International Journal of Infection Control
www.ijic.info ISSN 1996-9783

ORIGINAL ARTICLE

Knowledge, attitude and tuberculosis infection control practice among healthcare workers in DOTS centres in Lagos, Nigeria

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doi: 10.3396/IJIC.v12i4.021.16

Abstract

Tuberculosis (TB) is highly transmissible in resource-limited healthcare facilities and healthcare workers (HCWs) are at increased risk for acquiring TB in such settings. Training of HCWs in the different areas of a TB control program including TB infection control (IC) has been identified as an important factor in increasing the success of TB control, since they are responsible for the implementation of IC measures in healthcare settings. The aim of this study was to assess the knowledge, attitude and practice of infection control among HCWs in Directly Observed Treatment – Short course (DOTS) centres in Lagos State, Nigeria. This was a questionnaire based, cross sectional study involving 182 HCWs in 9 DOTS centres in Lagos State, including an assessment of the implementation of TB infection control measures in nine DOTS centres. While most of the questions were correctly answered by most participants, only 64.3% of respondents were able to correctly differentiate between pictures of an N95 respirator and a face mask. Attitudes were mostly in compliance to TB infection control guidelines and the majority of respondents reported always carrying out all of the five TB infection control activities. Not all respondents knew their HIV status. Two centres did not have a documented TB infection control policy but all had open air ventilation of patients' waiting areas. There are significant gaps in knowledge on TB infection control among HCWs in DOTS centres and practice of TB infection control in DOTS centres in Lagos State is not fully compliant with national guidelines.

Keywords: tuberculosis; infection control; health knowledge, attitudes, practice; directly observed therapy; Nigeria

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Introduction

Nigeria still remains a high-burden tuberculosis (TB) country with prevalence and incidence of 330 and 322 per 100,000 population respectively in 2014.[1] Tuberculosis is highly transmissible in resource-limited healthcare facilities and healthcare workers (HCWs) are at increased risk for acquiring TB in such settings.[2] Many studies have shown higher rates of tuberculin skin test conversion,[3] M/XDR-TB diagnosis and admittance compared with the general population[4] and some have been shown to have likely been transmitted in a healthcare setting.[4] Similarly, HIV patients who may be receiving care together with TB patients are also at increased risk of contracting TB.[3]

Tuberculosis infection control is a combination of measures aimed at minimising the risk of TB transmission within populations. Following the Centers for Disease Control and Prevention and World Health Organization guidelines on TB infection control, the Nigerian Federal Ministry of Health has published guidelines on TB Infection Control in HIV care settings[5] and some state governments have also followed suit. It is recommended that all health-care settings should have a TB infection-control program designed to ensure prompt detection, airborne precautions, and treatment of persons who have suspected or confirmed TB disease. Such a program should be based on a three-level hierarchy of controls, including administrative, environmental, and respiratory protection.[6]

Tuberculosis infection control is a subcomponent of the WHO updated Stop TB strategy contributing to strengthening of health systems. It is one of the three activities to reduce the burden of TB in persons living with HIV/AIDS.[7] It is also one element of the 12 collaborative activities for control of TB and HIV recommended by the WHO[8]. Tuberculosis infection control is also one of the "I"s in the WHO's "Three I's for HIV/TB" (the other two being isoniazid preventive therapy [IPT] and intensified case finding) and an essential part of sound HIV control programmes in countries with a high prevalence of HIV.[9]

A WHO report has noted five main obstacles to the expansion of Directly Observed Treatment – Short course (DOTS) and successful development of local and national programs.[10] Of these, four are directly related to human resource development.[11] This underscores the importance of adequate knowledge and good attitude towards the program, which will in turn lead to proper practice and successful implementation of the DOTS program. The aim of this study was to assess the knowledge, attitude and practice of infection control among HCWs in DOTS centres in Lagos State, Nigeria.

Materials and Methods

Lagos is one of the most densely populated states in Nigeria with an estimated population of 17.5 million and 3.2% growth rate, and an area of 3,568.61 square kilometres. It comprises of 20 Local Government Areas (LGA). The estimated prevalence of TB in the state is 536 cases per 100,000 population and the number of active cases is estimated to be about 21,000.[12] There are 127 DOTS centres servicing the population, spread across the 20 LGA in primary, secondary and tertiary centres, both public and private owned. Directly Observed Treatment – Short course services in Nigeria are typically integrated within selected primary health care centres or exist as units in secondary and tertiary hospitals. There are about 600 staff working in these centres.

