KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARDS ZOONOTIC BOVINE TUBERCULOSIS AMONG NOMADIC PASTORALISTS IN NASARAWA, NIGERIA

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ABSTRACT
Tuberculosis is a chronic debilitating disease occurring worldwide affecting a wide range of animals and man. In developing countries like Nigeria, the situation is still high among pastoral communities, occupationally related livestock workers, and immune-compromised individuals living with HIV and Aids whose knowledge, practice, and attitude could predispose them to zoonotic tuberculosis (ZTB). In this study, a total of 125 questionnaires were administered to pastoral communities in the southern zone of Nasarawa to determine the Knowledge Attitude and Practice among pastoralists towards ZTB, and informed consent was sought among the individuals before the interview was granted. A descriptive statistic was used to calculate and analyze data from the KAP level of response and the socio-demographic variables: Educational Level; duration in Pastoral activities and Age of the respondents. From the KAP level interview, the response indicated that (77.6 %) of respondents with a secondary level of education are aware of the zoonotic transmission of TB from animal to man while (62.4 %) have knowledge that man can contract TB from animals. The participants have some understanding of the signs of TB, but greater awareness (77.6 %) was observed mostly among participants with a secondary level of formal education. Consequently, on the knowledge of how TB is transmitted, there was inadequate knowledge among the participants as (68.8 %) of primary level and (41.6 %) of respondents without formal education said meat is the vehicle for the transmission of TB from animals while only (33.6 %) of the participants with secondary education mention Milk products. All the participants consumed Sour Milk (100 %) while the level of consumption of fresh and boiled milk among the participants was (24.1 % and 27.6 %; Table 2) regardless of their educational level. Regarding the practice of using protectives while in contact with animals, (68.0 %) and (61.6 %) of respondents with primary and secondary formal education said they wash their hands after contact with animals while only (20.8 %) of respondents without formal education wash their hands after contact with animals. KAP level observed a divergence of opinion among the participants due to inadequate awareness and knowledge of protection from ZTB.KAP level observed that more than (65 %) of the respondents do not undergo BCG vaccination. Consequently, the study observed a (100 %) consumption of Sour Milk among the respondents. There is a need for an integrated education in line with one health approach to pastoral communities to safeguard them from zoonotic bovine tuberculosis.
Key: Pastoralists; Zoonotic; Milk; Demographic; Tuberculosis; Communities; KAP

INTRODUCTION

Mycobacterium bovis is a type of bacteria that belongs to the Mycobacterium Tuberculosis Complex (MBTC). This group of bacteria is genetically related and can cause tuberculosis in various mammals, including humans, domestic animals, and wildlife (Gagneux *et al*., 2018; Michel *et al*., 2006). Bovine tuberculosis (BTB) is a contagious and zoonotic disease that results from infection with *Mycobacterium bovis*, *Mycobacterium caprae*, *or Mycobacterium tuberculosis* in some cases. Cattle-to-cattle transmission occurs through aerogenic means (Melaku *et al*., 2013) due to increased contact between animals, and Zanwa *et al*. (2023) report that in a location where animal population density increases especially in grazing reserves or communal grazing areas where animal density is high, the odds of detecting bovine tuberculosis increases.

The transmission of *Mycobacteria* can occur through various routes, depending on the location of the infection in the animal's tissues and organs. Tuberculosis can spread from the initial site of infection to other parts of the body through the lymphatic and aerogenous routes, resulting in pulmonary tuberculosis (Colins *et al*., 1987). While the primary ways in which a disease can be transmitted are understood, there is a need for additional information regarding the socio-cultural and economic

factors that contribute to practices that increase the likelihood of transmission to individuals, as well as strategies for promoting safer alternatives (Smita *et al*., 2021).

MATERIALS AND METHODS

Study Area

The research was carried out in the southern region of Nasarawa state, located in north-central Nigeria. The study area's latitude is 80 32' 20.22''N and longitude of 70 42' 29.56''E, covering five local government areas (Awe, Doma Keana, Lafia, and Obi) that include numerous districts, and villages. The zone has boundaries with Plateau to the east and Benue state to the south The participants in the study were classified based on their gender (male and female), educational level, duration of engagement in pastoral activities (≤ 3 years and, ≥ 3 years), and age groups of (≤25 years, 25-30 years, 31-35 years, 36-40 years, and above 40 years). A total of 125 volunteers were interviewed using a structured questionnaire to evaluate their knowledge, attitudes, and practices concerning zoonotic TB (ZTB) in some randomly selected pastoral communities in the southern region of Nasarawa state.

