



## Knowledge and Practice of TB infection Control by Health Care Workers at National Tuberculosis and Leprosy Training Centre, Zaria, North Western Nigeria

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### Abstract

**Background:** Tuberculosis (TB) is highly rampant in sub-Saharan Africa, thereby multiplying the risk of transmission in the population and among health care providers. Nigeria was rated the fourth highest Tuberculosis (TB)-burden country in the world and number one in Africa, according to the World Health Organization (WHO). Interactions between health care providers and patients with active TB increase the risk of TB infection among Healthcare providers and other patients. This study was carried out to assess the knowledge and practice of health care workers at the National Tuberculosis and Leprosy Training Centre, Zaria, Nigeria on Tuberculosis Infection Control.

**Methods:** A cross-sectional study was conducted between April and May, 2016. Eighty-two health workers across various cadres and units were included in the study. The health workers were selected by simple random sampling. A structured self-administered questionnaire was used to collect information. Data was entered into Epi-Info 7, cleaned and analyzed. Those with  $\geq 60\%$  score in Knowledge and Practice questions were considered to have good knowledge and practice. Frequency tables, cross tabulations and logistic regression were generated and a P-value  $< 0.05$  was statistically significant for the study.

**Results:** A total of 78 healthcare professionals participated in the study. The response rate was 95%. 61(78.2%) had previously received training on TBIC. Among those who were trained, 90.2% [95% CI= 79.8-96.3] were found to have good knowledge and 85.3% [95% CI= 73.8-93.0] with good practice on TBIC. 88% of those with  $\geq 5$  years of service had good knowledge and practice. Training was found to have a significant effect on TBIC knowledge, AOR= 6.42 [95% CI= 1.78-23.12] and practice, AOR= 13.8 [2.10-32.36]. Years of service had a significant effect on TBIC practice, AOR= 8.3 [95% CI= 1.44-20.14] and knowledge of TBIC also had a significant effect on good TBIC practice, AOR= 5.2 [95% CI= 1.47-18.12].

**Conclusion:** Most of the health care workers had good TBIC knowledge and practice, but a significant fraction had never been trained on TBIC. Respondents trained on TBIC were found to be more knowledgeable than those not trained. Similarly, respondents with good TBIC knowledge were more likely to have good TBIC practice compared to those with poor TBIC knowledge. We recommend training of all health care workers on TBIC.

**Keywords:** Tuberculosis; Tuberculosis Infection Control; Training; Knowledge; Practice

### Introduction

Tuberculosis, more commonly known as TB is a major cause of death among infectious diseases worldwide [1]. Over four million people are suffering from active TB with six hundred and fifty thousand deaths occurring every year in Africa. In sub-Sahara Africa, TB with can be prevented accounted for 25% of adult deaths and the transmission of multi-drug resistant TB (MDR-TB) among people living with HIV in hospitals has been documented with high case-fatality rates [2]. Tuberculosis is second only to Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

(HIV/AIDS) as the greatest killer worldwide due to a single infectious agent. Tuberculosis accounting for 2.4% of the global burden of disease and remains a Public health problem in Nigeria [2].

Tuberculosis remains one of the world's biggest threats, as it now ranks alongside HIV as a leading cause of death worldwide. HIV's death toll in 2014 was estimated at 1.2 million, which included the 0.4 million TB deaths among HIV positive people [4]. Worldwide, 9.6 million people are estimated to have fallen ill with TB in 2014: 5.4 million men, 3.2 million women and 1.0 million

children. Among the 9.6 million new TB cases in 2014, 12% were HIV-positive and fewer than two-thirds (63%) of the 9.6 million people estimated to have fallen sick with the disease. This means that worldwide, 37% of new cases went undiagnosed or were not reported. The quality of care for people in the latter category is unknown. Of the 480 000 cases of multidrug-resistant TB (MDR-TB) estimated to have occurred in 2014, only about a quarter of these – 123, 000 – were detected and reported [3].

To prevent TB transmission in health care settings, infection control measures must be put in place. Tuberculosis infection control is a combination of various measures put in place to drastically reduced the transmission of tuberculosis infection among health care professionals within the health care system as well as reducing transmission among general populations [4].

Health care workers (HCWs) are at higher risk for occupational acquisition of TB. The risk of TB infection is amplified by the interaction between patients with active TB in clinics, hospitals and the broader community. In spite of the knowledge of health workers, there is poor practice on tuberculosis infection control in the health facilities as shown from previous studies [5-8].

