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Tribal differences in perception of tuberculosis: a possible role in tuberculosis control in Arusha, Tanzania

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SUMMARY

SETTING: Arusha, Tanzania.

OBJECTIVE: To determine tribal differences in knowledge and practices that might influence tuberculosis control.

METHOD: Twenty-seven villages were selected randomly out of 242 villages in four districts. In each village, a general and a livestock keeping group were selected at random. The households were home-visited and 426 family members were interviewed.

RESULTS: On average, 40% of respondents practised habits that might expose them to both bovine and human tuberculosis. The Barabaig tribe had a significantly higher number of respondents (50%, $\chi^2_{(2)} = 5.1$, $P = 0.024$) who did not boil milk. Eating uncooked meat or meat products was practised by 17.9% of all respondents. The habit was practised more by Iraqw (21.1%, $\chi^2_{(2)} = 6.9$, $P = 0.008$) and Barabaig (31.6%, $\chi^2_{(2)} = 5.6$, $P = 0.016$) than other tribes. About 75% of the respondents had a poor knowledge of tuberculosis.

CONCLUSION: All tribes had habits and beliefs that might expose them to both bovine and human tuberculosis. The Iraqw and Barabaig tribes practised such habits more than other tribes. Knowledge of tuberculosis was limited in all tribes.

KEY WORDS: tuberculosis; perception; tribes

THE National Tuberculosis and Leprosy Control Programme (NTLP) in Tanzania has been functioning well for almost a decade. However, tuberculosis (TB) has increased rapidly, from 11 753 patients in 1983 to 54 513 in 2000. In 2000, smear-positive, -negative, relapses and extra-pulmonary cases comprised 44.2%, 32%, 3.3 %, and 20% of all cases, respectively.[1] A study on TB and human immunodeficiency virus (HIV) has shown that a substantial proportion of the TB increase is attributable to HIV infection.[2]

Likewise, contact with animals and animal products may contribute to the human tuberculosis epidemic in rural Tanzania. The extent of this contribution is not known, however. The animals and their products may expose humans to bovine tuberculosis. In most cases, *Mycobacterium bovis* infection in humans results in extra-pulmonary TB, in particular cervical lymphadenitis.[3] Most cases of extra-pulmonary TB in Tanzania are found in regions with high cattle to human ratio.[4] Tuberculosis lymphadenitis is a common health problem in Arusha and Mbeya regions. With the exception of Dar-es-Salaam City, Arusha is among the leading epidemic regions, reporting more than 3500 of new cases of tuberculosis annually. For the past decade the proportion of extra-pulmonary tuberculosis has been over 30% in the Arusha region.[1] HIV prevalence in tuberculosis patients varies from 21% to 77% in regions of Tanzania. The prevalence in Arusha relatively lower than in other regions, at 25%.[2]

The population of the rural districts consists of mostly peasants and livestock keepers. Tuberculin surveys in cattle indicate that the prevalence of *M. bovis* infection is about 13.0%, and prevalence in the herds ranges from 15% to 51%.[5,6] In the absence of clear control policy measures, these cattle are potential reservoirs of infection to humans. *M. tuberculosis* is the most frequent cause of human tuberculosis, but some cases are caused by *M. bovis*.[7–10] Dual HIV and *M. bovis* infection has been reported in industrialised countries.[3] Investigations in Tanzania have recently reported *M. bovis* in suspected pulmonary and extra-pulmonary TB, at proportions of at least 16% of culture-positive isolates.[11,12] The Arusha region was among the areas covered by these investigations.

TB is usually transmitted by inhalation of aerosols from patients with open pulmonary tuberculosis. Disease caused by *M. bovis* is transmissible from

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cattle to humans by the aerogenous route and by consumption of contaminated milk.[13] HIV infection may perpetuate the cycle of transmission of animal to human, human to human and human to animal.[7] One case with dual HIV and *M. bovis* infection polyresistant to anti-tuberculosis drugs in a Paris hospital was reported to have infected five other patients in less than 10 months.[14]

Attitudes, practices and lack of knowledge about tuberculosis may play a major role in the spread of the disease. Certain traditional beliefs and failure to recognise symptoms may delay diagnosis. Several studies have already suggested delayed diagnosis of pulmonary tuberculosis in developing countries.[15–24] Delayed diagnosis will eventually worsen the spread of the disease in the community. Variations in habits and practices in different tribes may further undermine control strategies.

