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Knowledge, attitude and practices of small ruminant butchers on tuberculosis in selected areas of Katsina State, Nigeria

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A questionnaire survey was conducted on the knowledge, attitude and practices of butchers on tuberculosis in small ruminants in selected areas of Katsina State, Nigeria. All respondents had some level of formal education. Animals slaughtered included cattle (18.0%), sheep (34.0%), goats (53.0%) and camels (4.0%). Animals were slaughtered in the countryside (23.0%), within the village (24.0%) and in community areas (57.0%). The butchers knew small ruminants could acquire tuberculosis and that tuberculosis could infect humans along with its signs and modes of transmission in animals and humans. Eighteen percent knew small ruminants could acquire tuberculosis from humans while 80.0% knew humans could acquire tuberculosis from animals. Thirty percent of respondents knew people with tuberculosis, while 10.0% each reported their family members having tuberculosis and living with tuberculosis-infected persons respectively. The butchers handled their tuberculosis-infected animals by taking such animals to Veterinary Clinic (52.0%), selling (21.0%) or leaving them in the flock (15.0%). The butchers reported socializing at night with friends (44.0%), brothers (14.0%), sisters (8.0%) and wives (34.0%). The butchers allowed dogs into the slaughter facilities and this was highly significant. Some of the butchers (62.0%) accepted childhood vaccination which included BCG (40.0%), Polio (28.0%) and Measles (27.0%). The study concluded that the butchers were aware of tuberculosis in both humans and animals, the signs and symptoms of the disease as well as its mode of transmission. The study has demonstrated poor attitudes and practices among the butchers about tuberculosis. The study recommends the need for greater education of butchers to enhance better practices and attitudes towards the disease to control it in themselves and the public they serve.

Keywords: Butchers, Knowledge, Practices, Small ruminants, Tuberculosis

Introduction

Tuberculosis is a bacterial, infectious and zoonotic disease of domestic and wild animals and man caused by the *Mycobacterium* spp (Radostits *et al.*, 2007). Among the *Mycobacterium* species, *M. bovis*, *M. tuberculosis*, *M. caprae* and *M. africanum* have been reported in animals and man in Nigeria (Shehu, 1988; Ahmad, 2015, Danbirni, 2016).

Among the animals reported to be infected with *Mycobacterium* spp in Nigeria include cattle, sheep, goats and pigs (Ahmad, 2015; Ibrahim *et al.*, 2021). Tuberculosis (TB), has been reported in all -six geopolitical zones of Nigeria (Onunkwo *et al.* 2003; Jenkins *et al.*, 2011; Abubakar *et al.*, 2014; Sani *et al.*, 2015; Saidu *et al.*, 2015; Saidu *et al.*, 2017).

The association of small ruminants with other animals in ownership holdings by pastoralists and farmers as well as the husbandry methods which predominantly involve extensive and semi-intensive methods usually increase the chances of small ruminants being infected with diseases seen mainly in cattle (Danbirni, 2016; Kaltungo, 2018a; Kaltungo, 2018b; Baba, 2019). The knowledge, attitude and practices of livestock owners in Nigeria, especially with regard to zoonotic diseases, seem to be low as reported (Buhari *et al.*, 2015; Muhammad, 2017). Thus, they can come in very close proximity to the diseases and in the process become infected without knowing.

In Nigeria, small ruminants form an important source of animal-based protein in most rural settings (Ajala, 2008), as such they can be infected with TB and other zoonotic diseases. When animal disease surveillance is poor, the risks of acquiring infections from animals can be high. In addition, the diagnostic facilities in the Veterinary Services in most states in Nigeria are inadequate (Adamu *et al.*, 2018); therefore the risks could be much higher than envisaged.

This study was therefore undertaken to determine the actual knowledge, attitude and practices of small ruminant butchers concerning TB so that a more informed study and recommendation could be given to governmental authorities on the approach to controlling the disease.

