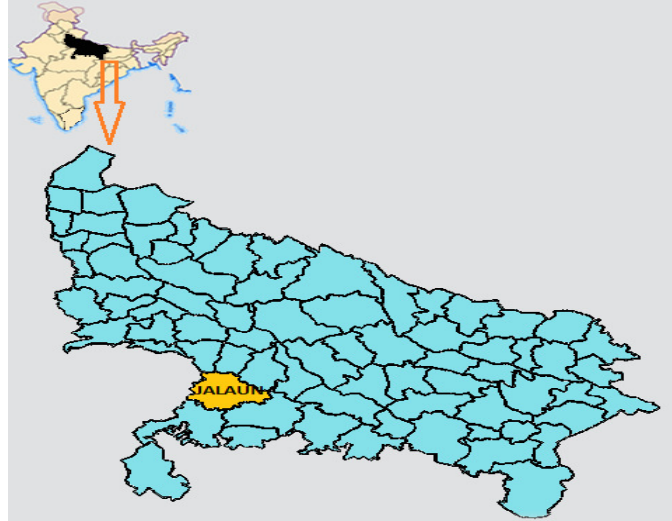


Fig. 1. Map of Uttar Pradesh showing Jalaun district of Uttar Pradesh.

B. Questionnaire and data collection

To facilitate communication with villagers, dairy farmers, and cattle keepers, a structured questionnaire was drafted in English and then translated to Hindi. The questionnaire was distributed to people who are responsible for the care and management of their livestock and maintain frequent interaction with them and the information is gathered about the farmer's knowledge, attitude and practices regarding brucellosis and its zoonotic potential. Before each interview, the purpose of the study was described to all of the participants and their verbal consent was collected. The questionnaire consisted of five parts. 1. The first part is based on the demographic and socioeconomic status of the cattle keepers. 2. The second part is about their knowledge on brucellosis as a disease, 3. The third part is about the awareness among the cattle keepers for disease brucellosis, 4. The fourth part of questionnaire is related to attitudes towards animal and human health for brucellosis, 5. The fifth part is practices of cattle keepers which make them and their cattle prone to disease. The questionnaire contained open and close ended questions. Cattle keepers were also enquired information about other prevalent diseases to their cattle and treatments. Interviewer interacted face to face to each respondent and it takes 10 to 15 minutes to completely fill a questionnaire of 41 questions. The interview was conducted by a group of volunteers consisting of both undergraduate and graduate students, spanning from July 2021 to June 2022.

C. Data analysis of Brucellosis

The primary author put the acquired data into Statistical Package for the Social Sciences (SPSS) version 20.0.

Errors in typing were noticed and rectified. By using Chi-square test, categorical and continuous data were evaluated.

RESULTS AND DISCUSSIONS

A. Study population

It is evident from the present finding of data that both men and women are responsible for the direct or indirect care of their cattle. Approximately 56% males and 44% females were involved in cattle keeping and milking their cows and buffaloes. The majority of cattle keepers, almost 53%, fall within the age range of 21-30 years. On the contrary, the age group with the lowest representation among cattle keepers is 41-50 years, comprising only 8% of the total population.

B. Knowledge about Brucellosis

Out of 500 participants about 94.6% (n=473) were never listen the name of brucellosis as well as only 11% (n=55) participant considered brucellosis as a zoonotic disease. There is only 16.6% (n=83) of participants answered positively that brucellosis can infect cattles/sheeps/goats, while 78% did not know the victim. For mode of transmission of brucellosis, 91% (n=455) of participants did not have any idea of its transmission route and regarding the cause of brucellosis, only 7.4% (n=37) of people considered bacteria is a causative agent, while 87.2% (n=436) did not have any knowledge regarding this. Cause of abortion in cattles were also positively responded by only the 3.2% (n=16) of participants, while 95.4% (n=477) did not know the reason.