In most countries, the detection of TB cases depends on early passive case finding. Hence, the desired features of effective TB control programmes are early and complete case finding. This requires early recognition of symptoms by patients as well as appropriate actions taken to seek care rapidly.[19,25]

The present study was conducted as part of the Tanzania National Tuberculosis Research Programme's investigation of the occurrence of *M. bovis* infection in humans and cattle in the Arusha region. The preliminary findings showed *M. bovis* in respectively about 10% and 16% of positive mycobacterial isolates from human and cattle specimens.[6,26] This article describes the local knowledge and practices in different tribes in four districts of Arusha region. Knowledge about TB symptoms, transmission by aerosols and *M. bovis*-contaminated food of animal origin, and preventive precautions are important factors addressed by this article. Tuberculosis services are free in Tanzania. Therefore, perception might be a potential factor that could encourage respondents to take necessary preventive measures, including early diagnosis.

METHODS

Design

A cross-sectional study was conducted from January to November 2000 in four rural districts of Arusha. The study was carried out in conjunction with a parallel study on cattle tuberculin skin testing. A total of 426 respondents were interviewed about practices, knowledge and beliefs of importance to tuberculosis control. Ethical clearance was obtained from the Medical Research Co-ordinating Committee in Tanzania.

Subjects and procedures

A complete list of villages was obtained for each district at the district headquarters. Using a random table, 27 villages were selected out of 242 villages in four districts: 6/82 villages in Babati, 8/52 villages in Hanang, 7/45 villages in Karatu, and 6/63 villages in Mbulu. The initial plan was to select six villages from each district; however, in Hanang and Karatu the estimated group of cattle for tuberculin testing was not reached, which necessitated random selection of additional villages in these districts. As the same team conducted both the tuberculin testing and the survey, it was considered cost-effective to conduct the survey in these additional villages also.

A meeting with community leaders was held at village headquarters to discuss the study purpose. The leaders then had 2 days to explain the study purpose and plan to the people. Two types of groups were selected in each village: one group was from the population as a whole, and the other was from the group of livestock-keepers. The general population group was obtained by selecting one ten-cell leader* in each village from the names obtained from the village chairperson offices. A random table was used to select one ten-cell leader. All households under the selected ten-cell leader were visited for interview regardless of whether they kept livestock or not.

The livestock keeping group relied on the livestock keepers. The livestock keepers from all *vitongoji*† in the village were requested to bring their cattle for tuberculin testing. Home visits were made on every next day after tuberculin testing. The households under the selected ten-cell leaders and livestock keeping group were visited at their homes. At each home, the study was discussed again and verbal consent was obtained. The family then selected one member for interview.

Instrument

The questionnaire was tested in a separate village that was not included in the study. Most of the questions were closed, with an open option, and a few were open-ended. Field workers were trained on how to ask the questions in Swahili language, and when necessary a translator was used to facilitate communication.

The status of milk for consumption was recorded as 'boiled' if both fresh and soured milk were boiled, and 'not boiled' if one or both types of milk were not boiled. Questioning about the history of TB in the family depended exclusively on previous hospital diagnosis. Information on treatment for not less than 8 months and treatment cards was requested to ascertain present and past TB cases in a family. The name, sex, and age of any patients were also recorded. TB in

* A local village member, selected by the villagers according to guidance given by local government, to represent around 10 households (but usually an average of 12) in governmental administrative issues.

† A *kitongoji* (singular form for *vitongoji*) is an administrative subdivision of a village. A village will usually have at least three subdivisions.

Tanzania is usually diagnosed according to guidelines in the NTLP manual.[27]

Three questions were asked in the form of a normal conversation after the formal interview with those who appeared to be willing to give information, as indicated by a positive relationship established during interview. The questions were about why other people drink or eat milk, meat and blood that are not cooked and share houses with livestock.

Data entry and statistical analysis

During data management, the responses to most questions were re-coded. This allowed computer entries of responses given in open questions or options and combinations in closed questions.

Data were entered and validated in Epi Info version 6.02.[28] Analysis was done using SPSS 9.0 for Windows.[29]

During analysis the responses to questions on knowledge were re-categorised into 'good' and 'poor' and for ventilation in houses as 'adequate' and 'inadequate' (Appendix). Cross-tabulations and multiple logistic regression were performed to assess and adjust for potential cofounders. Pearson $\chi^2(\chi^2_{(1)})$ and Wald statistics ($\chi^2_{(2)}$) tests were used to compare group differences of categorical variables. Adjusted Wald statistics and odds ratios with 95% confidence intervals are reported. Differences were considered statistically significant if $P \leqslant 0.05$.

RESULTS

Baseline profile of the study population

Groups

Table 1 shows the baseline profiles of the five tribes described in our findings. The Iraqw, Fyomi and Barabaig originate from the study region, while the Nyaturu and Rangi tribes originate from neighbouring regions. Of the 426 respondents interviewed, respectively 55.2% and 44.8% were from the general and the livestock keeping groups. When comparing the distribution of tribes in the two groups, statistically significant differences were found in the Nyaturu and Rangi tribes. The interviewees from Nyaturu tribe were 9.4% (n = 22) of the general group and 3.1% (n = 6) of the livestock keeping group ($\chi^2_{(2)}$ = 7, P = 0.008). The interviewees from Rangi tribe were 3.7% (n = 7) of the livestock keeping group and 1.3% (n = 3) of the general group ($\chi^2_{(2)}$ = 8.2, P = 0.004).