Materials and Methods

Study area

The study was undertaken in Katsina State, northwestern Nigeria, which has 34 Local Government Areas (FGN, 2009; KSIH, 2016). The LGA are grouped into three senatorial districts located between 11°0¹ and 13°25¹ N and between 6°45¹ and 9° 05¹ E. The State is bordered by Niger Republic to the North, Zamfara State to the West, Kano and

Jigawa States to the East and Kaduna State to the South (NPC, 2006; KSIH, 2016).

The human population in Katsina State is 5, 801, 584 (FGN, 2009) while the livestock population includes One million cattle, 2.5 million sheep and goats and 600,000 horses and donkeys (Ibrahim & Rumah, 2014). Livestock keeping is mainly extensive with small ruminants being herded with cattle or allowed to roam about in villages or urban and semi-urban areas, mixing with other animals of unknown history (Saidu *et al.*, 1991; Kaltungo *et al.*, 2013; Yakubu, 2016).

Study design

The study used a structured close-ended questionnaire to determine the knowledge, attitude and practices of butchers regarding TB. Using a random sampling method without replacement, a Local Government Area (LGA) was selected from each of the three senatorial zones of the State. Furthermore, two Wards were chosen using the same technique from each of the selected LGAs. One slaughter facility was selected from each of the chosen wards using convenience and acceptance by the butchers in the slaughter facility to participate in the study.

The questionnaire consisted of questions aimed at determining the biodata of the butchers, their knowledge with respect to TB in animals and humans, and their sources of knowledge. The study also enquired about their attitude towards TB, interaction with TB patients, operations at the slaughter facilities and socialisation with members of the communities. Similarly, the study found out the butchers' practices concerning the use of protective clothing during operations, consumption of meat, and allowance for ante and postmortem inspections, among others.

Sample size

The butcher sample size was arrived at using the formula by Thrushfield (2005). Thus:

$$n = \frac{Z^2Pq}{d^2} \text{ where:}$$

n = sample size

z = appropriate value for standard normal deviation set at 96% confidence interval (1.96)

p = prevalence (12.9%) as reported by Nwanta *et al.* (2011) for the prevalence of TB in humans in hospitals in Enugu State, Nigeria

q = complementary probability 1 – P

d = level of significance at 5% (0.05)

$$\therefore n = \frac{(1.96)^2 \times (0.129) \times (1 - 0.129)}{(0.05)^2}$$

$$= \frac{3.8416 \times 0.129 \times 0.88}{0.0025}$$

$$= 172.7$$

No. samples = 173.

The sample size was raised to 200 to increase precision

Questionnaire administration

To collect data on the questionnaire, the butchers in each slaughter facility were approached individually with the questionnaire administered to them. All the questions in the questionnaire were close-ended.

Data analysis

All data collected during the study were presented as tables. The results were also transferred onto a Microsoft spreadsheet and were analyzed using SPSS version 20, (IBM, USA 2011) statistical package using descriptive statistics. Chi-square was used to test for association between categorical variables. A P-value of ≤0.05 was considered statistically significant for all the data where applicable.

Results

A total of 200 butchers from Daura (66), Funtua (66) and Katsina (68) LGAs participated in the questionnaire survey (Table .1). Among them, 102 (51.0%) were in the age bracket of 15 to 30 years old, 52(26.0%) in the 31 to 46 years old and 38(19.0%) in 47 to 60 years old (Table 1). Furthermore, 92 (46.0%) of them had Primary education while 38(19.0%), 18(9.0%) and 58 (29.0%) had Secondary, Post-secondary and Islamic education, respectively (Table 1).

Animals commonly slaughtered by the butchers included cattle (18.00 %), sheep (34.00 %), goats (53.00 %) and camels (4.00 %) (Table 2). With regard to the locations they were slaughtering their animals, 46 (23.0%) of them reported slaughtering their animals in the countryside (areas away from the town where there are fields) while 48(24.0%) and 114 (57.0%) of them reported slaughtering their animals within their villages and in the community area respectively (Table 2).

Furthermore, 67.0% of them reported slaughtering animals daily, while 27.0% and 6.0% of others reported slaughtering animals regularly and once a while respectively (Table 3). The study required to know if some of the animals they were slaughtering were coughing, to which 51.0% of them responded positively (Table 3).

