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Perception and Factors Associated with Tuberculosis among Cattle Owner Tuberculosis Patients

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Abstract

This review synthesizes existing literature to explore the perceptions of Tuberculosis (TB) among cattle owners and the potential factors contributing to TB transmission from cattle to human. The current review highlights the importance of addressing the socio-cultural beliefs, economic constraints, and occupational exposures that affect cattle owners' adherence to TB treatment and their ability to implement preventive measures. TB is a significant public health concern globally, and understanding the unique challenges faced by TB on cattle owners who are also TB patients can contribute to the development of targeted interventions. generally, the review give emphasis to the need for comprehensive strategies that involve collaboration between healthcare providers, veterinary services, and public health agencies to effectively control TB transmission in cattle owner.

Keyword: Perception; Risk factors; Tuberculosis; Cattle owners.

Introduction

Worldwide, TB is the second leading infectious killer after COVID-19 (above HIV and AIDS). In 2022, an estimated 10.6 million people fell ill with Tuberculosis (TB) worldwide, including 5.8 million men, 3.5 million women and 1.3 million children [1]. Ethiopia has one of the world's highest rates of human tuberculosis, which is primarily caused by *Mycobacterium tuberculosis*. In addition, the country remains a hotspot for zoonotic illnesses like bovine tuberculosis, putting public health and the cattle industry at risk [2]. Bovine Tuberculosis (bTB) is an infectious bacterial disease caused by *Mycobacterium bovis* that causes granulomas to grow in tissues and organs, particularly in the lungs, lymph nodes, gut, kidney, liver, and spleen [3]. So, efforts have been made to control and eliminate Tuberculosis (TB), cattle owner face unique challenges that require special attention [4].

Perception of TB among cattle owners is can be influenced by a variety of factors such as cultural beliefs, misconceptions, and stigmatization [5]. Cattle owners habitually have close contact with their animals, and belief that TB can be transmitted between cattle and humans may contribute to heightened anxieties and fear of the disease [6]. These perceptions can influence the cattle owners' understanding of TB symptoms, treatment, and prevention measures, ultimately affecting their healthcare-seeking behaviors [7].

There are also various factors contribute to the transmission of TB from cattle to cattle owners. Such as prolonged contact with infected cattle or consumption of unpasteurized dairy products, can increase the risk of acquiring TB [8]. Furthermore, socio-economic factors, such as limited access to healthcare services and poverty, can hinder timely diagnosis and treatment initiation [9]. It is crucial to explore these factors comprehensively to design targeted interventions that address the specific challenges faced by cattle owners [10].

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Addressing the perception and factors associated with Tuberculosis (TB) among cattle owners requires a multidimensional approach [11]. Firstly, there is a need for cultural sensitivity and tailored health education programs that promote accurate information about Tuberculosis (TB) transmission and prevention in the context of cattle ownership [12]. This may involve community-based initiatives, the involvement of local leaders, and the use of local language and mediums to effectively convey the information [13]. Secondly, collaborating with veterinary services and public health agencies is essential for controlling TB transmission among the cattle owner [14]. Implementing effective animal TB surveillance programs, promoting good animal husbandry practices, and advocating for the implementation of milk pasteurization processes can help reduce the transmission of TB from cattle to humans [15].

In general terms, control measures of bovine tuberculosis in the traditional extensive production systems are more difficult and complex [16]. The complexities of human-animal relations, reflects on how people understand and conceptualize risk of bovine Tuberculosis (bTB) in an endemic area considering the economic value of livestock keeping as well as social and cultural practices of importance to the community [17]. This seminar aims to explore the perception of cattle owners regarding TB and identify the factors associated with the disease.

Literature review

Etiology

Genus Mycobacterium is characterized phenotypically as non-motile, no capsular, non-spore forming, obligate aerobic, thin rod usually straight or slightly curved having 1-10µm length and 0.2 - 0.6µm width, facultative intracellular microbe and has a slow generation time about 15 - 20 hours [18]. *Mycobacterium bovis* is the main etiological agent of bovine tuberculosis. *Mycobacterium bovis* belongs to the Mycobacterium Tuberculosis Complex (MBTC) group that also comprises *M. tuberculosis, M. caprae, M. microti, M. africanum, M. canettii, M. pinnipedii, M. bovis* BCG, *M. leprae*, and the recently identified *M. mungi* [19]. These pathogens has the same 16S rRNA sequence and up to 99.9% nucleotide identity [20].

Global burden of tuberculosis

Tuberculosis (TB) continues to be a significant global health burden, posing a substantial threat to public health worldwide. Despite progress made in combating the disease in recent years, TB remains one of the top infectious killers [21]. According to the World Health Organization (WHO), an estimated 10 million people fell ill with TB in 2022, and around 1.4 million died from the disease. TB predominantly affects low and middle-income countries, with a particularly high burden in sub-Saharan Africa and Asia [22]. In Ethiopia, TB killed over 19,000 people in 2022, which is more than two deaths every hour. The WHO estimates that about 30 percent of TB cases go undetected by the healthcare system in Ethiopia, resulting in unnecessary deaths [23].