This was a cross-sectional study of knowledge, attitude and practice (KAP) of TB infection control among HCWs in DOTS centres in Lagos State conducted between January and March 2014. Directly Observed Treatment – Short course centres were chosen by multistage sampling as follows: ten LGAs were selected and one DOTS centre was selected from each of the selected LGAs. Five secondary centres and five primary centres were selected and all HCWs on duty on the day of assessment were included. One of the primary centres selected could not be surveyed as permission could not be obtained from the Medical Officer of Health overseeing the centre after repeated attempts. Healthcare workers who had worked in the DOTS centre for three months or more were recruited. These included doctors, nurses, community health extension officers, pharmacy and laboratory staff.

Healthcare workers in DOTS centres in Lagos, Nigeria are of different cadres with different levels of training. Doctors must complete six years of higher education, a one year period of internship and a year of rural service. Nurses study for five years while Community

Table I. Demographic and work characteristics of respondents

Characteristic			Frequency n = 182 (%)
Gender	Female	137	(75.3)
	Male	45	(24.7)
Age range	20-29	26	(14.3)
	30-39	91	(50.0)
	40-49	37	(20.3)
	50-59	25	(13.7)
	>60	3	(1.6)
Mean age			**37.64 ± 9.37**
Job title	Nurse	69	(37.9)
	CHEW*	65	(35.7)
	Doctor	31	(17.0)
	Others**	17	(9.3)
Duration DOTS	≤2 years	133	(73.1)
	3-9 years	38	(20.9)
	≥10 years	11	(6.0)
Received training on TB infection control	Yes	77	(42.3)
	No	105	(57.7)
Centre	DOTS centre 1	24	(13.2)
	DOTS centre 2	4	(2.2)
	DOTS centre 3	11	(6.0)
	DOTS centre 4	12	(6.6)
	DOTS centre 5	16	(8.8)
	DOTS centre 6	47	(25.8)
	DOTS centre 7	20	(11.0)
	DOTS centre 8	20	(11.0)
	DOTS centre 9	28	(15.4)

*CHEW- Community Health Extension Worker
**Others include pharmacy, laboratory and health records staff

Health Extension Workers, laboratory and other staff usually complete at least three years of study with or without internship. Health promoters are community members working voluntarily or semi-voluntarily, who are trained for a period of at least two weeks in various primary care and promotional activities. The role of the health promoter involves the provision of primary care services throughout the community and often forms the first contact point between the community and access to the public health system.

Data were obtained using a self-administered structured questionnaire. This instrument was adapted from a study on TB Infection Control at the Church of Scotland

Hospital[4] and assesses TB infection knowledge (TB symptoms/transmission and the use of surgical masks/respirators), attitudes (opinions regarding various TB infection control tasks and topics) and practices (frequency of implementation of TB infection control measures). Direct observations of TB infection control measures (implementation of natural and mechanical ventilation, presence/absence of TB infection control policies and personnel) were also made using a check list also adapted from a previous study.[13]

Ethical approval for the study was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Lagos. Permission was also obtained from the Lagos State Health Service Commission and Primary Health Care Board as well as Medical Directors and Medical Officers of Health overseeing the participating centres. Written informed consent was obtained from participants before administering the questionnaire. Confidentiality was guaranteed as participants' names were not requested.

Epi-Info Version 7.0.9.34 (World Health Organization, Geneva) was used for data entry and the data were transferred to SPSS version 17.0.0 (IBM, Armonk, NY, USA) for analysis. Frequency distributions were generated for all categorical variables, and means and standard deviations were determined for the continuous variables. Association between variables was determined by chi-square. The level of confidence was set at 0.05 and confidence interval at 95%.

Results

Questionnaires were completed by 182 out of 196 distributed (92.8% response rate). The age of respondents ranged from 20 to 60 years (mean 37.64 ± 9.37) with most (50%) falling within the 30 - 39 age bracket. Most respondents (75.3%) were female, 37.9% of all respondents were nurses, 35.7% were Community Health Extension Workers, 17% were doctors while the remaining 9.3% were from other professions (pharmacists, laboratory workers, etc.). Most of the workers (73.1%) had spent two years or less in a DOTS centre, 20.6% had spent three to nine years, and 6.0% had spent over 10 years. Only 42.3% of HCWs said they had had any training on TB infection control.