The study, in determining the knowledge of the butchers on TB first enquired on their knowledge of animal diseases to which 65% of them reported knowing up to five animal diseases while 30.0% and 5.0% of others respectively reported knowing 10 and 15 animal diseases (Table 4). Some of the diseases they knew included PPR (43.0%), TB (16.0%), helminthosis (19.0%) and pododermatitis (22.0%).

The study further enquired on the butchers’ knowledge of TB in animals to which 64.0% of them responded positively and 48.0% of them gave signs of the disease in animals as coughing while 33.0%, 10.0% and 9.0% indicated signs to include weight loss, death and others respectively (Table 5).

There was no statistically significant difference in the knowledge of butchers on TB in animals (p=0.396)

Table 1: Biodata of the respondents in selected Local Government Areas of Katsina state, Nigeria

LGA	No. butchers	Age (Years)				Educational Status			
		15-30	31-46	47-60	>60	Prim	Sec	Post-Sec	Islamic
Daura	66	24	16	20	6	36	6	4	20
Funtua	66	44	18	4	0	26	14	6	20
Katsina	68	34	18	14	2	30	18	8	18
Total (%)	200 (100)	102 (51)	52 (26)	38 (19)	8 (4)	92 (46)	38 (19)	18 (9)	58 (29)

Key:

Prim: Primary

Sec: Secondary

Post-Sec.: Postsecondary

Table 2: Animals commonly slaughtered at slaughter facilities in selected Local Government Areas of Katsina, State, Nigeria

LGA	No. Butchers	Animals slaughtered				Slaughter Place		
		Cattle	Sheep	Goats	Camel	Countryside	Within village	Community Area
Daura	66	10	20	34	2	32	22	32
Funtua	66	8	24	32	2	8	18	40
Katsina	68	18	24	40	4	14	8	46
Total (%)	200	36 (18.0)	68 (34.0)	106 (53.0)	8 (4.0)	46 (23.0)	48 (24.0)	114 (57.0)

Table 3: Slaughter frequency and evidence of coughing in slaughtered animals

LGA	No. butchers	Frequency of slaughter			Evidence of coughing	
		Daily	Regularly	Once a while	Yes	No
Daura	66	56 (84.8%)	8	2	32	34
Funtua	66	46 (34.9%)	14	6	44	22
Katsina	68	36(26.5%)	32	4	26	42
Total	200 (100.0%)	104 (67.0%)	54 (27.0%)	12 (6.0%)	102 (51.0%)	98 (49.0%)

Table 4: Butchers’ knowledge of animal diseases in selected Local Government Areas of Katsina State

LGA	No. butchers	No. animal diseases known			Name of diseases known			
		5	10	15	PPR	TB	Helminthosis	Pododermatitis
Daura	66	36	24	6	36	6	12	12
Funtua	66	44	18	4	20	18	8	20
Katsina	68	50	18	0	30	8	18	12
Total (%)	200 (100.)	130 (65)	60 (30)	10 (5)	86 (43)	32 (16)	38 (19)	44 (22.0)

Table 5: Butchers’ knowledge of tuberculosis in animals in selected Local Government Areas of Katsina State, Nigeria

LGA	No. butchers	TB in sheep and goats		Signs of TB in animals			
		Yes	No	Coughing	Weight loss	Death	Others
Daura	66	20	14	20	8	3	2
Funtua	66	24	9	11	15	4	3
Katsina	68	20	14	17	10	3	4
Total (%)	200 (100.0)	124 (64.0)	72 (36.0)	96 (48.0)	66 (33.0)	20 (10.0)	18 (9.0)

$\chi = 1.850; p= 0.396$

$\chi = 5.879; p= 0.437$

Table 6: Butchers’ knowledge of means of transmission of TB in animals

LGA	No. butchers	Means of acquiring TB by goats and sheep			
		Ingestion of infected milk	Drinking contaminated water	Closeness to other animals	From infected persons
Daura	66	24	16	6	20
Funtua	66	22	24	10	10
Katsina	68	16	22	20	10
Total (%)	200	62 (31.0)	62 31.0)	36 (18.0)	40 (20.0)