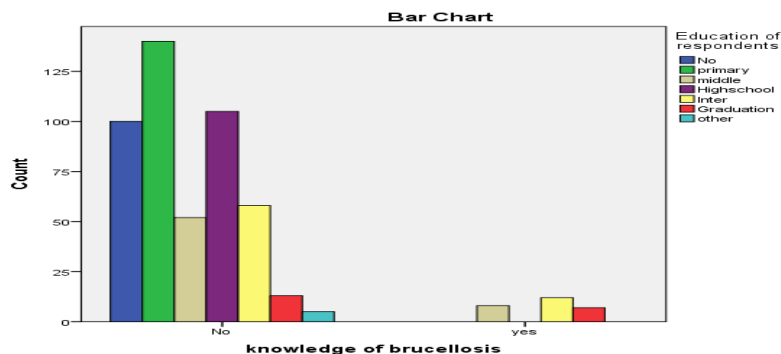


Fig. 2. Correlation between Education and Knowledge of Brucellosis.

C. Awareness among respondents regarding Brucellosis

Among 500 respondents, only 34.7% consumed raw/unboiled/unpasteurized milk and 71.2% supplied unpasteurized milk and dairy products. Almost 73.6% respondents did not know that unboiled/unpasteurized milk could cause brucellosis. 77.4% (n=387) of the participant did not know that bacteria can enter through a skin wound and mucous membrane. There were 32.4% (n=162) of participants aware about the undercooked meat can cause brucellosis. There were 45.2% (n=226) participants agreed that most affected gender by brucellosis is female, while 30% agreed most affected gender by brucellosis is male. Almost 46.4% (n=232) participant believe poverty and unawareness is a major risk factor for brucellosis and 22.4% agreed that living in close proximity to wild life is a major risk factor. Almost 55.6% (n=278) participants did not aware of any diagnostic test availability in their district. Only 22.8% (n=114) participants were aware about prevention of brucellosis while, 84.8% (n=426) participants did not know any vaccine for brucellosis (Fig. 3).

There were 32% (n=160) of participants considered brucellosis symptoms looks like Typhoid and Malaria. Almost 59.6% (n=298) participants agreed Artificial Insemination (AI) is used for animal reproduction, while 40.4% (n=202) people agreed they prefer for cattle's natural mating. Almost 43.2% (n=216) of cattle keepers sleep in cattle sheds. If cattle get sick almost 59% (n=295) of participants call a doctor while 56.8% (n=284) of participants did not call a doctor. Out of 500 participants, 100% were agreed that they never did a blood test before sale or purchase of cattle. For hygiene maintenance in cattle sheds, 23% of participants mentioned that they clean their cattle sheds by a disinfectant regularly, while 72% did not prefer any cleaning by disinfectant but they accepted, removal of cattle dung and washing their cattles and cattle sheds is done regularly. Only 17.4% (n=87) of participants screened their cattle for any disease. 47% of cattle keepers accepted that their cows and buffaloes aborted at 3rd month (1st trimester) while, few participants accepted that their cows show delayed heat after first pregnancy, hence they free their cattle or sell them after waiting for pregnancy to stay for 2-3 years.

D. Attitudes and practices of participants regarding Brucellosis

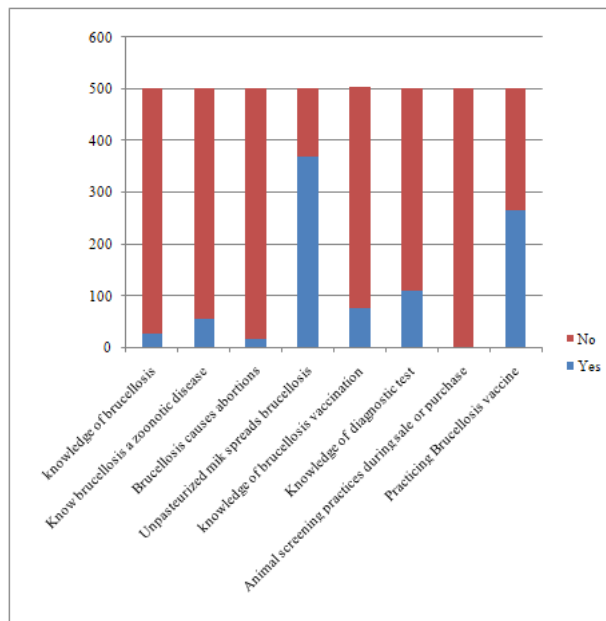


Fig. 3. Responses regarding KAP about Brucellosis.