Globally, 3.1% of human cases are attributed due to *M. bovis.* Case numbers are low in developed countries because of efficient routine prevention steps like milk pasteurization and implementation of eradication program. Developing countries mainly suffer due to the high cases of HIV/AIDS, use of raw milk and poor living condition apart from lack of intervention system. In endemic areas, where milk pasteurization is limited, it is estimated that about 10 to 15% human TB prevalence is due to *M. bovis*. Ethiopia is one of the high burdened countries in the world with human TB cases predominately due to MTB [24].

Tuberculosis in Cattle

Tuberculosis (TB) is not solely a human health concern; it also affects various animal species, including cattle [25]. Bovine Tuberculosis (bTB) is a chronic infectious disease primarily caused by *Mycobacterium bovis*, which can be transmitted between animals and occasionally to humans [26]. It poses a significant economic threat to the livestock industry, as infected cattle may experience weight loss, reduced milk production, and ultimately slaughter [27].

To prevent the spread of bTB, many countries have implemented surveillance and control programs, including mandatory testing of cattle and culling infected animals [16]. However, eradication efforts can be challenging due to variations in national policies, wildlife reservoirs, and limitations in diagnostic tools [28]. Moreover, the zoonotic potential of bovine TB underscores the importance of monitoring and controlling the disease in cattle to reduce the risk of transmission to humans, particularly individuals working closely with livestock or consuming unpasteurized dairy products [29].

Perception of Tuberculosis among Cattle Owners

Study revealed in Ethiopia indicate that almost all cattle owners (97.4%) have information about human TB, while it was extremely low in bTB cases (24.1%) [30]. Other study also revealed in Addis Ababa that reported 99.5% and in southern Ethiopia 99.6%, who found a profound awareness on human TB [31]. Nevertheless, indicated a lower (29.7%) awareness on TB occurrence in animals among cattle owners in the southern part of Ethiopia [32]. Despite a higher proportion of the cattle owner had information about human TB, more than half (56.7%) of them had little knowledge about the cause of the disease. Whereas, more than half (63.1%) of the respondents mentioned germ/bacteria is the actual cause of bovine TB [30].

Awareness variation seen between the two types of TB could be a reflection of remarkable educational efforts towards human TB through multiple information sources, participation large number of multicultural respondents in animal production, health, and husbandry. In study done in northern Ethiopia more than 20% of cattle owners said that they get information and awareness from radio/TV. Similarly, 64.6% respondents get information from television [33]. This may be due to the recent attention given by the government and NGOs operating in Ethiopia. These firms always air information on these diseases on TV and radio to create awareness [34].

Factors Associated with Tuberculosis transmission from cattle to human

Tuberculosis found in cattle can be passed on to humans either through the consumption of raw or undercooked contaminated animal products, such as milk and meat, or through inhalation of the TB spores produced when cattle and humans come into close contact with one another. There are many factor associated with transmission of TB from cattle to human including: Age, consumption of raw animal product (milk and meat), sharing a house with livestock, Humans and animals' use of common water sources, regular and direct contact with live animals, education level, knowledge of TB transmission modes, perception that TB cannot be passed from animal to human, Cattle owners' residence area, livestock shepherding practice, animals grazing on fields and types of animal breeds owned by

farmers [35].

Age

The Tuberculosis (TB) epidemic is *most prevalent in the elderly*, and there is a progressive increase in the notification rate with age [36].

Consumption of Raw animal product (milk and meat)

Consumption of milk that has not been pasteurized and meat that has not been cooked thoroughly could contribute to the propagation of tuberculosis. Meat that has not been prepared or raw meat from cattle that have tuberculosis could be the source of the disease in humans, most commonly Extrapulmonary.

Sharing a house with livestock

It is possible that the spread of Tuberculosis (TB) among humans and positive skin test reactions in cattle could be increased by housing animals alongside humans in enclosed living quarters [37].

2.5.4 Humans and animals' use of common water sources

Humans can contract Tuberculosis (TB) through indirect contact after being exposed to water that has been tainted by the urine of animals that are sick with TB [17].

Regular and direct contact with live animals

Longer exposure could arise from close contact between tuberculosis-infected animals and people, which would very certainly raise the likelihood of disease transmission from animal to human [35].

Educational status

The educational status of the cattle owner for awareness of TB in humans and animals was significantly associated with the perception [32]. Cattle owner with grade eight and above educational level had good perception of TB in both humans and animals [9]. The possible reason could be as the level of education increases; people would have acquired better information access about the diseases [38].

Animal grazing on the field

Bovine tuberculosis, have a direct link with animal husbandry systems; the development of animal husbandry systems is increasing the prevalence of the disease, which poses a considerable public health risk for people who consume animal products [17].