Figure 1 Map of Nigeria showing Nasarawa State in the North Central region

Figure 3: Map showing Nasarawa State southern zone

Questionnaire Design

This questionnaire was partially adapted from the research conducted by Adesokan *et al*. (2018) and included closed-ended questions in both Hausa and English. It aims to gather information on various aspects, including the socio-demographic profile of the respondent (age, gender, education, and pastoralism experience), as well as their knowledge, attitudes, and practices regarding zoonotic TB.

Sampling Procedure

The sampling was conducted between April 2019 and February 2020, 25 questionnaire was assigned to each local government area and a total of 125 questionnaire was distributed and returned. Only pastoralists were included and informed consent was sought before the interviews were granted using KAP.

Data management and statistical analysis

The data was entered, managed, and analyzed using IBM®SPSS software version 22.0 and Microsoft Excel 2010. Descriptive statistics were utilized to calculate the variables of interest on socio-demographic characteristics of respondents about their knowledge, attitude, and practice regarding ZTB.

RESULTS

Socio-demographic characteristics of the respondents

The socio-demographic information of the respondents suggested that the level of formal education amongst the respondents revealed that respondents with no formal education accounted for 44. % (56) while other respondents with Primary and Secondary levels of education were 31.2% (39) and 24.0% (30) respectively. The findings of this study suggest that the level of formal education among the respondents is good since respondents with primary and secondary levels of education (31.2% (39) and 24.0% (30); Table 1) were more than those respondents with no formal education (44. % (56); Table1). The duration of pastoral activity among the participants showed that 10.4% (13) of the respondents had ≤ 3 years in cattle pastoral activities while 89.6% (112) of the respondents had ≥ 3 years in pastoral activities accounting for a higher proportion among the respondents. Among them majority are male 96.0% (120) between the age group of 25-30 [38.4% (38)] and 31-35[42.0% (30)] (Table 1).

Table 1: Demographic characteristics of the respondents concerning Knowledge, Attitudes, and Practices of Zoonotic TB in the Southern Zone of Nasarawa.

Variable	Total No. of responses (%)
Level of Formal Education	
No formal Edu.	56(44.8)
Primary	39(31.2)
Secondary	30(24.0)
Total	125(100.0)
Duration in Pastoral activity	
≤ 3yrs	13(10.4)
>3yrs	112(89.6)
Total	125(100.0)
Age	
≤ 25	16(12.8)
25 – 30	48(38.4)
31 – 35	38(30.4)
36 – 40	18(14.4)
>40	5(4.0)
Total	125(100.0)
Sex	
Male	120(96.0)
Female	5(4.0)
Total	125(100.0)

Knowledge of the pastoralists towards zoonotic bovine tuberculosis

There is inadequate knowledge on how zoonotic bovine tuberculosis (ZTB) can be transmitted from animal to man among respondents without formal education along with those with a primary level of education accepting that they do not know that animals could transmit ZTB (71.2% and 68.8 %) consequently, only respondents with a secondary level of education had good knowledge and affirm yes (77.8%). Among the respondents (62.4%) of respondents with secondary school level had good knowledge that humans can contract TB from animals. Respondents had poor knowledge of how TB is transmitted through the consumption of animal products, as (41.6%) of respondents without formal education went in for Meat, (68.8%) of respondents with primary school level answered consumption of Meat as the vehicle for transmission of TB to humans while 38.6% of those with secondary level answered milk and milk product, however, there is inadequate awareness on the

knowledge of means of transmission of ZTB among the participating respondents. An impressive response was observed among the participants that TB can be cured by modern medicines (Table 2).

Table 2: Knowledge, Attitudes, and Practices towards Zoonotic Tuberculosis Among Pastoralists in Nasarawa