Gender distribution

The study population comprised 64.1% (273) males and 35.9% (153) females. Comparing the gender dis-

Table 1 Baseline characteristics of tribes in the study area

	Tribes						
Baseline characteristics	Barabaig % (*n*)	Fyomi % (*n*)	Iraqw % (*n*)	Nyaturu % (*n*)	Rangi % (*n*)	Others* % (*n*)	Total† % (*n*)
Group type‡							
General population	6.8 (16)	4.7 (11)	59.6 (140)	9.4 (22)§	1.3 (3)¶	18.3 (43)	55.2 (235)
Livestock keeper	3.7 (7)	3.7 (7)	69.6 (133)	3.1 (6)	3.7 (7)	16.2 (31)	44.8 (191)
Sex#							
Male	5.5 (15)	5.1 (14)	63.0 (172)**	7.0 (19)	2.9 (8)††	16.5 (45)	64.1 (273)
Female	5.2 (8)	2.6 (4)	66.0 (101)	5.9 (9)	1.3 (2)	19.0 (29)	35.9 (153)
Age (years)‡‡							
18–40	4.8 (13)	4.5 (12)	66.2 (178)§§	7.4 (20)	2.2 (6)¶¶	14.9 (40)	59.3 (269)
41–80	6.4 (10)	3.8 (6)	60.5 (95)	5.1 (8)	2.5 (4)	21.7 (34)	40.7 (157)
District##							
Babati	0.8 (1)	14.4 (18)	38.4 (48)	8.0 (10)	6.4 (8)	32.0 (40)	29.4 (125)
Mbulu	9.7 (9)	0.0	86.0 (80)	0.0	0.0	4.3 (4)	21.9 (93)
Hanang	12.5 (13)	0.0	56.7 (59)	17.3 (18)	1.0 (1)	12.5 (13)	24.5 (104)
Karatu	0.0	0.0	83.5 (86)	0.0	1.0 (1)	15.5 (16)	24.2 (103)
Occupation							
Cattle only	27.3 (6)	16.7 (3)	13.2 (35)	14.8 (4)	0.0 (0)	14.7 (10)	14.1 (58)
Farming only	18.2 (4)	16.7 (3)	6.8 (18)	7.4 (2)	20.0 (2)	11.8 (8)	9.0 (37)
Farming and cattle	54.5 (12)	66.7 (12)	78.5 (208)	77.8 (21)	80.0 (8)	67.6 (46)	74.9 (307)
Other	0.0 (0)	0.0 (0)	1.5 (4)	0.0 (0)	0.0 (0)	5.9 (4)	2.0 (8)

* Other tribes with frequencies less than 10 and coming from regions not adjacent to Arusha.
† Totals for some variables do not add up to 426 due to missing information.
‡ Pearson χ^2 = 12.9, P = 0.025.
§ Wald = 7.0, df = 1, P = 0.008.
¶ Wald =8.2, df = 1, P = 0.00.
# Pearson χ^2 = 3.2, P = 0.66.
** Wald = 6.5 df = 1, P = 0.011.
†† Wald = 3.8, P = 0.050.
‡‡ Pearson χ^2 = 4.5, df = 5, P = 0.477.
§§ Wald = 9.7, P = 0.002.
¶¶ Wald = 4.2, P = 0.03.
Pearson χ^2 = 164, df = 15, P = 0.001.

Table 2 Eating habits of the tribes (Wald statistic and ORs adjusted for group types*)

	Tribes						
Eating uncooked/unboiled animal products	Iraqw % (*n*)	Barabaig % (*n*)	Fyomi % (*n*)	Nyaturu % (*n*)	Rangi % (*n*)	Others† % (*n*)	Total‡ % (*n/N*)
Milk§	13.1 (34/260)¶	50.0 (11/22)#	41.2 (7/17)	34.6 (9/26)	30.0 (3/10)	17.4 (12/69)	18.8 (76/404)
Meat and meat products**	21.1 (49/232)††	31.6 (6/19)‡‡	11.8 (2/17)	8.0 (2/25)	0.0 (0/7)	9.4 (6/64)	17.9 (65/364)
Blood	82.1 (115/140)	88.2 (15/17)	70.0 (7/10)	66.7 (2/3)	0.6 (1/3)	85.2 (23/27)	81.5 (163/200)
Wild animal meat	34.4 (64/186)	41.2 (7/17)	57.1 (8/14)	45.0 (9/20)	37.5 (3/8)	34.6 (18/52)	36.7 (109/297)