Knowledge

Respondents' knowledge of TB transmission and protective measures is shown in Table II. Most of the questions were correctly answered by most participants. The lowest number of correct answers were to the questions "Most MDR-TB and XDR-TB patients catch MDR and XDR disease inside the hospital" (25.8%) and "Surgical masks protect HCWs and visitors by stopping TB particles from being breathed in" (31.9%). Just over half of the participants (51.6%) knew that patients with active TB disease cannot infect people by sharing food or drinks. Only 64.3% of respondents were able to correctly differentiate between pictures of an N95 respirator and a face mask. Overall, doctors performed better than other professions.

Attitudes

Self-reported attitudes are shown in Table III. There was almost unanimous agreement that it was important to prevent the spread of TB in the hospital (98.4%) and that it is important to have an infection control policy (98.9%). On issues of confidentiality, 77.5% of respondents said they would be comfortable seeking diagnosis if they developed symptoms of TB, 88.5% disagreed with hiding TB symptoms if they developed, while 67% of respondents agreed that HIV-positive HCWs in high risk areas should request to be relocated. Most of the respondents (81.3%) agreed that a lack of N95 respirators puts HCWs at risk of contracting TB.

Practices

The participants' self-reported practice showed a fairly good practice of infection control activities, with the majority reporting that they always carrying out all five activities surveyed. However, 18.7% reported that they never wear N95 respirators when around TB patients or suspect TB patients, 17% said they never offer surgical masks to visitors and 13.7% said that visitors never use surgical masks when offered. While most HCWs (83%) claimed to know their HIV status, four (2.2%) admitted that they did not and the rest (14.8%) did not reply to that question.

Tuberculosis Infection Control Measures

Nine DOTS centres were surveyed for implementation of TB infection control measures. The survey showed that two centres (22.2%) did not have a documented

Table II. Knowledge of TB infection control

Knowledge variables	Doctor No. (%) correct answers		CHEW No. (%) correct answers		Nurse No. (%) correct answers		Others No. (%) correct answers		Total No. (%) correct answers	
TB is often spread from person to person through sex (false)	31	(100)	58	(89.2)	68	(98.6)	17	(100)	174	(95.6)
TB is often spread from person to person through the air (true)	31	(100)	64	(98.5)	68	(98.6)	15	(88.2)	178	(97.8)
TB is often spread from person to person through blood (false)	29	(93.5)	53	(81.5)	59	(85.5)	14	(82.4)	155	(85.2)
Usually, only people with active TB disease in the lungs or throat are infectious (true)	23	(74.2)	45	(69.2)	47	(68.1)	12	(70.6)	127	(69.8)
Patients with active TB disease can infect people by coughing (true)	29	(93.5)	58	(89.2)	63	(91.3)	16	(94.1)	166	(91.2)
Patients with active TB disease can infect people by sharing food or drinks (false)	23	(74.2)	33	(50.8)	32	(46.4)	6	(35.3)	94	(51.6)
Patients with active TB disease can infect people by sharing bed linens or toilet seats (false)	30	(96.8)	47	(72.3)	59	(85.5)	16	(94.1)	152	(83.5)
Patients with active TB disease can infect people by talking (true)	21	(67.7)	51	(78.5)	53	(76.8)	11	(64.7)	136	(74.7)
N95 masks protect healthcare workers and visitors by stopping TB particles from being breathed in (true)	29	(93.5)	52	(80.0)	53	(76.8)	10	(58.8)	144	(79.1)
Surgical masks protect healthcare workers and visitors by stopping TB particles from being breathed in (false)	20	(64.5)	14	(21.5)	23	(33.3)	1	(5.9)	58	(31.9)
A wet or dirty N95 can still be used (false)	27	(87.1)	47	(72.3)	56	(81.2)	11	(64.7)	141	(77.5)
Surgical masks keep TB patients from coughing TB particles into the air (true)	21	(67.7)	46	(70.8)	57	(82.6)	12	(70.6)	136	(74.7)
Keeping doors and windows open helps to reduce the spread of TB (true)	30	(96.8)	60	(92.3)	66	(95.7)	16	(94.1)	172	(94.5)
Most MDR-TB and XDR-TB patients catch MDR and XDR disease inside the hospital (true)	12	(38.7)	16	(24.6)	19	(27.5)	0	(.0)	47	(25.8)
Identified N95mask	28	(90.3)	37	(56.9)	43	(62.3)	9	(52.9)	117	(64.3)