Despite the role of health care workers in the implementation of Tuberculosis infection control policy, previous studies have shown that there is knowledge gap on TB infection control among various cadres of health care workers [5-8]. Most of these studies were conducted in other countries with little studies carried out in Nigeria. This study was therefore carried out to assess the level of Tuberculosis infection control knowledge and practice of health care workers at the national Tuberculosis and Leprosy Training Centre, Zaria, Nigeria.

## Materials and Methods

### Study area

This study was conducted at National Tuberculosis and Leprosy Training Centre (NTBLTC), Zaria Nigeria. The NTBLTC is situated in a village called Saye, along the old Zaria-Kaduna road, off Birnin Gwari road, about 5 km from Zaria city junction of the Kaduna-Kano express way in Kaduna state, Nigeria.

### Study Design, study timing and study population

This cross-sectional study was conducted between April and May, 2016. The study participants include all health care professionals who had been working at NTBLTC for at least 6 months before the commencement of the study. Health workers who were on annual leave or study leave during the period of data collection were excluded from the study. Eighty-two health workers across

various cadres (doctors, nurses, laboratory scientists/technologists, pharmacists x-ray technicians and other health officers) and units (OPD, Laboratory, Pharmacy, X-ray, TB/HIV Care Unit) were included in the study. The selected 82 health workers was equivalent to average number of health care workers on duty daily.

? Study tools (already provided under data collection below) - highlighted red.

The study variables are the healthcare workers, infection control committee at the health facility.

### Sampling Procedures

The various units within the hospital were first identified with the list of staff in each unit. Numbers of participants across the units were selected in proportion to the total number of staff working in each unit/department. The health workers were selected by simple random sampling.

### Data collection and analysis

A structured self-administered questionnaire was used to collect information. Data was entered into Epi-Info 7, cleaned and analyzed. Those with  $\geq 60\%$  score in Knowledge and Practice questions were considered to have good knowledge and practice respectively.

Descriptive analysis was done by calculating means, frequencies and tables. Cross tabulations and bivariate analysis were generated and a P-value  $< 0.05$  was statistically significant for the study.

### Ethical considerations

Ethical Approval for this study was sought and obtained from the Management of National Tuberculosis and Leprosy Training Centre (NTBLTC), Zaria, Nigeria. Written inform consent was obtained from the individual respondents after they had been informed about the purpose of the study. Participants were assured of confidentiality of information provided.

## Results

Socio-demographic characteristics of the study population.

A total of 82 participants were selected but 78 participants responded with a response rate of 95%. Majority (58.97%) of the participants were male and the mean age was 37 years, Std Dev  $\pm 6.3$  years while the mean years of service was 6.7 years, Std Dev  $\pm 5.7$  years. Concerning educational status, majority 32 (41%) and

27 (34.6%) has diploma and first degree respectively. Professionally most of the respondents 25 (32%) were Laboratory scientists/technologists while 26 (33.3%) of the participants works at the

laboratory. Majority of the respondents 41 (52.6%) had spent at least 5 years in service and 47 (60.3%) have been trained on TB infection control (Table 1).

Variable	Characteristics	Frequency (n)	Percentage (%)
Age (in years)	21-25	6	7.69
	26-30	20	25.64
	31-35	28	35.9
	36-40	13	16.67
	41-45	7	8.97
	46-50	2	2.56
	51-55	2	2.56
Sex	Male	46	58.97
	Female	32	41.03
Educational Background	SSCE/School Leaving Cert.	11	14.1
	Diploma	32	41.03
	First Degree	27	34.62
	2nd Degree and above	8	10.26
Profession	Physician	5	6.41
	Nurse/Midwife	18	23.08
	Laboratory HW	25	32.05
	Pharmacist HW	6	7.69
	CHEW	4	5.13
	Radiographer/X-ray Technician	3	3.85
	Health Attendant	17	21.79
Current Assignment Place	OPD	14	17.95
	TB/HIV Care units	15	19.23
	General Medical Ward	12	15.38
	Laboratory	26	33.33
	Pharmacy	7	8.97
	X-ray	4	5.13
Number of years of Service	< 2	1	1.28
	2 - 4	36	46.15
	≥ 5	41	52.56
Have you ever taken training on TBIC	Yes	47	60.26
	No	31	39.74
When was the training conducted	In the past 1 year	8	17.02
	In the past 2 years	19	40.43
	In the past 3/more years	20	42.55
How long was the training	1 day or less	14	29.79
	2-3 days	19	40.42
	more than 3 days	14	29.79
How many TB suspects or confirm cases do you encounter/provide service in one day	1 - 5	27	36.00
	6 - 10	14	18.67
	>10	12	16.00
	Don't Know	22	29.33