* General population and livestock keeping groups.
† Other tribes with frequencies less than 10 and coming from regions not adjacent to Arusha.
‡ Totals for some variables do not add up to 426 due to missing information.
§ Pearson χ^2 = 30.3, *P* = 0.001.
¶ Wald statistic = 12.3, *P* = 0.001, OR = 0.6 (95%CI 0.4–0.8).
\# Wald statistic = 5.1, *P* = 0.024, OR = 1.7 (95%CI 1.1–2.7).
** Pearson χ^2 = 10.9, *P* = 0.054.
†† Wald statistic = 6.9, *P* = 0.009 OR = 2.2 (95%CI 1.2–3.9).
‡‡ Wald statistic = 5.6, *P* = 0.016, OR = 2.5 (95%CI 1.2–5.2).
OR = odds ratio; CI = confidence interval.

tribution among the tribes, statistically significant differences were noted in Nyaturu and Rangi tribes. There were 7% (*n* = 19) of males and 5.9% (*n* = 9) of females in Nyaturu tribe ($\chi^2_{(2)}$ = 6.5, *P* = 0.011), and 2.9% (*n* = 8) of males and 1.3% (*n* = 2) of females in Rangi tribe ($\chi^2_{(2)}$ = 3.8, *P* = 0.050).

Age and geographical distribution

There were 59.3% (*n* = 229) and 40.7% (*n* = 157) of interviewees in the 18–40 and 41–80 year age groups, respectively. The differences in interviewee age groups were statistically significant in the Iraqw and Rangi tribes. There were 66.2% (*n* = 178) of interviewees in the younger age group (18–40 years) and 60.5% (*n* = 95) in the older age group (41–80) in the Iraqw tribe ($\chi^2_{(2)}$ = 9.7, *P* = 0.002). By contrast, the corresponding figures in the Rangi tribe were 2.2% (*n* = 6) and 2.5% (*n* = 4), respectively ($\chi^2_{(2)}$ = 4.2, *P* = 0.039).

Of 425 interviewees, respectively 29.4%, 21.9%, 24.5%, 24.2% were from Babati, Mbulu, Hanang, and Karatu. The differences in tribal distribution in the districts were statistically significant.

Eating habits

Table 2 shows the distribution of eating habits and significance tests of the tribes after adjusting for group types. Of 404 respondents, 18.8% (*n* = 76) did not boil milk; 13.1% (*n* = 34) were from the Iraqw and 50% (*n* = 11) from the Barabaig tribes. The proportions were significantly lower in the Iraqw ($\chi^2_{(2)}$ = 12.3, *P* = 0.001) and higher in the Barabaig ($\chi^2_{(2)}$ = 5.1, *P* = 0.024) respondents than in other tribes. The habit of eating uncooked meat or meat products was practised by 17.9% of 364 respondents. This practice was observed in 21.1% (*n* = 49) of Iraqw and 31.6% (*n* = 6) of Barabaig respondents, with significant Wald statistics of 6.9 (*P* = 0.009) and 5.6 (*P* = 0.01), respectively.

Of the 200 respondents who admitted to drinking blood, 81.5% (163) drank uncooked blood. The habit of eating meat from wild animals was practised by 36.7% (*n* = 109) of 297 respondents. None of these habits were statistically different among the tribes.

Housing, prevalence of cough and history of TB patients

Table 3 shows that 35.6% (130) of 365 respondents had cattle living in the same house. A significantly higher proportion (82.4% [*n* = 14]; $\chi^2_{(2)}$ = 14.3, *P* = 0.001) of families in the Fyomi tribe shared their house with cattle or other domestic animals than other tribes. Poor ventilation was observed in 67.7% (*n* = 264) of the 390 families. The proportions of

Table 3 Past TB in families, cough and ventilation (Wald statistic and ORs adjusted for group types*)

	Tribes						
	Iraqw % (*n*)	Barabaig % (*n*)	Fyomi % (*n*)	Nyaturu % (*n*)	Rangi % (*n*)	Others† % (*n*)	Total‡ % (*n/N*)
Animals in family house§	36.2 (88/243)¶	14.3 (3/21)	82.4 (14/17)#	19.1 (4/21)	11.1 (1/9)	37.0 (20/54)	35.6 (130/365)
Poor ventilation	69.6 (174/250)	76.2 (16/21)	50.0 (11/22)	46.2 (12/26)	80.0 (4/ 5)	66.2 (47/71)	67.7 (264/390)
Cough	8.4 (23/273)	8.7 (2/23)	11.1 (2/18)	3.6 (1/28)	10.0 (1/10)	2.7 (2/74)	7.3 (31/426)
History of TB in family	17.8 (46/259)**	17.4 (4/23)	17.6 (3/17)	0.0 (0/26)	20.0 (2/10)	14.3 (10/70)	16.0 (65/405)