VARIABLES		LEVEL OF EDUCATION (%)			DURATION IN PASTORAL ACTIVITY (%)		AGE (%)				
		No Formal	Primary	Secondary	≤3yrs	≥3yrs	≤25yrs	25-30	31-35	36-40	>40
Knowledge of TB can be transmitted from animal to man.	**Yes**	28.8	31.2	77.6	70.4	16.0	38.4	44.0	32.8	31.2	
	No	60	68.8	22.4	29.6	84	25.6				
							70.6	56.0	67.2	68.8	
							74.4				
Knowledge of humans can contact TB from animals.	**Yes**	15.2	17.6	62.4	35.2	23.2	30.4	16.0	31.2	32.8	
	No	84.8	82.4	37.6	64.8	76.8	31.2				
							69.6	84.0	68.8	67.2	
							68.8				
Knowledge of signs of TB.	**Yes**	45.6	45.6	77.6	49.6	50.4	58.4	69.6	46.4	50.4	
	No	54.4	54.4	24.4	50.4	53.6	44.0				
							41.6	30.4	53.0	49.6	
							56.0				
Knowledge of how TB is transmitted.	Direct Contact.	24.8	13.6	16.0	0.0	31.2	0.0	16.8	0.0	12.0	
	Meat	41.6	68.8	28.8	36.8	38.4	8.0				
	Milk	24.8	16.0	21.6	32.8	20.4	8.8	17.6	53.6	38.4	
	Milk Prod.	8.8	1.6	33.6	30.4	9.6	62.4				
							65.6	17.6	20.0	28.8	
							8.0				
							25.6	48.0	26.4	20.8	
							12.6				
Knowledge of TB can be. cured	**Yes**	53.6	70.4	72.0	52.0	63.2	55.2	61.6	39.6	59.8	
							64.0				
	No	46.4	29.6	28.0	48.0	36.8					
							34.4	38.8	50.4	43.2	
							36.0				
Practices of kind of Milk consumed.	Fresh	24.1	24.1	24.1	32.7	67.3	18.9	22.6	17.0	13.2	
	Sour	100	100	100	32.7	67.3	28.3				
	Boiled	27.6	27.6	27.6	32.7	67.3	18.9	22.6	17.0	13.2	
							28.3				
							18.9	22.6	17.0	13.2	
							28.3				
Ways of protection against animal disease.	Protective Material.	30.4	8.0	6.4	0.0	16.0	13.6	0.0	0.0	15.2	
					0.0	40.0	11.2				
	Limit contact	48.8	24.0	32.0	100	100	0.0	60.0	60.0	48.0	
	Hand wash.	20.8	68.0	61.6			35.2				
							86.4	40.0	40.0	36.8	
							53.6				
Have you ever had a BCG vaccination?	**Yes**	7.2	33.6	15.2	15.2		11.2	0.0	12.8	7.2	
	No	92.8	66.8	84.8	100	84.8	16.8				
							88.8	100	87.2	92.8	
							83.2				

Attitude of the pastoralists toward Zoonotic Bovine tuberculosis

The attitudes of the participants towards ways of protecting themselves from zoonotic TB, (48.8%) of respondents with no formal education said they limit contact with animals, while (68.0%) of those in primary and secondary school (61.6%) said they often wash their hands after coming in contact with animals. On the use of protective material. (30.4%) of the respondents with no formal education said they use protective material when coming in contact with animals, however, there is a poor attitude among participants with no formal education. Among the participants, only 7.2% of respondents with no formal education had ever undergone Bacillus Calmette Guerin (BCG) vaccination and 33.6% and 15.2% of those with primary and secondary school had also received BCG, this revealed that there are poor attitudes towards protection (Table 2).

Practice of the pastoralists toward Zoonotic Bovine tuberculosis

Among the respondents with primary and secondary levels of education including those without formal education greedy to consumption of sour milk (100%), 27.6% boiled their product before consumption and 24.1% consumed the fresh product immediately after milking (Table 2).

DISCUSSION

This study suggested that there is a knowledge gap among a pastoral community whose main occupation is cattle nomadism and the routine contact with their animals during grazing, health inspection, and milking activity cannot be estimated due largely to the frequency of contact they had with their animals and since the transmission of bovine tuberculosis is largely through inhalation of infected aerosols that is contaminated with *Mycobacterium bovis* (Cosivi *et al*., 1998) or through consumption of unpasteurized milk (Ofukwu *et al*., 2008) and other milk products that could predisposed humans to non-tuberculous *Mycobacteria* (Agada *et al*., 2008). The awareness gap among the pastoralists with no formal education (28.8%) and those with primary education (31.2%) is very low in the knowledge of the transmission of bovine tuberculosis from animals to humans. (77.6%) of participants with secondary education had more knowledge of the disease transmission from animal to man and agrees with the report of Renuka and Muralidhar (2012) whose KAP findings recorded good understanding among high school students in India while in Addis Ababa Kidane *et al*., 2015 recorded a KAP level of (99.5%) among high school students.

This study revealed that there is a poor understanding among respondents that humans can contract zoonotic TB from animals especially among pastoralists with no formal education (15.2%) and those having primary school education (17.6%), but a good result was established among pastoralist with secondary school level (62.4%) who accepted the fact that human can contract ZTB from animals and this agrees with the findings of Bihon *et al*. (2021) whose reports in a study carried out in Ethiopia, maintained that (33.3%) of respondents believed that no transmission of ZTB can occur from animals to humans regardless of the age of the participating respondents.

Among the respondents who had good knowledge of signs of TB, (77.6%) came from participating respondents with secondary school level, the duration of pastoral activity and the age of the respondents also showed greater awareness and this is in agreement with the findings of Gabremariam *et al*. (2011) whose report mentioned that respondents are aware of the signs of TB and were able to mention few signs of the disease. The duration of involvement and the age of the participating respondents might have exposed them to ZTB since the lower age group had little knowledge regarding the signs of the disease and that could serve as a predisposing factor to the disease (Sichewo *et al*., 2019). The role played by mass media cannot be overemphasized as Abraham *et al*. (2014) maintained that high school students are more aware of the signs of TB and when asked, how they knew it, they mentioned Radio and Television jingles as their sources of information and this is in agreement with the report of this study.