**Table 1:** Socio-demographic and other General Characteristics of the study population (N = 78).

### Infection control committee

Majority of the respondents 49 (62.8%) agreed there is a person or team of people responsible for infection control activities

while 39 (50%) agreed there is a formal infection control committee in the facility (Table 2).

Variable	Characteristics	Frequency (N = 78)	Percentage (%)
Is there a person or team of people responsible for conducting infection control activities in your facility?	Yes	49	62.82
	No	2	2.56
	Don't Know	27	34.62
Is there a formal Infection Control Committee in the facility?	Yes	39	50.00
	No	6	7.69
	Don't Know	33	42.31
Does the committee include at least one physician, one nurse, and one other person with training in infection control?	Yes	30	44.78
	No	2	2.99
	Don't Know	35	52.24
Did the committee meet during the past 12 months?	Yes	5	9.43
	No	4	7.55
	Don't Know	44	83.02
How many times did the committee meet in the last 12 months?	1-3	4	80.00
	>3	1	20.00
	Don't Know	0	0.00

**Table 2:** Infection Control Committee.

### Knowledge of TB infection control

Knowledge of health care workers on tuberculosis infection control was assessed by 11 questions majorly on prevention, transmission and symptoms of tuberculosis. Sixty-five (83.3%) of the health workers had good knowledge of TB infection control. In this study, 70 (89.7%) had the knowledge that door and window of a room should be left open whenever a patient suspected or confirmed to have TB is in the room (Table 3).

### Standard practice of TB infection control procedures

Practice of Health workers towards was assessed with 8 questions on standard TB infection control practices. Sixty-nine (88.5%) health workers are opening window whenever a patient suspected or confirmed to have TB is in the room while 52 (66.7%) sees coughing patients first. In all, fifty-nine (75.6%) had good TB Infection Control Practices. Regarding personal protective, 60 (76.9%) health workers use mask/respirator whenever they are attending to patients with suspected or confirmed TB (Table 4).

### Predictors of TBIC knowledge and practice by health care workers

Using bivariate and logistic regression analysis, training was a predictor of TB infection control knowledge (Table 5) while years of service and training were predictors of TB infection control practice (Table 6). Training was found to have a significant effect on TBIC knowledge, AOR= 6.42 [95% CI= 1.78-23.12] and practice, AOR= 13.8 [2.10-32.36]. Years of service had a significant effect on TBIC practice, AOR= 8.3 [95% CI= 1.44-20.14] and knowledge of TBIC also had a significant effect on good TBIC practice, AOR= 8.5 [95% CI= 1.34-23.20].

### Discussion

Findings from this study revealed, there was a committee on TBIC but there was no regular meeting of the committee in the past 12 months. Majority (83.3%) of the health workers had good overall knowledge about tuberculosis infection control. This find-

Variable	Characteristics	Frequency (N = 78)	Percentage (%)
The door and window of a room should be left open whenever a patient suspected or confirmed to have TB is in the room.	Yes	70	89.74
	No	3	3.85
	Don't Know	5	6.41
Patients suspected or confirmed to have TB should be kept separately from the rest of the patients	Yes	63	80.77
	No	10	12.82
	Don't Know	5	6.41
HCWs should try to minimize the time TB patients spend in the health facility	Yes	61	78.21
	No	6	7.69
	Don't Know	11	14.1
Surgical masks can't protect the HCW from contracting tuberculosis	Yes	45	57.69
	No	15	19.23
	Don't Know	18	23.08
Respirators can protect the HCW from contracting tuberculosis	Yes	58	74.36
	No	9	11.54
	Don't Know	11	14.1
TB patients have to be educated to cover their mouth with a handkerchief or scarf	Yes	66	84.64
	No	6	9.69
	Don't Know	6	9.69
Every health facility should establish an Infection Control Committee	Yes	59	75.64
	No	9	11.5
	Don't Know	10	12.82
Patients suspected or confirmed to have TB and are coughing should get priority to be seen by a nurse/doctor first	Yes	65	83.33
	No	7	8.97
	Don't Know	6	7.69
Regular screening of HCWs for presence of TB is one of the TB infection control measures	Yes	48	61.54
	No	13	16.67
	Don't Know	17	21.79
Fans (Ventilators) can be used in TB wards to reduce the transmission of TB in TB wards	Yes	48	61.54
	No	13	16.67
	Don't Know	17	21.79
TB cannot be transmitted from person to person by blood contact	Yes	56	71.79
	No	14	17.95
	Don't Know	8	10.26