* General population and livestock keeping groups.
† Other tribes with frequencies less than 10 and coming from regions not adjacent to Arusha.
‡ Totals for some variables do not add up to 426 due to missing information.
§ Pearson χ^2 = 25.3, df =5, *P* = 0.001.
¶ OR = 1.4 (95%CI 1.0–1.9).
\# Wald statistic = 14.3 df = 1, *P* = 0.001, OR = 4.3 (95%CI 2.04–9.34).
** History in the Iraqw tribe of livestock keeping group (22.1%, 27/122), and of general population group (13.9%, 19/137), $\chi^2_{(2)}$ = 5.3, *P* = 0.022 (OR = 1.9, 95%CI 1.2–3.4).
OR = odds ratio; CI = confidence interval; df = degrees of freedom.

Table 4 Distribution of TB knowledge by tribe (Wald statistic and ORs adjusted for group type,* sex and age groups)

	Tribes					
Poor knowledge	Iraqw % (*n*/N)	Barabaig % (*n*/N)	Fyomi % (*n*/N)	Nyaturu % (*n*/N)	Others† % (*n*/N)	Total‡ % (*n*/N)
What is TB?§	63.6 (147/231)	52.2 (12/23)	58.8 (10/17)	44.4 (12/27)¶	69.1 (47/68)	62.8 (230/366)
TB types	56.7 (131/231)	60.9 (14/23)	70.6 (12/17)	60.7 (17/28)	53.0 (35/66)	57.8 (211/365)
PTB spread—How is pulmonary TB transmitted?	62.4 (146/234)	78.3 (18/23)	52.9 (9/17)	57.1 (16/28)	51.5 (35/68)	60.8 (225/370)
Bovine TB spread—How can TB spread from animals to humans?	82.2 (185/225)	69.6 (16/23)	62.5 (10/16)	71.4 (20/28)	70.6 (48/68)	78.3 (282/360)
Acquiring TB lymphadenitis—How can humans acquire TB lymphadenitis?**	97.0 (225/232)††	95.5 (21/22)	93.8 (15/16)	82.1 (23/28)	95.5 (64/67)	95.9 (350/365)
Symptoms, PTB	89.5 (205/229)	90.9 (20/22)	94.1 (16/17)	77.8 (21/27)	97.0 (64/66)	91.1 (329/361)
Symptoms, EPTB	80.0 (176/220)	82.6 (19/23)	76.5 (13/17)	74.1 (20/27)	81.5 (53/65)	80.1 (282/352)
Risks for TB—Once infected, what people are in high risk of getting tuberculosis?	99.6 (225/226)	100 (20/20)	100 (17/17)	100 (26/26)	96.8 (60/62)	99.7 (350/351)
TB prevention—How can TB spread be prevented?	90.6 (202/223)	91.3 (21/23)	93.8 (15/16)	82.1 (23/28)	91.0 (61/67)	91.0 (325/357)
TB treatability—Is tuberculosis treatable/curable?	8.9 (21/236)	9.1 (2/22)	0 (0/17)	10.7 (3/28)	15.7 (11/70)	10.2 (38/373)
Place of treatment—Where should tuberculosis be treated?‡‡	6.2 (14/227)	0.0 (0/20)	5.9 (1/17)	11.5 (3/26)	7.9 (5/63)	6.8 (24/353)

Note: Rangi tribe not included due to paucity of numbers ($n = 3$).
* General population and livestock keeping groups.
† Other tribes with frequencies less than 10 and coming from regions not adjacent to Arusha.
‡ Totals for some variables do not add up to 426 due to missing information.
§ Pearson $\chi^2 = 6.3$, $P = 0.280$.
¶ Wald = 7.5, $P = 0.006$; OR = 0.6 (95%CI 0.4–0.9).
** Pearson $\chi^2 = 17.2$, $P = 0.004$.
†† Wald statistics = 5.1, df = 1, $P = 0.023$; OR = 1.7 (95%CI 1.1–2.6).
‡‡ Medical facilities = good, Others = poor.
PTB = pulmonary tuberculosis; EPTB = extra-pulmonary tuberculosis; OR = odds ratio; CI = confidence interval.

respondents with cough of more than 3 weeks and a history of tuberculosis in the family were 7.3% ($n = 31$) and 16.0% ($n = 65$), respectively. A history of tuberculosis was found in 19.9% (35/176) and 13.1% (30/226) of livestock keeping and general groups, respectively, with Pearson χ^2 of 3.4 ($P = 0.065$). In the Iraqw tribe, the proportion with a history of tuberculosis was significantly higher ($\chi^2_{(2)} = 5.3$, $P = 0.022$) in the livestock keeping group (22.1%, 27/122).

