Original Article

Practices that are Potential Risks to an Increase in Zoonotic Tuberculosis: A Cross-sectional Study among Cattle Holders in Peri-Urban Area of Sonipat

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Abstract

Background: The main causative agents of bovine tuberculosis (TB) are *Mycobacterium bovis* and to a lesser extent, *Mycobacterium caprae*. The zoonotic transmission of these pathogens occurs primarily through close contact with infected cattle or consumption of contaminated animal products such as unpasteurized milk. **Objectives:** The objective of this study is to assess the association of practices potentially increasing the risk of zoonotic TB (zTB) among cattle holders in the peri-urban area of Sonipat district. **Methodology:** This study was carried out among 100 cattle holders. The snowball sampling method was used to select the study units. Those who were handling cattle at home for the maximum time were included under the study (one per household). Face-to-face interviews were carried out using a structured questionnaire. The modified Kuppuswamy scale was used for the segregation of risk. **Results:** Only 4% of participants have heard about zTB and belonged to the middle and upper-middle class. Dietary practices such as consumption of boiled milk and cooked meat, mixed type of milk, meat, and raw milk were found to be 15% (40–49 years), 68% (20–29 years), 3%, and 9% (30–39 years), respectively. Cooked meat was consumed by 15% of participants, of which 12% were of 20–29 years and 3% were of 30–39 years, whereas 3% (20–29 years) population was consuming mixed form of meat. **Conclusion:** The risky practices such as attending animal fares, treating sick cattle, and contact with stray animal and in dietary practices of milk and meat consumption increase the zTB risk.

Keywords: *Mycobacterium bovis, Mycobacterium caprae*, peri-urban, tuberculosis, zoonosis, zoonotic tuberculosis

Introduction

A peri-urban area refers to a transition or interaction zone, where urban and rural activities are juxtaposed, and landscape features are subject to rapid modifications, inducing by human activities.[1] An estimated 8.8 million new cases, a global average incidence rate of 128/100,000 population/year, and 1.5 million deaths were attributed to TB in 2010.[2] Zoonotic tuberculosis (zTB) is a form of TB in people caused by *Mycobacterium bovis,* which belongs to the *Mycobacterium tuberculosis complex*. Cattle are the most important animal reservoir for *M. bovis* in relation to zoonotic exposure of humans, but the disease can affect many other species and become established in wildlife reservoirs.[3] *M. bovis*, the cause of bovine-type TB, has an exceptionally wide host range. The susceptible species include cattle, humans, nonhuman primates, goats, cats, dogs, pigs, buffalo, badgers, possums, deer, and bison. Many susceptible species, including human, are spillover hosts in which infection is not self-maintaining.[4] It often affects the sites other than the lungs (extrapulmonary), such as lymph nodes of the neck and gastrointestinal tract, but in many cases is clinically indistinguishable from TB caused by *M. tuberculosis*. It results in important economic losses and trade barriers with a major impact on the livelihoods of poor and marginalized communities.[5] Aerosol is considered to be the main route of infection in animals.[6,7] *M. bovis* is usually transmitted to human by consuming raw, infected cow milk, or through aerosol droplets. Pasteurization kills

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M. bovis bacteria in infected milk. In the developing world where pasteurization may not be routine, *M. bovis* is a relatively common cause of human TB.[8] *M. bovis* infection was recognized as a major public health problem when this organism was transmitted to human through milk from the infected cows. The introduction of pasteurization helped eliminate this problem. Those occupational groups working with *M. bovis* infected cattle or deer, on the farm or in the slaughter house, are more likely to develop pulmonary disease than alimentary disease.[4] However, in developing countries, such as in African, Asian, and South American and the Caribbean nations, 46%, 44%, and 35% of sporadic occurrences and (particularly in Africa 11%) enzootic occurrences of zTB have been, respectively, reported.[9] In 2015, there were an estimated 149,000 new human cases of zTB globally, and 13,400 deaths due to zTB.[10] The burden of zTB is the heaviest in the African region, followed by the South-east Asian region.[11] Ethiopia is one of the African countries where TB is widespread in both humans and cattle, and the endemic nature of TB in humans and cattle has long been documented. The disease is considered one of the major livestock diseases that results in high morbidity and mortality, although the current status on the actual prevalence rate of bovine TB (BTB) at the national level is yet unknown. The detection of BTB in Ethiopia is carried out most commonly on the basis of tuberculin skin testing, abattoir meat inspection, and very rarely on bacteriological techniques.[9] Herds with the following risk factors had a significantly greater prevalence of intradermal test positives: >50 cattle in the herd ($P = 0.024$), herds housed inside at night ($P = 0.021$), and herds in contact with wildlife ($P = 0.041$). Furthermore, villages that experienced annual flooding had a higher prevalence of infection ($P = 0.043$).[12] Although the BTB prevalence seems low, its potential risk to public health was important based on food consumption, poor sanitary measures, and the lack of understanding about its zoonosis.[13]

The aim of this study was to assess the association of zTB among cattle holders involved in the animal-handling practices with greater risk of infections. This study was conducted in the peri-urban area of Sonipat district in Haryana state.