$\chi = 8.468; p= 0.206$

and signs of the disease in animals ($p=0.437$). The study also determined the butchers’ knowledge of means of transmission of the disease in animals to which 31.0% of them indicated ingestion of meat/milk and drinking of contaminated water, while, 18.0% and 20.0% others reported closeness with infected animals and humans respectively (Table 6). Again there was no statistically significant difference in the source of infection TB in animals ($p=0.206$). Enquiry on TB in humans indicated that 54.0% of the butchers were aware of the disease in humans and that 55.0% of them gave cough as one of its signs and symptoms in humans while 27.0% and 9.0%, others each gave symptoms as weight loss, fever, death and others respectively (Table 7). There was no statistically significant difference in knowing TB in humans and signs of the disease in men ($P=0.956$). Furthermore, 40.0% of them gave its means of

transmission in humans as eating contaminated meat while 39.0% and 21.0% mentioned drinking contaminated milk and being close to an infected person (Table 8). There was a statistically significant difference in the butchers’ knowledge of the means of transmission of TB in humans ($p=0.000$). The knowledge of the butchers on TB in humans indicated that 18.0% of them agreed that goats and sheep could acquire the disease from humans and that 80.0% of them also agreed that humans could acquire the disease from these animals (Table 9). There was no significant statistical difference in the butchers’ knowledge of small ruminants acquiring TB from humans though there was a statistically significant difference in humans acquiring TB from these animals and the transmission of TB between small ruminants and humans ($p=0.044$). The study determined from the butchers whether they knew

Table 7: Butchers' knowledge of tuberculosis in humans in selected Local Government Areas of Katsina State, Nigeria

LGA	No. Butchers	Disease in humans		Signs of disease in humans			
		Yes	No	Coughing	Weight loss	Fever	Death
Daura	66	15	18	16	10	3	4
Funtua	66	16	17	18	9	3	3
Katsina	68	23	11	21	8	3	2
Total	200 (100.0%)	104 (54.0%)	92 (46.0%)	110 (55.0%)	34 (27.0%)	18 (9.0%)	18 (9.0%)

$\chi = 3.923$; $p = 0.141$ $\chi = 1.551$; $p = 0.956$

Table 8: Butchers' knowledge on means of transmission of TB in humans

LGA	No. Butchers	Methods of acquiring Tb in humans		
		Eating contaminated meat	Drinking contaminated milk	Closeness with infected persons
Daura	66	20	46	0
Funtua	66	36	16	14
Katsina	68	24	16	28
Total	200	80 (40.0%)	78(39.0%)	42 (21.0%)

$\chi = 28.134$; $p = 0.000$

Table 9: Butchers' knowledge of tuberculosis being zoonotic in selected Local Government Areas of Katsina State, Nigeria

LGA	No. respondents	Goats and sheep acquiring TB from humans		Humans acquiring TB from goats and sheep	
		Yes	No	Yes	No
Daura	66	12	54	60	6
Funtua	66	18	48	44	22
Katsina	68	6	62	56	12
Total	200 (100.0%)	36 (18.0%)	164 (82.0%)	160 (80.0%)	40 (20.0%)

$\chi = 3.863$; $p = 0.145$ $\chi = 6.239$; $p = 0.044$

Table 10: Butchers' knowledge of people with tuberculosis

LGA	No. butchers	Knowledge of anybody with TB		Member of the family with TB	
		Yes	No	Yes	No
Daura	66	16	50	2	64
Funtua	66	20	46	12	54
Katsina	68	24	44	6	62
Total	200	60 (30.0%)	140 (70.0%)	20 (10.0%)	180 (90.0%)

$\chi = 0.976$; $p = 0.614$ $\chi = 4.288$; $p = 0.117$

Table 11: Eating and socialization habits of butchers in selected Local Government Areas of Katsina State

LGA	No. respondents	Frequency of eating 'Suya'			Staying with TB patients	
		Daily	Weekly	Monthly	Yes	No
Daura	66	48	12	10	2	64
Funtua	66	36	24	6	12	54
Katsina	68	40	16	12	6	62
Total	200 (100.0%)	124 (62.0%)	52 (26.0%)	24 (12.0%)	20 (10.0%)	180 (90.0%)

$\chi = 4.026$; $p = 0.402$ $\chi = 4.288$; $p = 0.117$

anybody with TB to which 30.0% of them indicated yes and 10.0% of them indicated their family members were infected with TB. There was no statistically significant difference in the knowledge of

the butchers on people with TB and their family members being infected with TB (Table 10). With regard to their attitude toward staying with TB-infected persons, 10.0% of them indicated staying

with them (Table 11). Again there was no statistically significant difference ($p=0.117$).

