Frontline healthcare workers' knowledge of tuberculosis in rural south-east Nigeria

Ukwaja K N, Alobu I, and Onu E M

Abstract

A healthcare worker's lack of knowledge of tuberculosis (TB) may contribute to their risk of developing the disease. With limited TB infection control activities in health institutions across Africa, there is a need to evaluate information challenges in TB services delivery from the front-line, in order to clarify priority areas for intervention. We examine the knowledge of TB among frontline healthcare workers in rural Nigeria.

A cross-sectional study was conducted in December 2011 during an interactive clinical meeting organised for TB-focal persons in charge of 45 rural health facilities by the National Tuberculosis and Leprosy Control Programme in Ebonyi State. All the participants completed a self-administered questionnaire assessing knowledge on TB, treatment, and infection control. Participants with ≥70% of correct responses were considered to have a good knowledge.

Of the 52 healthcare workers surveyed, 48% were professionals (doctors/nurses) with a mean age of 36.3±10.6 years. Just over half of the respondents were female 27 (52%), most had tertiary education 43 (83%), and 33 (63%) had worked in TB care for 5 years or more. Only 14 (27%) of the respondents had a good knowledge score. Mean knowledge scores varied across job categories ($f=6.2$, $p< 0.001$) and with duration working in TB care ($f =30.7$, $p< 0.001$). Knowledge gaps existed regarding TB disease and treatment, but most deficits were found in infection control.

TB knowledge gaps were found among rural healthcare workers, this may influence their risk of nosocomial TB infection: therefore they should be re-educated about TB, especially infection control.

Kingsley Nnanna Ukwaja and Emmanuel Mbah Onu, Department of Internal Medicine, Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria; and Isaac Alobu, National Tuberculosis and Leprosy Control Programme, Ministry of Health, Ebonyi State, Nigeria.
Correspondence to: Dr Kingsley Nnanna Ukwaja.
Email: ukwajakingsley@yahoo.co.uk.

Introduction

In low-income countries, healthcare workers (HCWs) are 5.7 times more likely to develop tuberculosis (TB) than the general population.[1] The degree of risk is dependent on multiple factors such as healthcare setting, TB prevalence, patient population, occupational group, and the effectiveness of TB infection control (TBIC) measures.[1] Previous research has reported that TB HCWs often lack knowledge about TB disease and infection control,[2,3] and even when well-informed, infection control measures are not always implemented.[3–5] Thus, in the current absence of functional TBIC interventions,[6] long delays in TB diagnosis,[7] and high burden of TB/HIV,[8] Nigerian HCWs have increased risk of exposure to *Mycobacterium tuberculosis*.

In the last decade, several changes have occurred in the way TB services are delivered. This includes the development of fixed-dose combinations of anti-TB medications, the international standards of TB care, the promotion of TBIC, TB/HIV collaborative activities, and, more recently, the management of TB in children. Consequently, TB control programmes in low-income countries now have enormous training and re-training needs in order to deliver TB services effectively. The World Health Organization (WHO) has recommended improved knowledge as the foundation to improve any TB control intervention.[1] No studies were found that examined the knowledge about TB and infection control among rural TB HCWs in Nigeria. This study was conducted to assess the knowledge of TB disease, treatment, and infection control among frontline TB HCWs in order to identify knowledge gaps and design comprehensive training programmes with future interventions.

Methods

This was a descriptive cross-sectional study of frontline TB HCWs conducted in December 2011 during a 1-day interactive clinical meeting organised by the National Tuberculosis and Leprosy Control Programme in Ebonyi State, Nigeria for TB-focal persons in charge of 45 rural, directly observed treatment short-course (DOTS) facilities. The meeting took place at the Presbyterian Joint Hospital Uburu, Ebonyi State and the content of the meeting focused on the current state of TB infection control and occupational safety activities in their respective institutions. All participants were aged over 18 years. Following informed consent, all participants completed a self-administered questionnaire on their knowledge of TB disease, treat-

ment, and infection control in approximately 15 minutes before the meeting.

