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Assessment of Infection Prevention and Control Practices and Compliance for Pulmonary Tuberculosis Among Healthcare Workers in Doma Local Government, Nasarawa State, Nigeria

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ABSTRACT

“Pulmonary Tuberculosis’’ (PTB), an ancient infectious disease has caused more suffering and deaths than any other infectious disease and remains a public health problem worldwide. Tuberculosis (TB) infection prevention and control (IPC) is one of the key components of the ‘End TB Strategy’ being applied at both the facility and national level to prevent the spread of this communicable airborne disease. The healthcare workers (HCWs) by virtue of the environment they work in, are at high risk to nosocomial Mycobacterium Tuberculosis (MTB) due to the close contact with infected individuals. The TB Infection Prevention and Control guidelines for health care workers focuses on the four-pillar approach- managerial, administrative, environmental, and personal respiratory protection to minimize transmission of TB. Key measures include rapid ‘fast tracking’ triaging of coughing patients, use of N95 masks, and strict cough etiquette among others. The prevalence of active PTB is high among HCWs in Nigeria. This cross-sectional study assessed the IPC practices and knowledge of pulmonary tuberculosis of all categories of health care workers (n=391) in all public health facilities in Doma Local Government Area, Nasarawa State. Majority of the respondents, 387 (99.0%) had a good knowledge of the transmission and prevention of pulmonary tuberculosis. However, 71.4%, of the respondents had a fair practice of TB IPC and only 15.6% had a good practice of TB IPC. There was no statistically significant association between having knowledge of TB transmission and prevention and the practice of TB IPC (Fisher’s exact =0.324) among the respondents. Just over half of the respondents reported ‘TB suspects’, and followed the ‘National TB IPC Guidelines’. These findings highlight the need to provide the ‘National TB IPC Guidelines’ at designated points of care in health facilities, mentor HCWs during on-the-job supervision, and integrate TB IPC into the routine supportive supervision checklist (by state and local government authorities) in order to enhance compliance to TB IPC. This would contribute positively to the reduction of the

risk of transmission and exposure among health care workers to PTB in healthcare settings.

Keywords: Health care workers, pulmonary tuberculosis, infection prevention and control practices, infection prevention and control compliance

INTRODUCTION

Pulmonary tuberculosis, caused by Mycobacterium tuberculosis (MTB), is a chronic infection primarily affecting the lungs and represents the commonest form of Tuberculosis. As an airborne pathogen, MTB poses a serious global public health threat (Yu Y, et al, 2025). Tuberculosis is an age-old disease, estimated to be in existence for over 70,000 years (Sachdeva K.S, 2020). Tuberculosis is judged to be the leading infectious cause of death worldwide. It has been observed that never before were more individuals reported by the World Health Organization (WHO) to be affected by tuberculosis than currently (Lange C., et al, 2025; Dorjee K, et al 2025).

The World Health Organization (WHO) reported 1.8 million new TB cases globally in 2023. According to the "Global Tuberculosis Report 2024", there was an incidence of 134 per 100,000 populations (Chen Z., et al, 2025; Farnia P., 2025). Of this figure, Sub-Saharan Africa (SSA) bore a disproportionately high burden of the disease, and accounted for 24% of incident cases and over 33% of deaths despite representing only 14% of the global population (Li S., 2025; Kapata N., et al, 2025). High TB burden and low- and middle-income countries (LMICs) account for 87% of global cases of TB disease.

Health care workers (HCWs) in resource-limited work settings are at high occupational risk of exposure to tuberculosis (TB) (O'Hara M.L., 2017; Okpokoro E., et al, 2025) due to persistent exposure to MTB in healthcare settings (Ilesanmi O.T., et al 2014). The number of TB cases per 100 000 HCWs in some LMICs is more than double the incidence rate among the general population, implying that healthcare facilities are an important source of TB transmission in these countries. (Paleckyte A., et al 2021; Olalekan WA et al, 2019). The prevalence of active PTB is high among HCWs in Nigeria, as seen in a study in Kaduna where it was as high as 15% (Laminu et al, 2023). In 2024, the Nasarawa State Tuberculosis and Leprosy Control (NSTBLCP) program reported 236 cases of TB in Doma Local Government Area (LGA) and 65 of them were from General Hospital Doma. This high rate of TB among HCWs as well as hospital-based outbreaks of multidrug and extensively drug-resistant TB among patients and workers have led to increased concern about the risk of Mycobacterium tuberculosis transmission in healthcare settings (O'Hara M.L., 2017).

Inadequate IPC interventions for MTB are a major barrier to the implementation of essential disease prevention and control measures (Paleckyte A., et al 2021; Westhuizen H.M., et al, 2022; Laminu C., et al 2023). In 2015, the World Health Organization (WHO) introduced the "End TB" Strategy, aiming to reduce TB incidence by 95% by 2030. One of the key components of the 'End TB Strategy' to be applied to all levels of healthcare at the health facility and policy level was the guidelines for 'TB infection prevention and control (IPC) (Azeredo A.C.V., 2020). In Nigeria, the IPC for TB guidelines has four pillars- managerial, administrative, environmental, and personal respiratory protection to minimize transmission of TB. However, without involvement of the stakeholders, the healthcare workers, implementation of most recommendations cannot be appropriately introduced in resource-constrained settings and areas of high TB incidence. (Masuku S., et al, 2024).