The study enquired from the butchers what they would do if any of their small ruminants were infected with TB, in which 52.0% indicated taking such animals to the Veterinary Clinic for treatment while 21.0% and 15.0% indicated selling it and leaving the animal in the flock respectively (Table 12). There was no statistically significant difference in their practices ($p=0.450$). Furthermore, the study enquired from the

butchers how they were spending their nights 44.0 % of them reported with friends while 14.0 %, 8.0 % and 34.0 % indicated with brothers, sisters and wives/husbands respectively (Table 13). There was no statistically significant difference in their practices concerning how they spent their nights ($p=0.337$). In addition, 17.0 % of them said those they were spending the night with them were even coughing. The study determined from the butchers the distance of their homes from the slaughter facilities in which

Table 12: Butchers’ practices with regards to infected animals and socialization

LGA	No. Butchers	Action if Sheep and Goats get infected with TB			
		Report to clinic	Sell	Leave in flock	Do nothing
Daura	66	26	20	14	6
Funtua	66	38	12	6	10
Katsina	68	20	10	10	8
Total	200	104 (52.0%)	42 (21.0%)	30 (15.0%)	24 (12.0%)

$\chi = 5.763; p = 0.450$

Table 13: Butchers’ practices with regard to socialization

LGA	No. butchers	Socialization at Night				Coughing by those Socializing		Coughing by self	
		With friends	With brothers	With sisters	With spouse	No	Yes	No	Yes
Daura	66	20	16	6	24	56	10	31	4
Funtua	66	32	8	6	20	48	18	26	14
Katsina	68	36	4	4	24	62	6	28	12
Total (%)	200	88 (44.0)	28 (14.0)	16 (8.0)	68 (34.0)	166 (83.0)	34 (17.0)	170 (85.0)	34 (17.0)

$\chi = 6.824; p = 0.337$ $\chi = 4.159; p = 0.125$ $\chi = 3.254; p = 0.197$

Table 14: Butchers’ Practices with regards to tuberculosis in slaughtering places

LGA	No of Respondents	Distance of Household from slaughtering place			Provision of water at the slaughtering place	
		1km	2km	3km	No	Yes
Daura	66	48	6	3	0	33
Funtua	66	36	10	5	33	0
Katsina	68	44	8	4	0	34
Total (%)	200	128 (64)	48 (24)	24 (12)	66 (33)	132 (67)

$\chi = 2.379; p = 0.667$ Fisher’s exact = 100.00; $p = 0.000$

Table 15: Butchers’ practices with regard to pets and washing hands at the slaughter facilities

LGA	No. butchers	Dogs coming to the slaughter facility		Washing hands at the slaughter facility	
		Yes	No	Yes	No
Funtua	66	26	40	4	62
Daura	66	38	28	0	66
Katsina	68	14	54	6	62
Total (%)	200	78 (39%)	122 (61%)	10 (5%)	190 (95.0%)

$\chi = 9.633; p = 0.008$ $\chi = 2.861; p = 0.239$

Table 16: Butchers’ acceptance of childhood vaccination programmes in selected Local Government Areas of Katsina State

LGA	No. of Respondents	Acceptance of Vaccination		childhood Vaccination Routinely Taken				
		No	Yes	NR	BCG	Measles	Polio	NR
Daura	66	20	84	4	30	18	7	4
Funtua	66	24	68	8	26	20	9	2
Katsina	68	32	84	4	24	16	12	4
Total (%)	200	120 (30.0)	124 (62.0)	16 (8.0)	40 (40.0)	27 (27.0)	56 (28.0)	10 (5.0)
				$\chi = 2.971$; $p = 0.563$		$\chi = 2.301$; $p = 0.890$		

NR – No response

BCG - *Baciluse Calmette-Guérin*

they were operating with 44.0 % of them said 1 km away while 24.0 % and 12.0 % said 2 km and 3 Km respectively (Table 14). There was no statistically significant difference in the distance from their homes to the slaughter facilities ($p=0.667$). The study similarly enquired from the butchers if there was a provision of water for operations at the slaughter facilities to which 33.0% of them answered yes and this was statistically significant ($p=0.000$).