Measurements and data collection

The questionnaire used was compiled from standards of treatment, TB infection control, the WHO TB-KAP (knowledge, attitude, and practice) survey guide, and previous studies.[1,2,8–10] It was written in English and consisted of 3 true/false and 14 multiple-choice questions. Each question had a correct answer; subjects had to select/circle all of the correct responses for the question to be scored as correct. The questionnaire was pre-tested among 15 TB community health workers (CHWs) working in two urban secondary hospitals in the State 3 months before the survey. They were not included in the main study since it focused on rural TB healthcare workers. The pre-test led to minor modifications of the initial questionnaire. The final questionnaire included three areas: disease process (four questions), treatment (seven questions), and infection control (six questions).

Data analysis

Statistical analyses were performed using Epi Info (CDC Atlanta, version 3.4.1). Because a high level of knowledge was expected from CHWs, participants with 70% and above of correct responses were considered to have a good knowledge of TB disease, treatment, and infection control, while those with a lower score had poor knowledge. Average correct responses for each of the major areas for which knowledge was assessed (i.e. disease process, treatment, infection control) were also reported. Data were analysed with descriptive statistics, and group differences were examined with Chi-square test and analysis of variance. Statistical significance was set at a p value of <0.05.

Approval for this study was given by the National Tuberculosis and Leprosy Control Programme, Ebonyi State, Nigeria, and all participants gave voluntary informed oral consent for inclusion in the study.

Results

Of the 52 participants employed in one of 45 DOTS facilities, 7 (13%) were physicians, 18 (35%) nurses, 13 (25%) CHWs, 5 (10%) laboratory technicians, and 9 (17%) support staff (i.e. health record officers and health assistants). The age of the respondents was 22–57 years and the mean age was 36.3 years with a standard deviation of 10.6 years. Just over half of the respondents were female 27 (52%); most had tertiary education 43 (83%), and had worked in TB care for 5 years or more 33 (63%) (see Table 1). Only 14 (27%) of the respondents had a good knowledge score (see Table 2), and there was no significant gender difference among respondents with good knowledge score (χ^2 0.03, p=0.87). Average correct responses were 75% for TB disease process, 49% for treatment, and 48.8% for infection control. Mean knowledge scores and the proportion with correct responses are reported according to job categories (see Table 3). Mean knowledge scores varied across job categories (f=6.2, p<0.001) and with duration of working in TB care (f=30.7, p< 0.001). However, mean knowledge scores did not differ significantly across age (p=0.05), educational status (p=0.9), or gender categories (p=0.5).

Variable	n (%)
Age (years)	
<25	9 (17)
26–45	32 (62)
>45	11 (21)
Gender	
Female	27 (52)
Male	25 (48)
Education	
Secondary	9 (17)
Tertiary	43 (83)
Occupation	
Physician	7 (13)
Nurse	18 (35)
Community health worker	13 (25)
Laboratory staff	5 (10)
Support staff	9 (17)
Years working with TB control programme	
<5 years	19 (37)
≥5 years	33 (63)

Table 1 Socio-demographic characteristics of respondents from Ebonyi, Southeast Nigeria, December 2011

% Knowledge score	Male n (%)	Female n (%)	Total n (%)
<29	3 (5.8)	1 (1.9)	4 (7.7)
30–39	0 (0)	1 (1.9)	1 (1.9)
40–49	2 (3.8)	8 (15.4)	10 (19.2)
50–59	8 (15.4)	5 (9.6)	13 (25.0)
60–69	5 (9.6)	5 (9.6)	10 (19.2)
>70	7 (13.5)	7 (13.5)	14 (26.9)
Total	25 (48)	27 (52)	52 (100)

Table 2 Proportions of respondents' TB knowledge score according to gender in Ebonyi, southeast Nigeria, December 2011

TB disease was fairly well understood. The majority of the respondents correctly identified the causative organism and the most common symptom associated with pulmonary TB. However, most could not distinguish between TB infection and disease, and about a quarter incorrectly identified vomiting, diarrhoea, eye pain, and joint pains as symptoms of TB. Except for knowledge regarding the *International Standards of TB Care* (ISTC), levels of knowledge about treatment were higher than those about the disease process. Only 1 (2%) of the respondents knew the correct definition of the ISTC and only 17 (33%) correctly identified the main side-effect of isoniazid (see Table 3). Levels of knowledge about TB infection control were lowest. About 12 (23%) of the respondents incorrectly believed that TB can be transmitted by needles or by consuming contaminated