**Table 3:** Knowledge of Tuberculosis Infection Control (TBIC).

ing was lower than the finding of similar study carried out in Iraq in 2003 which report 90.2% [5] and 90% reported in a survey conducted among hospital staff in South Africa [6]. However, this finding was higher than results from previous studies which reported

63.9% in a study conducted among health care workers in Ethiopia [8]. This finding was also higher than 63.3% report in South Africa [7].

Variable	Characteristics	Frequency (N = 78)	%
Does facilities heads monitor and evaluate HWs on TB Infection Control?	Always	43	55.13
	Sometimes	26	33.33
	Never	9	11.54
Do you open the window whenever a patient suspected or confirmed to have TB is in the room?	Always	69	88.46
	Sometimes	6	7.69
	Never	3	3.85
Do you try to see coughing patients at first, in other words, if there are coughing patients in the waiting area, do you give them priority?	Always	52	66.67
	Sometimes	15	19.23
	Never	11	14.1
Do you use a mask/respirator whenever you are treating TB patients/suspects?	Always	60	76.92
	Sometimes	9	11.54
	Never	9	11.54
Do you educate your TB patients on cough etiquette? (That is covering of mouth while coughing, not spitting on the floor, etc...)	Always	62	79.49
	Sometimes	8	10.26
	Never	8	10.26
If you were supplied with fans, would you turn them on while you are treating TB suspects or confirmed cases?	Always	52	66.67
	Sometimes	11	14.1
	Never	15	19.23
Having been in contact with TB patients, would you test for TB in case you have cough?	Always	47	60.26
	Sometimes	23	29.49
	Never	8	10.26
Is there any designated sputum produced area for TB pts?	Always	74	94.87
	Sometimes	3	3.85
	Never	1	1.28

**Table 4:** Practice of Standard TB Infection Control Measures.

Variable	Knowledge		AOR	95% CI		p-value
	Good n (%)	Poor n (%)		Lower	Upper	
<b>Age</b>						
< 35	36 (55)	9 (69)	0.56	0.15	1.98	0.690
> 34	29 (45)	4 (31)				
<b>Sex</b>						
Male	46 (14)	3 (37)	3.69	0.15	1.98	0.360
Female	24 (86)	5 (63)				
<b>Educational Background</b>						
SSCE/Diploma	10 (14)	1 (17)	1.24	0.05	10.18	0.850
First degree and above	62 (86)	5 (83)				
<b>Number of years of service</b>						
≥ 5	37 (37)	28 (5)	5.3	0.39	6.20	0.479
< 5	6 (63)	7 (95)				
<b>Training on TBIC</b>						
Yes	55 (90)	10 (59)	6.4	1.78	23.12	0.002*
No	6 (10)	7 (41)				

**Table 5:** Predictors of TB infection control knowledge of health workers.

\* Significant variable

Variable	Practice		AOR	95% CI		p - value
	Good n (%)	Poor n (%)		Lower	Upper	
<b>Age</b>						
Male	37 (63)	8 (42)	1.01	0.35	2.99	0.972
Female	32 (52)	9 (53)				
Male	37 (63)	8 (42)	0.43	0.15	1.23	0.189
Female	22 (37)	11 (58)				
<b>Educational Background</b>						
SSCE/Diploma	6 (11)	5 (24)	2.66	0.71	9.87	0.154
First degree and above	51 (89)	16 (76)				
<b>Number of years of service</b>						
≥ 5	38 (64)	5 (26)	8.3	1.44	20.14	0.004*
< 5	21 (36)	14 (74)				
<b>Training on TBIC</b>						
Yes	52 (85)	7 (41)	13.8	2.10	32.36	< 0.001*
No	9 (15)	10 (59)				
<b>Knowledge Level</b>			5.2	1.47	18.12	0.018*
Good	53 (90)	12 (63)				
Poor	6 (10)	7 (37)				