Methodology

A descriptive, cross-sectional study in peri-urban area of the Sonipat district was conducted among 100 cattle holders. A total of 123 households were approached, of which 23 refused to participate in the study. The snowball sampling method was used to select the study units. One person from each household was interviewed using the structured questionnaire. Only the HoH/spouse/member who were handling cattle at home for the maximum time were included in the study from each house (1 person/HH), wherein elderly members and children who are not involved in cattle practices were excluded from the study. The interviewer visited the area along with the schedule and a person from their community who was willing to participate was interviewed.

The selected cattle holders were segregated into five categories based on the modified Kuppuswamy scale for socioeconomic status. This scale was consisting of three categories which were education level scoring, occupation level scoring, and income level scoring.

Risk scoring was done according to 0 for no risk and 1 for practicing risky practices. 5 was calculated as a score when no risky practices were practiced and 20 was the maximum score for practicing risky practices.

Ethical considerations

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

Four percent of male respondents have heard of zTB. Six percent of respondents attended animal fair. The other potential risk factors were form of milk and meat consumption. Fifteen percent of the respondents were consuming boiled milk (14% males and 1% females), mixed type of milk by 68% (of which 61% were male and 8% were female), and raw milk by 9% (8% males and 1% females). Cooked meat was consumed by 15% (only by males), mixed type of meat by 3% (males only), and there was no practice to consuming raw meat in the study area.

The tendency to consume boiled milk was maximum in the age group of 40–49 years (7%), whereas the mixed form was more consumed by the people from the age group of 20–29 years (26%) and 30–39 years (16%) were consuming raw milk. Cooked meat was consumed in the age group of 20–29 years (12%) and 30–39 years (3%). Mixed form of meat was consumed by 3% (20–29 years). The maximum risk score was calculated as 12, minimum was 5, mean score was 9.41, and standard deviation was 1.43. According to the risk score, three categories were formulated: 34 participants were falling in category 1; 76 were in category 2; and none were from category 3.

Discussion

The mean was compared across age, gender, education, and socioeconomic status. The results suggested that participants who were at maximum risk had the following attributes across these risk parameters: age group (20–29 years and 30–39 years), gender male, socioeconomic status as lower-middle and middle-upper middle class, and education as secondary and tertiary. In the developing world where pasteurization may not be routine, *M. bovis* is a relatively common cause of human TB.[8] The transmission of zTB occurs primarily through close contact with infected cattle or consumption of contaminated animal products such as unpasteurized milk.[14] Both of the findings were in line with the observations from the study conducted in the peri-urban

area of Sonipat. Dietary practices such as consumption of raw milk and meat are also leading to the greater risk of zTB among the community. The males from the community in the age group of 20–29 years and 30–39 years are majorly exposed risk because of their dietary habits. The major factors that were identified to be influencing the knowledge gaps between different BTB prevalence settings were not only plausible biologically, but also socially. This underscores the importance of disease awareness campaigns. This should take form in farmer education, farmer-supported actions, and participation in disease extension services. Such active participation in disease control activities will develop the farmers' interests further assisting disease control experts when adopting workable methodologies aimed at controlling livestock diseases such as BTB in diverse farming communities with varying levels of disease perceptions among cattle owners.[15] Awareness campaigns, information education communication (IEC) activities to increase the awareness about the zTB, risk factors, and practices should be conducted targeting the particular age group and gender for awareness.

Limitations

The limitations of the study were that participants were from the Hindu community; hence, the results cannot be generalized on the Muslim community.

Coclusions

Zoonotic TB is a widely distributed, often neglected disease in mostly developing countries which have its public health consequences. These needs to be included in health policies and strategies to control its transmission. The community should be encouraged to consume boiled or pasteurized milk. There should be intersectoral coordination for its surveillance in humans and animals as well. The risk factors should be determined for the transmission of the infection and this should be conveyed to the risk population in animal fares and camps.

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Conflicts of interest

There are no conflicts of interest.

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