CHEW- Community Health Extension Worker; Others include pharmacy, laboratory and health records staff
MDR-TB- Multidrug Resistant TB, XDR-TB- Extremely Drug Resistant TB

Table III. Attitudes towards TB infection control

Statements	Agree		Neutral		Disagree	
It is very important to prevent the spread of TB in the hospital	179	(98.4)	3	(1.6)	0	(0)
It is important for every DOTS centre to have an official TB infection control policy	180	(98.9)	2	(1.1)	0	(0)
If I were to develop symptoms of TB, I would feel comfortable requesting TB diagnosis	141	(77.5)	15	(8.2)	26	(14.3)
If I were to develop symptoms of TB, I would hide them for as long as I can	18	(9.9)	9	(4.9)	155	(85.2)
HIV-positive healthcare workers in high-risk TB areas should request to be relocated.	122	(67.0)	19	(10.4)	41	(22.5)
Lack of N95 masks for healthcare workers in DOTS centres puts them at higher risk of getting TB	148	(81.3)	17	(9.3)	17	(9.3)

TB infection control policy and most of them did not have an infection control committee. While all the centres had adequate ventilation in the TB patients' waiting area, these were not separated from waiting area for other patients in four centres. Five centres (55.6%) used ventilation systems in form of standing or ceiling fans. Seven centres (77.8%) reported the availability of personal protective devices in form of facemasks. While two centres (22.2%) had extractor fans installed, only one centre (11.1%) had N95 respirators available as well as ultraviolet germicidal irradiation fixtures installed.

Discussion

This study provides information on the knowledge and self-reported attitudes and practices of TB infection control among HCWs involved in TB services as well as implementation of controls for TB infection control in DOTS centres across Lagos State, Nigeria. The high burden of TB in the state means that there is high potential for healthcare-associated transmission of TB.

This survey revealed significant gaps in knowledge of TB infection control. Even though overall knowledge was above average, knowledge about preventive measures was lower than knowledge about transmission of TB. Poor knowledge on preventive measures translates to poor implementation of these measures and increases risk of transmission.[14] It is imperative that optimal knowledge of TB transmission and prevention be maintained among all workers involved in TB care, hence the need for continuous education programs to keep these HCWs constantly abreast of current trends. Posters and flyers have been used elsewhere to improve awareness on TB infection control.[9,14,15]

Attitudes of respondents were largely positive, however concerns about confidentiality were identified through responses to statements on seeking diagnosis for TB symptoms and transfer from high-risk areas. Lack of confidentiality for HCWs has been identified as an important contributory factor to HCWs not knowing their HIV status[3,4,6] and this has serious implications for TB infection control as lack of confidentiality and fear of stigma encourages practices that delay diagnosis and treatment of TB disease.[16] Interventions to combat stigma should be focused on the individual, environmental and policy levels.[17] Deliberate policies to prevent violations of confidentiality will help change the attitudes of HCWs towards checking HIV status. This requires political will and resources to support and scale up stigma-reduction activities throughout healthcare settings.

Training on infection control appears to be low, as only 42.3% of respondents reported having had any training on TB infection control. This shows poor compliance to the national guidelines for TB infection

Table IV. Practice of TB infection control

Statement	Always		Often		Sometimes		Occasionally		Never	
Frequency of wearing an N95 mask when around TB patients or suspects	94	(51.6)	26	(14.3)	20	(11.0)	8	(4.4)	34	(18.7)
Frequency of cough hygiene procedures use by patients	130	(71.4)	30	(16.5)	19	(10.4)	2	(1.1)	1	(.5)
Frequency of separating coughing patients from other patients attending clinic	126	(69.2)	27	(14.8)	14	(7.7)	7	(3.8)	8	(4.4)
Frequency of offering surgical masks to visitors to centre?	85	(46.7)	26	(14.3)	23	(12.6)	17	(9.3)	31	(17.0)
Frequency of visitors actually using surgical masks when you offer them?	92	(50.5)	27	(14.8)	12	(6.6)	26	(14.3)	25	(13.7)

control, which clearly outline the need for continuous training of all staff in TB care centres on TB infection control.[5] Continuous training helps to maintain risk awareness, which is a strong motivation for compliance to infection control guidelines.