Knowledge about TB

Table 4 shows that few respondents (10.2%, $n = 373$) were unaware that tuberculosis is treatable and that the disease could be treated at hospital (6.8%, $n = 353$). A statistically significant difference was noted in the proportion of respondents from the Nyaturu tribe who had poor knowledge about 'what is tuberculosis' (44.4% ($n = 12$), $\chi^2_{(2)} = 7.5$, $P = 0.006$). The Iraqw tribe had a significantly higher proportion of respondents who had poor knowledge about 'how tuberculosis adenitis can be acquired' (97.0 % ($n = 225$), $\chi^2_{(2)} = 5.1$, $P = 0.023$).

Beliefs

Of 215 respondents, 21.9% thought that the reason why other people prefer traditional healers was due to cultural beliefs (Table 5). After adjusting for group type and sex, more Iraqw tribe respondents thought that other people preferred traditional healers mainly due to beliefs other than cultural ones (85.8% [$n = 121$], $\chi^2_{(2)} = 6.6$, $P = 0.010$).

Overall, 42% of 50 respondents thought that other people prefer using unboiled milk for reasons related to quality of milk and calf's health (Table 5). The main reason given for sharing houses with animals was safety (77.3%, $n = 34$). Overall, 66.7% of 51 respondents thought that other people prefer eating uncooked meat or meat products for reasons related to quality of meat, medicine and taste. The distribution of these three beliefs was not significantly different among the tribes (Table 5).

DISCUSSION

Our findings with regard to milk and meat or meat products may be explained by the fact that the Iraqw and Barabaig tribes dominate the study population. During festivals and monthly auction markets, they consume raw blood, offal and intestinal contents. By handling contaminated milk, humans can acquire bovine infection in the form of cervical lymphadenopathy, intestinal lesions and other non-pulmonary manifestations.[3] The Barabaig tribe is normally nomadic and lives in remote areas, and medical facilities are often not easily accessible. This may result in poor health education, especially on boiling milk and water, as such education

Table 5 Distribution of beliefs of tribes about tuberculosis disease (Wald statistic and ORs adjusted for group types* and sex)

	Tribes					
Reasons for beliefs	Iraqw % (*n*)	Barabaig % (*n*)	Fyomi % (*n*)	Nyaturu % (*n*)	Others % (*n*)	Total % (*n*)
Traditional healers†						
Cultural‡	14.2 (20)§	9.1 (1)	40.0 (4)	41.2 (7)	41.7 (15)	21.9 (47)
Other beliefs¶	85.8 (121)	90.9 (10)	60.0 (6)	58.8 (10)	58.3 (21)	78.1 (168)
Unboiled milk						
Milk quality/calf's health#	46.7 (14)	66.7 (2)	100 (2)	50.0 (2)	9.1 (1)	42.0 (21)
Other**	53.3 (16)	33.3 (1)	0 (0)	50.0 (2)	90.9 (10)	58.0 (29)
Housing with animals						
Safety	76.9 (20)	100 (3)	0.0 (0)	75.0 (3)	72.7 (8)	77.3 (34)
Other††	23.1 (6)	0.0 (0)	0.0 (0)	25.0 (1)	27.3 (3)	22.7 (10)
Uncooked meat and meat products						
Quality of meat,‡‡ medicine, taste§§	69.0 (20)	100 (3)	100 (2)	80.0 (4)	41.7 (5)	66.7 (34)
Other¶¶	31.0 (9)	0.0 (0)	0.0 (0)	20.0 (1)	58.3 (7)	33.3 (17)

Note: Rangi tribe not included due to paucity of numbers ($n = 3$).
Questions: Why so other people prefer to be treated by traditional healers? Why do other people not boil milk? Why do other people like to keep animals in family house? Why do other people eat uncooked meat or blood?
* General population and livestock keeping groups.
† Pearson $\chi^2 = 20.5$, $P = 0.001$.
‡ Because they are able to treat the disease, belief in witchcraft, if people see you in hospital you may die.
§ Wald statistics = 6.6, $P = 0.010$; OR = 1.5 (95%CI 1.1–1.9).
¶ Other = Ignorance, trust in traditional facilities, mistrust to the medical facilities, poverty.
\# Boiling will destroy milk, butter, energy and taste, calves will die or their umbilicus will not heal.
** Other = Used to this habit (customs), due to ignorance, boiling milk is time consuming.
†† Other = used to this practice, for more milk production (less stress to cattle), heating the houses, and ignorance.
‡‡ Cooking will destroy the quality of meat or blood (good taste when eaten with blood, an appetiser), uncooked blood provides high nutrients (including haemoglobin) and more energy to the body.
§§ '*qansa* or *sanka*' (mixture of uncooked intestinal contents with blood, offal and meat) is used as treatment for fever, diarrhoea, vomiting and snake bite.
¶¶ Other = used to the habit (custom), few diseases in the past.
OR = odds ratio; CI = confidence interval.

is normally given to people who attend medical facilities. This could also explain the low proportion of respondents who boil milk compared to other tribes. This contrasts with earlier findings that most Africans boil milk.[30] The habit of not boiling milk may put the Barabaig at risk of contracting bovine tuberculosis. Community-based health education at village or ten-cell leader levels might benefit this group.