Among the respondents, a significant number of participants with primary (70.4%) and secondary (72.0%) levels agreed that TB can be cured with modern drugs (Bati *et al*., 2013) however, (53.6%) responses were recorded from participants who had no formal education and this reports could highlight the significance of Information Unit of the Local Governments DOT centers on sensitization campaigns in pastoral communities in the Southern zone of Nasarawa state on the need to undergo regular BCG vaccinations and this is in agreement with the reports of Bihon *et al*.(2020) whose findings suggested that community health education should be integrated with one health approach to improve awareness to public health. The results of the duration of pastoral activity and the age of the respondents also had a greater impact on the role played by community education through a sensitization approach.

Report on milk consumption by the participating respondents showed that greater consumption of sour Milk (100%) with a lower level of Boiled (27.6%) and Fresh (24.1%) observed among the respondents in the southern zone of Nasarawa state, regardless of with or without formal education and when asked why taking sour milk, the response was just based on the sour test but unknowingly the sour milk contain more bacterial load causing the bacterial oxidation that produces the sour test (Ofukwu *et al*., 2008). Age groups of all the respondents showed that they consumed all the products at different proportions and this could put them at greater risk of contracting zoonotic TB (Firdessa *et al.,* 2014). A high proportion of consumption of sour Milk among respondents with ≥ 3 years in pastoral activity regardless of their age groups was recorded and since ZTB is a chronic disease they could latently get infected and begin to transmit TB to the community unnoticed and this is in tandem with the findings of Ofukwu *et al*. (2008) whose reports maintained that zoonotic *Mycobacteria* were isolated from Skimmed Milk (nono) sold for public consumption, this ostensibly underscore the need for pasteurization of milk before consumption, a process hardly carried out in traditional milking

system in most developing countries where the burden of zoonotic TB is still high among pastoral and rural communities (WHO,2018).

Furthermore, our findings revealed that with regards to the age of the respondents, (60%) of the age groups between 25-30 and 31-35 agreed to employ a method of limiting contact with animals as an attitude to protection, while (86.4%) of age groups between ≤ 25yrs uses handwashing as means of protection from TB. Available reports revealed that TB spreads primarily through an aerogenous route among cattle and poses a higher risk to those directly in contact with them especially herdsmen, who are more likely to develop pulmonary tuberculosis (Melaku *et al*., 2013) and consequently, zoonotic tuberculosis ensue due to frequent contact with their animals (Ofukwu *et al*., 2008). The duration in Pastoral activities among the respondents suggested that there is inconsistency on the means of protection against diseases, since respondents with [≤3yrs and ≥3yrs duration in pastoral activities ;Table 2] accepted they utilized hand washing (100%) while only (40%) of the participating respondents with ≥3yrs in pastoral activity agreed to the use of method of limiting contact with their animals as a means of protection while participating respondents with primary (68.0 %) and secondary education (61.6 %) also agreed to the use of handwashing but (30.4%) of respondents without formal education accepted that they used protective materials like rubber boots, and when asked why they use the boots, they replied, to prevent leg injuries from animals and this findings is consistence with work of Bihon *et al*.(2020) whose findings suggested that cattle owners are at high risk potentials of developing zoonotic TB due to lack of good knowledge, as Bati *et al*. (2013) and Bihon *et al*. (2020) suggested that as the education of the participants increases their knowledge towards disease prevention also increases.

In sub-Saharan Africa traditional pastoralist communities engage in close contact with livestock, putting them at risk of *M. bovis* infection, therefore occupational-related populations should be aided in terms of implementation and development of specific preventive measures and guidelines to prevent zoonotic TB.

CONCLUSION

This study concludes that there is a very good knowledge of ZTB among respondents with a secondary level of education (77.6 %) lower than what was observed in other studies carried out in different countries. (60.0 %) of respondents without formal education and (68.8 %) with primary education do not understand the zoonotic tuberculosis approach in response to the KAP level. A good response of signs of TB (77.6 %) among respondents with a secondary level of education was observed while almost a 50%-50% level of understanding of yes, I know the signs and no, I don't know the signs among the response from participants without formal education and those with primary school level was seen and this is in-tandem with other studies whose findings on signs of TB was understood by herdsmen. This study ostensibly found that the consumption of Sour milk by (100 %) of the respondents with lower levels of consumption of boiled and fresh milk. There is a need for community education among the nomads, the role played by nomadic education should inculcate the cultural interplay of knowledge of livestock disease and cattle nomadism to learn more about knowledge, attitude, and practices that could exacerbate the risk factors for zoonotic transmission of ZTB to man.

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