**Table 6:** Predictors of TB infection control practice of health workers.

\* Significant variable

The result of this study showed that majority (89.7%) of the respondents knew the door and window of a room should be left open whenever a patient suspected or confirmed to have TB is in the room. This finding was slightly lower than the study from west Gojam in Ethiopia which reported 91.4%. This was also lower than 96% reported in public health facilities in Addis Ababa, Ethiopia [8]. This study also found 80.8% of the respondents knew that suspected or confirmed TB patients should be separated from the rest of the patients and 84.6% knew that TB patients have to be educated to cover their mouth with a handkerchief or scarf. These findings were similar to finding from previous study in Ethiopia [8] and consistent with recommendation of WHO tuberculosis infection control guideline [9].

In terms of the knowledge of respiratory protection control of tuberculosis, more than half (57.7%) of the respondents believed surgical masks cannot protect the HCW from contracting tuberculosis. This was contrary to the findings from west Gojam, Ethiopia [7]. Majority (83.3%) of the respondents believed patients suspected or confirmed to have TB and are coughing should get priority to be seen by health care workers.

In terms of educational status, this study shows that 85.9% of the health care workers had first degree and above and were about 1.24 times more likely to be more knowledgeable compare to others with diploma or lesser degrees. Likewise, those with 5 or more years of service were about 5 times likely to have more knowledge of tuberculosis infection control compare to those with less than 5 years in service. This finding is in line with the finding from previous study in Addis Ababa, Ethiopia [8] but contrary to findings from similar study Bahir Dar [7]. Similarly, health care workers who had attended tuberculosis infection control training before were found to be more than 6 times likely to have more knowledge than others. The finding was also in line with similar studies in west Gojam [8] and Busia district of Kenya [10]. These discrepancies might be due to differences in study population and educational backgrounds of the health care workers.

The overall practice of health care workers was found to be 75.6% which is higher compared to the findings of 48.6% in a similar study among health workers in Ethiopia [8] and 63.3% in another study conducted in selected hospital in Kenya [10]. However, this was lower than 90.2% reported in Iraq in 2003 [5] and

90% in South Africa in 2011 [6]. These differences might be due to differences in categories of sampled health facilities and health professionals. Majority (88.5%) of the health care workers usually open the window whenever a patient suspected or confirmed to have TB is in the room. This finding was consistent to with the finding of similar study on hospital staff in South Africa which reported 90% [6]. In contrast, this finding was much higher than findings from other similar studies in Bahir Dar which reported 64.9% [7], with 53.4% [8] and Iraq with 43% [5]. This study also found that if there are coughing patients in the waiting area, 66.7% of the health workers will give priority to the coughing patients. Findings from this study also show that about 77% of the health workers always use a mask/respirator whenever treating suspected or confirmed TB patients. This finding was higher than 21.1% reported in a similar study among health care professionals [7] but similar to that reported from Bankong [11] and South Africa [12]. The differences in these findings might be attributed to the unavailability of the mask/respirator.

Those with first degree and above were about 2.7 times likely to have good TB infection control practices than those with lower degrees. However, this is not statistically significant. In terms of years of service, those with 5 years and above are about 8 times likely to have good TB infection control practices compare with those with less than 5 years. Also, those with previous training on TB infection control are about 14 times likely to have good TB infection control practices than those without any training on TB infection control. This findings was consistent with findings reported in Ethiopia [8]. Health workers with good knowledge of TB infection control are about 5 times likely to have good TB infection control practices compared to those with poor knowledge.

### Study Limitations

This study was conducted in a facility which limited the sample size. Also, practice was assessed using questionnaire to ask practice questions unlike observing practices which might produce more accurate results.

### Conclusion and Recommendations

This study has revealed that few health care workers were aware of the existence and activities of infection control committee at the health facility.

A significant proportion of the health care workers had relatively good overall knowledge and practice of TB infection control. A significant percentage of the health workers have been trained on TB infection control and about 50% had at least 5 years of service.

Training on TB infection control was found to be a strong determinant of knowledge and practice of TB infection control, while knowledge of TB infection control was a strong predictor of TB infection control practice. On the other hand, years of service did not appear to have a significant influence on TB infection control knowledge but was found to have significant influence on TB infection control practices.

We hereby recommend that functional TB infection control committee should be put in place and every health care worker should be trained on TB infection control measures.

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