The Fyomi tribe had a significantly higher proportion (82%) of people sharing houses with animals than other tribes. This practice, combined with poor ventilation, may play a role in the exposure and spread of both bovine and human tuberculosis infections.

The higher proportion of history of TB in Iraqw families in the livestock keeping group could indicate that these families attend health facilities more often than the nomadic families, resulting in higher case detection in this tribe by the NTLP. In contrast, the low frequency of TB in the family in the nomadic tribes, despite relatively frequent high risk practices such as drinking raw milk and eating raw meat and blood, could be due to the fact that the practices are more related to tuberculosis caused by *M. bovis* than *M. tuberculosis* and the foregoing discussion on accessibility to health facilities. The history of TB depends on factors related to both bovine and human tuberculosis as well as case finding by the NTLP.

On average, 75% of respondents from all tribes had poor knowledge about tuberculosis disease, transmission and prevention. These findings are consistent with other reports from developing countries.[31–33] The lack of knowledge about the disease may delay diagnosis and treatment, and may result in further spread of the disease. In addition, late treatment has shown to have high morbidity and mortality, especially in HIV positive cases.[34] Nevertheless, it is encouraging to find that more than 90% of all the respondents knew that tuberculosis is treatable and that the appropriate place for treatment is the medical facilities. One could therefore reasonably conclude that the burden of tuberculosis in these groups is due to risk practices and failure to identify suspects of tuberculosis as early as possible before they spread the disease to others. The impact of this in HIV endemic areas will worsen the situation.

Safety was the main reason identified for sharing houses with animals (77.3%). Better education may enable people to explore the possibilities of building simple, affordable shelter for their domestic animals. Beliefs that cooking will destroy the quality of milk, meat or blood, and that a mixture of uncooked intestinal contents with blood, offal and meat (famous as 'qansa or sanka') is a treatment for fever, diarrhoea, vomiting and snake bite, could be corrected through health education.

These beliefs and poor knowledge could potentially influence the transmission of infection, and could delay diagnosis and treatment. Wandwalo and Morkve[15] reported that patient's delay in Mwanza, Tanzania, was associated with those who visited traditional facilities first, and those who had no information on tuberculosis prior to diagnosis.

The insight obtained from these beliefs will help in planning an appropriate approach for a public health education package which should presumably be effective for correcting beliefs that are not favourable for disease prevention. This could include strategies such as health promotion through community involvement, incorporation of tuberculosis education into school curricula and mass media programmes. Education related to both bovine and human tuberculosis should be included. However, to give strong advice about preventing the disease, more studies on pulmonary cases are needed.

Our study has some limitations. The conversations relating to belief issues were held after formal interview with those who appeared to be willing to give information. This was presumed a convenient way to elicit reliable responses on certain sensitive issues about the respondents' beliefs. Wide variations on beliefs were not expected in the same geographical set-up, and this information was required to give more insight into why people practise risk habits for tuberculosis infection.

At family level, we were unable to select an interviewee randomly. In many African cultures, it is common for the family to choose a member to talk to a visitor. This could be an reason why there were more male interviewees (Table 1). In addition, the principle of random selection was only applied at the village level in the selection of the livestock keeping group. This principle could not be extended to ten-cell leaders because lists of households for cattle-keepers were not available, and a large group of cattle for tuberculin testing was required. Nevertheless, this was the best way of carrying out such a study, especially in a society where lists of households or individuals are not available.

CONCLUSIONS

On average, 40% of the study population practised habits that might expose them to both bovine and human tuberculosis. The Iraqw and Barabaig tribes practised such habits more than other tribes. It is, however, worth noting that a lower proportion of Iraqw respondents did not boil milk before use.

Overall, about 75% of the study population had poor knowledge about tuberculosis disease, transmission and prevention. Beliefs that pose potential obstacles to tuberculosis control efforts were observed in all tribes. An educational package with attention to problem areas in the respective tribes is needed to reduce exposure risk factors to both bovine and human tuberculosis infections.