Enquiries on whether they allowed dogs in the abattoir showed that 61.0 % of them affirmed it and this was highly significant (Table 15). Furthermore, only 5.0% of them were regularly washing their hands during operations (Table 15). The number of butchers washing their hands during operations was not significant.

The study determined if the butchers routinely accepted their children to be vaccinated with the regular vaccines to which 62.0 % of them accepted and even mentioned the vaccines to be BCG (40.0 %), measles (27.0 %) and Polio (28.0 %) vaccines (Table 16). There was no significant difference in the acceptance of vaccination ($p=0.563$) and the types of vaccines being given to the children ($p=0.890$).

Discussion

In this study, butchers were the main operators captured during the study though there were public abattoir personnel at the facilities. The type of abattoir personnel identified at the slaughter facilities under the study was similar to those in other abattoirs in Nigeria. The veterinarians, animal scientists and para veterinarians were public servants while the butchers were mostly self-employed. A lot of them were the owners of the animals being slaughtered at the abattoirs. Lawan *et al.* (2010), Bello *et al.* (2015) and Yakubu (2016) reported similar scenarios in their studies. The public officers were there to ensure antemortem and postmortem

inspections were carried out on animals being slaughtered. They were also to serve as surveillance agents by documenting cases as well as collecting and processing samples as appropriate.

Most of the people working at the slaughter facilities were males. This agrees with the norm of the area since most, if not all of them were Muslims. Normally Muslim women, especially in Katsina State, would not be seen in such places due to their religious inclination. Yakubu (2016) also reported that most of the workers at the Kaduna abattoir. The age graduation of the workers in the study area indicated people of ages between 15 years and over 60 years old. Most of the young workers among them were the butchers’ children working to help their parents and it was not impossible that they were pursuing secondary or even postsecondary education. Some had finished secondary school and were awaiting further studies or even undergoing further studies. In Nigeria, there are a lot of such individuals who seek extra moral work to gain funds to sustain their living while undergoing studies.

From the study, cattle, small ruminants and camels were being slaughtered at the facilities under the study. Similar reports have been made by Abubakar *et al.* (2014) in Kano and Yakubu (2016) in Kaduna both in Northern Nigeria. The study has shown that some of the butchers were operating in the countryside. This practice is seen mainly in rural areas in Nigeria where formal abattoir facilities are not available. This may indicate that routine antemortem and postmortem inspections may not be performed on the carcasses. If that is the case the level of risks can be said to be staggering since studies by Danbirni (2016) and Ibrahim *et al.* (2021) have reported a prevalence of TB of up to 16% or more in cattle while Cadmus *et al.* (2009) reported a prevalence of about 5.0% in goats in Ibadan, South Western Nigeria. The slaughter frequency as seen in this study agrees with

the frequency of slaughter in other towns in Nigeria. This indicates that there is high demand for animal-based protein in the study area. It could also be said that the risk of acquiring TB can be increased with the number of animals being slaughtered as a good percent of them could be tuberculous. Muhammad (2021) reported a prevalence of 41.5% TB infections by using gross lesions and 88.0% by Acid Fast stain among the small ruminants he studied in Katsina state, Nigeria. Thus, the risks are real when this prevalence is considered.