Impact of Cattle Ownership on Tuberculosis Control

Cattle ownership plays a crucial role in Tuberculosis (TB) control efforts, as it directly impacts the spread and management of bovine Tuberculosis (bTB) [17]. The ownership and management practices of cattle have significant implications for disease transmission and control. Firstly, responsible cattle ownership involves vigilant monitoring and testing of animals for bTB [16]. Regular diagnostic testing can help identify infected animals and prevent further transmission within and between herds [39]. This is especially important in regions where bTB is prevalent or poses a public health risk [17]. Implementing robust surveillance programs and adhering to testing requirements can aid in early detection and containment of the disease [23].

Secondly, effective biosecurity measures are essential in controlling bTB. These include maintaining strict hygiene practices, minimizing contact between infected and uninfected animals, and preventing the entry of potential disease carriers onto farms. Isolating and removing infected animals from the herd is crucial to prevent the further spread of bTB [16]. Vaccination programs can also be employed to reduce the overall prevalence and severity of the disease [40]. Thirdly, cattle ownership has implications for human health [33]. People in close contact with cattle, such as farmers, veterinarians, and abattoir workers, are at risk of contracting bTB. Therefore, promoting awareness, providing education, and adopting proper hygiene practices among livestock owners and those exposed to cattle can help reduce the risk of transmission to humans [41].

Responsible cattle ownership, which entails regular testing, effective biosecurity measures, and awareness of the zoonotic potential of bTB, is crucial for the control and prevention of the disease [42]. Close collaboration between veterinary services, livestock owners, and public health agencies is necessary to mitigate the impact of bTB and protect both animal and human health [43].

Challenges and current opportunities

Challenges

Lack of awareness: Cattle owners who are TB patients may have limited knowledge about the disease, its transmission, and preventive measures, which can hinder their understanding of the risks associated with TB [44]. Stigma and fear: There might be a social stigma associated with being a TB patient, which can lead to fear of disclosure and unwillingness to seek treatment [45]. Cattle owners may be concerned about the implications of their TB diagnosis on their livelihood and social standing within the community [17]. Limited resources: Cattle owners often face resource constraints, making it challenging for them to prioritize their own health [41]. Occupational exposure: Cattle owners who work closely with their animals, especially in close confinement or unsanitary conditions, are at a higher risk of contracting bovine TB [42].

Opportunities

Education and awareness campaigns: Government health facilities can organize information campaigns targeting cattle owners to raise awareness about TB [46]. Integrated healthcare services: Government health facilities can collaborate with veterinary services to provide integrated healthcare services to both cattle and human populations [47]. Financial support: Government initiatives can provide financial support programs for low-income cattle owners who are TB patients, including subsidies for TB medications and healthcare services [41]. Livelihood support: Efforts can be made to ensure that TB patients who are cattle owners do not face negative impacts on their livelihoods due to their diagnosis [16].

Research gap and future direction

Despite the established association between tuberculosis (TB) in cattle and the risk of transmission to humans, there is a notable research gap concerning the perception and factors associated with TB among cattle owners who are themselves diagnosed with tuberculosis [17]. Limited studies have been conducted on this specific population, and their perspectives, knowledge, and awareness regarding TB transmission, prevention, and control measures remain understudied [48]. Further-

more, the potential impact close contact with cattle on the development and spread of the disease has not been extensively explored [27]. Understanding the perception and factors specific to this group is crucial for planning effective interventions and policies to combat TB transmission both in cattle and humans [17].

To address the above-mentioned research gap, future studies should employ a multidisciplinary approach combining medical, veterinary, and social science perspectives [49]. Qualitative research methods, such as in-depth interviews and focus group discussions, can be utilized to gather rich data on the perception and factor associated with TB among cattle owners who are tuberculosis patients [50]. Additionally, quantitative surveys can be conducted to assess the prevalence and risk factors associated with TB among cattle owners [33]. The findings from such studies will help inform targeted interventions, educational campaigns, and policies aimed at reducing the transmission of TB among both cattle and humans in this specific context [44].

Conclusion and Recommendation

The review on perceptions and factors associated with tuberculosis among cattle owners who are also tuberculosis patients have a good role on giving awareness tuberculosis prevention and control. According to available literature it is low perception on tuberculosis among cattle owner. Factors associated with transmission of tuberculosis from cattle human such as: consumption of raw animal product and inhalation of respiratory droplet of infected cattle through house sharing with cattle, common drinking water, contact with cattle and shepherding cattle is common. Based on the review, several recommendations can be made: First, targeted awareness campaigns should be devised to educate cattle owners about the modes of TB transmission from animals to humans. Then, collaborative efforts between healthcare providers, veterinary services, and agricultural authorities should be established to enhance the exchange of knowledge and facilitate the implementation of integrated control strategies.

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