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APPENDIX

Definitions for variables used to assess ventilation and knowledge of tuberculosis

Variables for knowledge	Good knowledge	Poor knowledge
What is TB?	Cough for 3 weeks in combination with any other symptoms of tuberculosis mentioned	Only one symptom of tuberculosis other than cough or symptoms not related to tuberculosis or don't know
TB types (identifying the infectious type was given priority)	Pulmonary tuberculosis or pulmonary tuberculosis with other types of tuberculosis	Other tuberculosis types without pulmonary tuberculosis and don't know
Pulmonary tuberculosis spread: ways	Aerogenous route alone or in combination with other correct possibilities	Other possibilities without aerogenous route and completely incorrect ways mentioned
TB spread: Man to man	Aerogenous route alone	Other ways
Acquiring TB lymphadenitis: ways	Unboiled milk, uncooked meat or meat product or combinations	Don't know
Tuberculosis spread animal to man: ways	Unboiled milk alone or in combinations with uncooked meat or meat products, sleeping together with animals	Other combinations, incorrect ways and don't know
Tuberculosis symptoms: pulmonary	At least cough for >3 weeks with two other symptoms of tuberculosis	Other incorrect and non-pulmonary tuberculosis symptoms
Tuberculosis symptoms: extra-pulmonary	Swellings at neck, axillary or inguinal or swellings with constitutional symptoms or other EPTB sites	Other incorrect responses and don't know
Tuberculosis risks for disease development	At least two risk factors for developing tuberculosis disease	One or incorrect risk factors and don't know
Is tuberculosis treatable?	Yes, tuberculosis is treatable	Any other response
TB treatment facilities; medical vs. traditional	Medical facilities	Any other facilities
TB prevention	Early case finding and treatment with other correct prevention precautions	Other incorrect methods of prevention
Variable for ventilation	Adequate/good Houses with windows	Inadequate/poor Houses with holes or without windows

EPTB = extra-pulmonary tuberculosis.

RÉSUMÉ

CADRE : Arusha, Tanzanie.

OBJECTIF : Déterminer les différences tribales en matière de connaissances et de pratiques qui puissent influencer la lutte antituberculeuse.

MÉTHODE : On a sélectionné au hasard 27 villages parmi 242 villages de quatre districts. Dans chaque village, on a sélectionné au hasard un groupe général et un groupe détenteur de bétail. Les familles ont été visitées à domicile et 426 membres des familles ont été interviewés.

RÉSULTATS : En général, 40% des répondeurs avaient des habitudes qui pouvaient les exposer à la tuberculose à la fois bovine et humaine. La tribu Barabaig avait un nombre significativement plus élevé de répondeurs (50%, $\chi^2_{(2)} = 5{,}1$; $P = 0{,}024$) qui ne faisaient pas bouillir le lait. La consommation de viande ou de produits de la viande non cuits était le fait de 17,9% de tous les répondeurs. Cette habitude était pratiquée davantage par les Iraqw (21,1%, $\chi^2_{(2)} = 6{,}9$; $P = 0{,}008$) et les Barabaig (31,6%, $\chi^2_{(2)} = 5{,}6$; $P = 0{,}016$) que par les autres tribus. Les connaissances concernant la tuberculose étaient piètres chez environ 75% des répondeurs.

CONCLUSION : Toutes les tribus ont des habitudes et des croyances qui peuvent les exposer à la tuberculose à la fois bovine et humaine. Les tribus Iraqw et Barabaig pratiquent de telles habitudes plus que les autres tribus. Dans toutes les tribus les connaissances en matière de tuberculose sont limitées.

RESUMEN

MARCO DE REFERENCIA : Arusha, Tanzania.

OBJETIVO : Determinar las diferencias tribales con respecto a los conocimientos y prácticas que pueden influir en el control de la tuberculosis.

MÉTODO : Se seleccionaron al azar 27 aldeas entre 242, de cuatro distritos. En cada aldea se seleccionó al azar un grupo general y un grupo poseedor de ganado. Las familias fueron visitadas a domicilio y se entrevistaron 426 miembros de estas familias.

RESULTADOS : En promedio, el 40% de las personas que respondieron tenían hábitos que podían exponerlos tanto a la tuberculosis bovina como humana. La tribu Barabaig tenía un número significativamente más elevado de participantes que no hacían hervir la leche (50%, $\chi^2_{(2)} = 5{,}1$; $P = 0{,}024$). El 17,9% de todos los participantes consumían carne cruda o sus productos. Esta costumbre era practicada con más frecuencia por los Iraqw (21,1%, $\chi^2_{(2)} = 6{,}9$; $P = 0{,}008$) y los Barabaig (31,6%, $\chi^2_{(2)} = 5{,}6$; $P = 0{,}016$) que por las otras tribus. Alrededor del 75% de los participantes tenían escasos conocimientos sobre la tuberculosis.

CONCLUSIÓN : Todas las tribus tenían hábitos y creencias que podían exponerlos tanto a la tuberculosis bovina como humana. Las tribus Iraqw y Barabaig practicaban más estos hábitos que las otras tribus. El conocimiento sobre la tuberculosis era limitado en todas las tribus.