Almost 43.2% (n=216) of participants accepted that they throw the aborted material of their cattle in open, while 33.6% (n=168) of participants prefer a veterinary doctor after an abortion. There were 18.8% (n=94) of participants prefer to wear a glove during cleaning while, 52.6% (n=263) of participants accepted that they only wash their hands after handling aborted material. A significant proportion of participants, specifically 29.6% (n=148), reported seeking veterinary assistance when their cattle experience prolonged illness. Additionally, 25.2% (n=126) of participants acknowledged selling their cattle to fairs or other individuals, which may pose a serious risk of bacterial transmission to other animals. A total of 264 participants, accounting for 52.8%, reported that their animals receive annual vaccinations from the district veterinary doctor. However, these participants were uncertain as to whether the vaccine administered was

for brucellosis or another disease. Conversely, 236 participants, representing 47.2%, reported that they do not vaccinate their cattle for any disease. None of the participants (0%) were familiar with the vaccines RB51 and S19 for the prevention of brucellosis.

E. Risk factor analysis of brucellosis

In a statistical analysis, males were more likely to report having heard of brucellosis than females (chi-square $\chi^2 = 19.027$, $p < 0.001$). There was also a significant correlation between educational attainment and brucellosis awareness ($\chi^2 = 80.569$, $p < 0.001$) and educational status and knowledge of zoonotic potential of brucellosis ($\chi^2 = 69.8$, $p < 0.001$). Chi-square showed: ($\chi^2 = 5.176$, $p = 0.023$) a significant correlation between unvaccinated cattles and a positive diagnosis for brucellosis (Table 1).

Table 1: Chi-square (χ^2) analysis of brucellosis associated risk factors.

Questions	χ^2	p value	d.f.
Correlation between cattle keeper's gender and knowledge of brucellosis	19.0	<0.01	1
Correlation between education levels and knowledge of brucellosis	80.5	<0.01	6
Correlation between education levels and knowledge of the zoonotic potential of brucellosis	69.8	<0.01	6
Correlation between unvaccinated cattles and positive herd	35.7	<0.01	1

Abbreviation: χ^2 - chi square value, p value <0.01, df- degree of freedom

This study represents the initial epidemiological investigation of knowledge, attitudes, and practises (KAP) regarding brucellosis in the Jalaun district of Uttar Pradesh (UP), India. The research revealed that a mere 40% of individuals possess primary education, with an additional 20% lacking any formal education. The findings indicate that a significant proportion of cattle keepers, approximately 94.6%, were not aware of the term "brucellosis". This observation is consistent with the results of previous studies conducted in Noida, UP (Kant *et al.*, 2018) and Kenya (Kang'ethe *et al.*, 2007). The aforementioned discovery presents a contrast to the results of surveys carried out in various regions such as Whittlesea Community in South Africa (Cloete *et al.*, 2019), Northern Uganda (Nabirye *et al.*, 2017), Kenya (Obonyo and Gufu 2015), Egypt (Holt *et al.*, 2011), and Nigeria (Buhari *et al.*, 2015). In these studies, a significant proportion of participants, namely 60%, 63%, 79%, 83%, and 93% respectively, displayed awareness of brucellosis. In the Whittle sea community of South Africa, individuals have primarily been informed about brucellosis through veterinary healthcare services. However, in present survey, a majority of participants reported acquiring knowledge about brucellosis from personal acquaintances such as friends or family members. Therefore, it is imperative that government veterinary services and media outlets assume a crucial role in disseminating knowledge and information to cattle owners with respect to brucellosis. Due to a lack of awareness regarding the zoonotic nature of brucellosis among cattle keepers, adherence to safety protocols during cattle care was infrequent. The assertion is reinforced by a survey carried out in Puducherry, which revealed that a mere 16.4% of participants had knowledge of the potential

transmission of brucellosis from animals to humans (Rajkumar *et al.*, 2016).