From the study, over 65.0% of the operators were knowledgeable about livestock diseases. This is understandable as there were veterinarians, animal scientists and para veterinarians among the workers at the slaughter facilities under study. Furthermore, Kaltungo *et al.* (2013), Buhari *et al.* (2015) and Baba *et al.* (2021) reported pastoralists indicated knowledge of animal diseases and ascribed their sources of knowledge as radio agricultural programmes, friends and parents among others. These butchers also indicated knowing TB in small ruminants and even gave signs of the disease in these animals. No doubt their knowledge could be due to what happens in their operation areas since there could be a condemnation of parts due to the disease. It is on record that the Katsina State Veterinary Services also conducts training programmes on livestock diseases and other related topics for butchers and this can be a source of knowledge for them. This and other sources of knowledge can also account for their knowledge on means of transmission of the diseases in animals, the occurrence of the disease in humans along with its signs and symptoms and methods of transmission in humans. Other workers like Kaltungo *et al.* (2013); Kaltungo (2018a; Kaltungo 2018b) and Fadimu (2014) among others have similarly reported butchers and livestock owners' knowledge of zoonotic diseases. However, only a few of the butchers knew animals could acquire TB from humans and this can aggravate the situation, should any of them infected could spread the disease to his animals, especially those animals under fattening programmes and subsequently spread to the public through the carcasses after slaughter. Buhari *et al.* (2020) reported proximity between animal owners and their animals during fattening as one of the causes of infection with tuberculosis while Kaltungo (2018a) reported close proximity between small ruminant owners and their animals in their homes in Sokoto and Katsina States. In the study, up to 30.0% of the butchers knew individuals suffering from TB. Such

individuals included their family members, friends and parents. These individuals could have acquired the infection from the butchers themselves since some of the butchers have reported harbouring the infections too. Thus, there is a great risk of the disease circulating in communities undetected. Furthermore, the disease can be circulated through meat and milk as there is poor surveillance, inadequate and inappropriate laboratories for confirming TB infections even in human hospitals. Most of the Veterinary Clinics in Nigeria are not equipped with laboratories and as such diagnoses are based on clinical signs and post-mortem examination alone as well as the clinician's experience.

The study has shown that the butchers had poor attitudes toward eating poorly cooked meat and socialization with known TB patients. To them, mere eating could not lead to an infection. Similarly, Lawan *et al.* (2010) and Damina *et al.* (2011) reported butchers, pastoralists and community dwellers freely consuming unpasteurized milk and eating poorly cooked meat at abattoirs without fear of any infection. These and many other forms of attitude could have resulted in Nigeria being the 6th top most countries in the world with TB infections (Ugwu *et al.*, 2021). Such habits could be said to have made Nigerians to have human patients with mixed infections of TB and HIV/AIDs (Nwanta *et al.*, 2011; Nwabuko *et al.*, 2012; Kolade *et al.*, 2016; Atilola *et al.*, 2018).

The butchers' practices as observed in this study have similarly been reported by other workers like Onunkwo *et al.* (2003) and Lawan *et al.* (2010) among others. These practices are capable of resulting in infections with TB. For example, allowing dogs into slaughter facilities could lead such dogs to carry condemned parts somewhere remote to the slaughter facilities with subsequent infection in small ruminants that are allowed to graze freely in community areas as reported by Kaltungo *et al.* (2013) and Yakubu (2016).

The butchers' practice of socializing at night with people is capable of spreading TB once any of them is infected since the disease is communicable. Thus, the infection could circulate among friends, brothers, sisters and wives. The lack of routine and effective surveillance in both human and Veterinary Services in Nigeria has left many diseases circulating in communities, especially in rural areas of Nigeria, where the prevalences of many zoonotic diseases are high beyond the World Health Organization standards.

In conclusion, it could be said that there could be adequate presence of public services at these slaughter facilities. However, the level of effective operation could be said to be low due to the poor level of operations as indicated by the butchers' attitudes and practices. The fact that most of the butchers were aware of TB, their attitude and practices were below expectations and these could lead to the spread of the disease, not only among their family members but also beyond since they were spending their evenings with friends, especially that some of the butchers were themselves infected with TB. It is therefore recommended that more sensitisation should be carried out to inform these and other butchers and the general public on the fact that TB is real and should be controlled if not eradicated by Government.

It is therefore recommended that more sensitization should be carried out to inform butchers, other abattoir workers and the general public at large on the fact that TB is real and should be controlled if not eradicated by Government.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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