As in other studies, there were inconsistencies between self-reported TB infection control practices and observations,[4,15] for instance while 51% of respondents said they always use N95 respirators when around patients with active TB, only one centre reported having supply of N95 respirators during the period of the survey. This is in line with the theory of bias in self-reported adherence to guidelines as respondents tend to overestimate desirable behaviour.[18]

The assessment of implementation of TB infection control measures showed varying levels of compliance with administrative and other controls. Administrative controls are the least expensive and easiest measures to implement, and their importance is further underscored by the fact that other control measures are not effective without their proper implementation. Two of nine centres admitted to not having a documented TB policy. A TB infection control policy or plan is the first step to instituting TB infection control measures. It is drawn up after an assessment of the facility's risk of TB transmission and outlines HCW training needs and training plan, policies for triage and screening, referral, diagnosis, separation and isolation, use and maintenance of environmental control

Table V. Participants' HIV status

Statement		Doctor		CHEW		Nurse		Others		Total	
Do you know your HIV status	Yes	28	(90.3)	53	(81.5)	57	(82.6)	13	(76.5)	151	(83.0)
	No	0	(0)	2	(3.1)	0	(0)	2	(11.8)	4	(2.2)
	No response	3	(9.7)	10	(15.4)	12	(17.4)	2	(11.8)	27	(14.8)

CHEW- Community Health Extension Worker; Others include pharmacy, laboratory and health records staff

Table VI. Implementation of TB infection control measures

Infection control measures	Frequency N = 9	(%)
Documented TB infection control policy	7	(77.8%)
Established infection control committee	4	(44.4%)
Designated infection control officer		
Doctor	3	(33.3%)
CHEW	3	(33.3%)
Total	6	(66.6%)
Separate waiting area for TB suspects	5	(55.6%)
Use ventilation systems	5	(55.6%)
Use UVGI fixtures	1	(11.1%)
Personal protective equipment	7	(77.8%)
N95 particulate respirators available/used	1	(11.1%)
Mixing Extractor fans	2	(22.2%)

CHEW- Community Health Extension Worker, UVGI- Ultraviolet Germicidal Irradiation

measures, description of roles and responsibilities for implementation and monitoring the infection control plan and budget.

Seven centres had a designated infection control officer while four had an established infection control committee. The centres with infection control committees were mostly secondary centres. In many cases, this officer was in charge of all infection control activities in the hospital. This appears to be the case in other parts of Nigeria as well.[13] With heavy work load and staff shortages in most centres, the tendency to overlook infection control requirements is quite high,[4,19] hence the need for a dedicated infection-control officer to ensure continuous compliance. The national guideline requires a designated TB infection control officer for all centres and a TB infection committee to oversee TB infection control activity in larger centres. This duty can be performed by the general infection control committee in settings were a separate committee for TB infection control is not feasible and this was the case in all centres where a committee was present.

All centres were observed to have adequate ventilation in waiting areas for patients seeking TB care, largely because these waiting areas were mainly outdoors. However, in most of the centres, these waiting areas were not clearly or at all separated from the waiting area for other patients. In some centres, this was clearly due to lack of space to implement this separation. The use of environmental control fixtures was quite low. Most centres only had ventilation systems in the form of electric fans while extractor fans and ultraviolet germicidal irradiation were extremely rare. This may, however, have little consequence; especially in centres where patients' waiting areas are located outdoors, as natural ventilation can provide adequate mixing of air and reduce concentrations of TB particles.[3,20] Propeller fans, like ceiling fans and standing fans, have been recommended as an inexpensive way of increasing the effectiveness of natural ventilation by increasing the mixing of airborne TB as well as assisting in the direction of air movement by pushing or pulling of the air.[21]

Conclusions

There are significant gaps in knowledge on TB infection control among HCWs in centres providing DOTS services in Lagos and this may increase the risk of transmission of TB to them and to other patients within the healthcare settings. Practice of TB infection control in DOTS centres in Lagos state is not fully compliant with national guidelines. The following recommendations will help to improve compliance:

1. TB infection control training and retraining for all HCWs directly and indirectly involved in care of TB patients in DOTS centres should be strengthened.
2. Adequate supplies of N95 respirators and other personal protective equipment required for TB infection control should be maintained by public health authorities.
3. The TB control program in the state should enforce the appointment of TB infection control officers and the development and implementation of TB infection control plan in all centres providing TB care in the state.

Acknowledgements

The authors wish to thank the Lagos State Health Service Commission, Lagos State Primary Healthcare Board, Medical Officers of Health and TB coordinators of participating centres for facilitating this study.

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