	All (n=52) % correct	Physician (n=7) % correct	Laboratory staff (n=5) % correct	CHW (n=13) % correct	Nurses (n=18) % correct	Support staff (n=9) % correct
Mean scores (SD)	9.8 (2.7)	12.8 (2.6)	11.8 (3.5)	9.8 (2.5)	9.2 (5.7)	7.7 (3.2)
Questions						
Disease process						
1. What isTB is caused by?	85	100	100	92	78	67
2. Is TB infection the same as TB disease?	40	86	40	54	55	11
3. What is the most common symptom of pulmonary TB?	100	100	100	100	100	100
4. Give the main four general symptoms of TB?	73	100	80	54	72	78
Treatment						
5. Are you aware of the International Standards of TB Care?	65	86	80	54	61	67
6. Briefly define what is meant by the ISTC (if aware).	2	14	0	0	0	0
7. For at least how long should new TB patients be treated?	75	100	100	85	67	44
8. Why should at least four drugs be used to treat TB?	71	100	100	54	78	44
9. What adverse reactions may be caused by isoniazid?	33	86	0	15	44	6
10. Can TB be cured?	92	100	100	100	94	67
11. Can MDR-TB be cured?	71	100	80	77	61	56
Infection control						
12. How does pulmonary TB spread?	77	86	100	85	72	56
13. Can the Sputum AFB smear test be used to diagnose TB?	87	100	100	100	78	67
14. What does a positive smear indicate about a patient's infectiousness?	80	100	100	85	78	44
15. Tick the factors that can affect infectiousness of a TB patient.	14	14	20	8	6	33
16. What three types of infection control method should a TB programme include?	10	14	0	8	11	11
17. If a pulmonary TB patient is coughing repeatedly in your clinic, who should wear a surgical mask?	25	57	80	31	6	0

Notes: CHW = community health worker; SD = standard deviation; ISTC = International Standards of TB Care; AFB = acid-fast-bacilli; TB = tuberculosis; MDR-TB = multidrug-resistant TB.

Table 3 Respondents knowledge about tuberculosis and infection control in Ebonyi, Southeast Nigeria, December 2011

foods or water. Also, although 42 (80%) of respondents understood the relationship between a positive sputum smear and infectiousness, only 7 (14%) identified other factors like duration of disease, adequate treatment, HIV co-infection and type of TB disease that affect infectiousness. Furthermore, only 7 (14%) knew the three types of infection control methods a TB programme should include; and only 13 (25%) of the respondents mentioned natural ventilation technologies to remove airborne *M tuberculosis* in their clinics. Thirteen (25%) of the respondents would, in the absence of a personal protective respirator, give a surgical mask to patients coughing repeatedly in their clinic (see Table 3).

Discussion

In this study, we have shown that frontline TB HCWs had fairly good knowledge about the disease and treatment, but poor knowledge of TB infection control measures. Knowledge gaps observed in this study can increase the risk of nosocomial infection for TB HCWs. Although TB HCWs in our setting are given several in-service training programmes, gaps still exist in their knowledge of the TB disease process, treatment, and infection control. Our findings are consistent with previous reports from Russia, South Africa, USA, Peru and Brazil where several knowledge gaps regarding TB were observed,[2,3,10-12] but contrast with what was observed in Iraq a decade ago where 95.5% of HCWs had good knowledge of TB.[13] The reason for these differences is not clear. This suggests that new strategies are needed to improve current knowledge regarding TB, especially those concerning the ISTC and infection control among HCWs. Additionally, the studies mentioned developed and used various questionnaires for their study, thus they could not be meaningfully compared. There is a need to develop a standardised questionnaire for assessing HCWs' knowledge of TB. This should include areas such as: drug-resistant TB, childhood TB, HIV-associated TB, and standards of TB care, etc.

As previously observed,[2,11,12] knowledge gaps varied by job category; this has important implications for designing educational programmes for various categories of TB HCWs as TB infection/disease knows no such bounds.

Support staff had the lowest mean knowledge score. This may be due to their lower educational status. Thus, educational programmes should be adapted to their needs. Knowledge also increased with years spent in TB care;[11] this may be due to in-house training and experience gained from working in TB care over time. Improved knowledge about TBIC measures remains a pillar on which infection control interventions can be built.[1] In the absence of well-established institutional TBIC programmes and policy in most low-resource settings in Africa,[6] HCWs are expected to adopt simple infection control procedures such as natural ventilation technologies and giving surgical masks to patients with suspected TB. Unlike results found in South Africa,[3] this study suggests that relevant TBIC knowledge was generally low. The differences may be because the survey in South Africa was conducted in a single rural hospital – thus all TB staff in the hospital could have been previously trained on TBIC, while this study involved participants from 45 rural facilities.