A research study was conducted in Kenya to investigate practises that pose a high risk of disease transmission. The study reported that grazing healthy cattle alongside diseased livestock may increase the transmission of brucellosis. Similar findings were reported in Nigeria, Uganda, and South Africa by Buhari *et al.* (2015); Kansime *et al.* (2014); Cloete *et al.* (2019), respectively. The study revealed that a significant proportion of the participants, approximately 33%, consumed raw or unpasteurized milk, which may serve as a potential reservoir for brucellosis. This finding is consistent with a recent investigation carried out in Noida, Uttar Pradesh (Kant *et al.*, 2019) and Tajikistan (Lindahl *et al.*, 2015). The findings of the current investigation suggest that a proportion of 32.4% of the respondents possess awareness regarding the potential of uncooked meat to induce brucellosis. According to Cloete *et al.* (2019), the handling of meat from contaminated animals during the slaughtering process is considered a high-risk practice. Insufficient knowledge and awareness of zoonotic diseases among cattle keepers poses a significant public health concern. The majority of participants lacked knowledge regarding the availability of vaccines for brucellosis. Previous studies conducted in Noida and Western Uttar Pradesh has reported comparable results (Kumar *et al.*, 2016; Kant *et al.*, 2018).

According to a research conducted in Tajikistan, Pakistan, and throughout the world, it is evident that people with a higher level of education have a greater understanding and knowledge of brucellosis than those with a lower level of education, which is validated by the present study (Lindahl *et al.*, 2015). We found that almost 60% of participants prefer AI (Artificial

Insemination) to their female cattle, which is the most effective method for preventing the spread of brucellosis. The Indian government mandates that brucellosis-free bulls be used for the production of sperm, and it also required that all breeding bulls at facilities that perform AI be subjected to routine testing. It is established that brucellosis may be transmitted during mating from bull to cow and vice versa; hence AI should be preferred over natural mating process to control brucellosis (Mantur and Amarnath 2008). In the present study it was found that 72% of cattle keepers did not clean the shed properly and regularly and unaware towards the proper handling of aborted foetus and placenta as well as lack of access to protective equipment such as gloves could amplify the transmission of the disease to humans. Almost 30% of participants accepted that they seek for veterinary help, when their cattles get sick and all the participants agreed they never preferred blood test before sale or purchase of their cattle. Similar findings were found in an Egyptian and Tajikistan investigation (Holt *et al.*, 2011; Lindahl *et al.*, 2015). The aforementioned findings suggest that solely raising awareness and providing education could be insufficient in preventing infection among individuals. Instead, a change in behaviour and cultural customs may be imperative (Njenga *et al.*, 2020). It should be made mandatory for Government veterinary authorities to ensure that wearing gloves, mask, proper cleaning of hand and handling of aborted foetus material should be done in proper manner by veterinary doctors or cattle keepers to reduce the spread to human as well as decrease environmental transmission of brucellosis. It was found that some cattles showed recurrent abortions and delayed heat which is a primary symptom of brucellosis. Cattle keepers should be educated about the symptoms of brucellosis and immediate vaccination and proper medication.

CONCLUSIONS

The persistent presence of *B. abortus* infection in cattle, in combination with religious concerns regarding the slaughter of infected animals and the resulting distressful sale of such animals, has led to positive serological diagnoses. This has created a critical need for the strict implementation of a control policy in cattle, prompting government authorities to adopt a vaccination strategy as a means of preventing and controlling brucellosis in cattle. The implementation of preventive measures during the handling of infected cattle can lead to a significant reduction in the incidence of brucellosis in humans. Despite the significant accomplishments in eradicating bovine brucellosis in various countries such as Europe, Australia, Canada, Israel, Japan, and New Zealand, the disease continues to prevail in certain areas of Africa, the Middle East, and Asia owing to inadequate awareness, governance, and financial resources. The principal strategies employed to manage and avert brucellosis comprise of the identification and segregation or culling of infected cattle, as well as

administering a one-time vaccination to all eligible female calves.

FUTURE SCOPE

This study examines the current state of knowledge regarding brucellosis disease among cattle keepers, which could be enhanced through proper education about the disease and vaccination strategies. These studies could be useful for planning appropriate and timely action to attain the WHO targets for brucellosis.

Acknowledgements. We are grateful to our District Veterinary Officers (VOs), students, local villagers, cattle keepers, and dairy farmers for their participation in our survey.

Conflict of Interest. None.

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How to cite this article: Rashmi Singh, Deeksha Marwari and Akanksha Singh (2023). A Study of Knowledge, Attitude and Practices Associated to Brucellosis among Cattle Keepers of Jalaun district, Uttar Pradesh, India. *Biological Forum – An International Journal*, 15(4): 434-439.