Conclusion

In conclusion, this study may be limited by its small sample size and selection bias, i.e. selection of at-least one person per DOTS facility. However, the study participants were TB-focused persons responsible for TB control activities in their health institutions. Thus, they represent the best source of information to identify priority training needs. Also, they represent the best targets for initial educational interventions. Despite this limitation, we have shown that frontline TB HCWs had a poor knowledge about TB (especially TBIC measures) and only 27% had a good knowledge score. We have shown that mean knowledge scores varied with job category and increased with years in TB care. Our survey suggests that the identified knowledge gaps among TB HCWs in Nigeria may influence their risk of nosocomial TB infection. Therefore, frontline TB HCWs need to be re-educated about the differences between TB infection and disease, the current international standards of TB care, and TB infection control. Furthermore, in view of the recent developments in TB and its management, a standardised questionnaire for assessing healthcare workers' knowledge of TB in Africa is urgently needed.

Acknowledgements

The authors would like to acknowledge the Pan-African Thoracic Society's Methods in Clinical, Epidemiologic and Operations Research (PATS-MECOR) training course. They also acknowledge the health workers who participated in the study.

References

1. World Health Organization. *WHO policy on TB infection control in health-care facilities, congregate settings and households*. Geneva: World Health Organization, 2009.
2. Woith WM, Volchenkov G, Larson JL. Russian health care workers' knowledge of tuberculosis and infection control. *Int J Tuberc Lung Dis* 2010; 14: 1489–92.
3. Kanjee Z, Catterick K, Moll AP, Amico KR, Friedland GH. Tuberculosis infection control in rural South Africa: survey of knowledge, attitude and practice in hospital staff. *J Hosp Infect* 2011; 79: 333–8.
4. Jelip J, Mathew GG, Yusin T, et al. Risk factors of tuberculosis among health care workers in Sabah, Malaysia. *Tuberculosis (Edinb)* 2004; 84: 19–23.
5. Luksamijarulkul P, Supapvanit C, Loosereewanich P, Aiumlaor P. Risk assessment towards tuberculosis among hospital personnel: administrative control, risk exposure, use of protective barriers and microbial air quality. *Southeast Asian J Trop Med Public Health* 2004; 35: 1005–11.
6. Ogbonnaya LU, Chukwu JN, Uwakwe KA, Oyibo PG, Ndukwe CD. The status of tuberculosis infection control measures in health care facilities rendering joint TB/HIV services in 'German Leprosy and Tuberculosis Relief Association' supported states in Nigeria. *Niger J Clin Pract* 2011; 14: 270–5.
7. Odusanya OO, Babafemi JO. Patterns of delays amongst pulmonary tuberculosis patients in Lagos, Nigeria. *BMC Public Health* 2004; 4: 18.
8. Federal Ministry of Health, Department of Public Health. *National tuberculosis and leprosy control programme: workers manual*. Revised 5th ed. Abuja: Nigeria; Federal Ministry of Health, 2010.
9. World Health Organization. *Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys*. Geneva: World Health Organization, 2008.
10. Lai KK, Fontecchio SA, Kelly LA, Melvin ZS. Knowledge of the transmission of tuberculosis and infection control measures for tuberculosis among healthcare workers. *Infect Control Hosp Epidemiol* 1996; 17: 168–70.
11. Maciel EL, Vieira RC, Milani EC, et al. Community health workers and tuberculosis control: knowledge and perceptions. *Cad Saude Publica* 2008; 24: 1377–86.
12. Kiefer EM, Shao T, Carrasquillo O, Nabeta P, Seas C. Knowledge and attitudes of tuberculosis management in San Juan de Lurigancho district of Lima, Peru. *J Infect Dev Ctries* 2009; 3: 783–8.
13. Hashim DS, Kubaisy Al Kubaisy W, Al Dulayme A. Knowledge, attitudes and practices survey among health care workers and tuberculosis patients in Iraq. *East Mediterr Health J* 2003; 9: 718–31.