This study aims at finding out the association between the knowledge of health workers on

TB transmission and practices and how that knowledge relates to compliance with TB Infection Prevention and Control practices at the health facility work place. Such studies conducted are few in Nigeria and none for Nasarawa State, Nigeria.

General Objective

The main objective of the study is to assess the Infection Prevention and Control practices and compliance for Pulmonary Tuberculosis among healthcare workers in Doma Local Government Area, Nasarawa State

Specific Objectives

i. To assess the knowledge of health care workers on Pulmonary Tuberculosis infection prevention and control practices among health care workers in Doma Local Government Area of Nasarawa State.

ii. To describe the practices employed by health care workers for the prevention of Pulmonary Tuberculosis infection among health care workers in Doma Local Government Area of Nasarawa State.

METHODOLOGY

Study Area

Doma Local Government Area (LGA) is one of 13 local government areas in Nasarawa state. The LGA has only one General Hospital, located at Yelwa Ediya road in Doma LGA of Nasarawa state. It has ten political wards with each ward having a Primary Health Care Centre (PHC). All these health facilities offer TB services.

Study Design

A cross-sectional descriptive study was used.

Study Population

The study population was all health workers such as doctors, nurses, laboratory and X-ray technologists, and community health aides of General Hospital Doma and all Primary Health Care Centers in Doma Local Government Area of Nasarawa State.

Sample Size

A total population sampling technique was employed. A total of 391 health care workers participated in this study

Sampling Technique

The comprehensive list of all the health care workers in the General Hospital and Primary Health Centres was obtained from the Nasarawa State Hospital Services Management Board and from the Nasarawa State Primary Health Care Development Agency (NAPHDA), which was then collated into a single list (Appendix 1). Names of the workers were included in the original list/ health facility name, with sample code numbers allocation (for example, GD1(G=General Hospital Doma D=Doctor1), GN1 (G=General Hospital Doma, N=Nurse 1))

Data Collection Method

A structured interviewer-administered questionnaire was designed, pretested and used for data collection. Questionnaires had code numbers for identification but did not capture any of the respondents' names. Data collection was done by the principal researcher and research assistants. The research assistants were trained on how to ask the questions. The questionnaire had the following sections:

Section A: Demographic data

Section B: Knowledge about transmission of TB infection and Infection Prevention and Control interventions

Section C: Infection Prevention and Control Practices and Compliance for preventing TB infection

Data Analysis

Data was collected with the 'Kobo toolbox', imported into SPSS version 25, cleaned, analyzed and the results presented in tables.

Ethical Considerations

Ethical approval was obtained from the Nasarawa State Ministry of Health Ethics Committee and from the Doma Local Government Area authority. In addition, an

introductory letter for permission to conduct the study was obtained from the Medical Director of the General Hospital, directed to the heads of wards/units to conduct the research study among the healthcare workers in the health facility. This applied same to the Primary Health Care Centres where the letter for approval was obtained from Doma LGA Health Secretary.
Written informed consent was also sought from participants/respondents prior to administration of the questionnaires. Staff` were ensured of confidentiality of the nature of data that would be collected, and right to withdraw from the study at any time. Explanation was also given regarding refusal to participate and withdrawal, emphasizing that it would not affect their employment status with the hospital. Anonymity was assured by not placing the names of participants but rather the use of numbers (codes) on the questionnaires. General information on the consent form was included such as the purpose of the study, objectives, specific expectation regarding participation and potential cost and benefits. The participants were assured of their protection and the information received would not be known to anyone except the principal investigator of the study.

RESULTS

Table 1: Sociodemographic characteristics of respondents

Variable	Frequency	Percentage
Age group		
M±SD	34.95±8.23	
20-29	102	26.1
30-39	221	56.5
40-49	34	8.7
50-59	30	7.7
60-69	4	1.0
Total	391	100.0
Sex		
Male	249	63.7
Female	142	36.3
Total	391	100.0
Marital status		
Single	2	0.5
Married	146	37.5
Separated	4	1.0
Divorced	239	61.1
Total	391	100.0
Professional category		
Doctor	4	1.0
Nurse	67	17.1
Laboratory professional	60	15.3
Pharmacy technician	15	3.8
CHEW	236	60.4
Imaging professional	9	2.3
Total	391	100.0
Level of education		
Diploma	351	89.8
Bachelor’s degree	37	9.5
Masters’ degree and above	3	0.8
Total	391	100.0
Years of experience		
<5 years	66	16.9

5-10 years	286	73.1
>10 years	39	10.0
Total	391	100.0
Department/unit		
OPD	188	48.1
PHARMACY	15	3.8
RADIOLOGY	8	2.0
TB	9	2.3
ART	10	2.6
CONSULTING	28	7.2
LABORATORY	57	14.6
MATERNITY	15	3.8
NURSING	61	15.6
TOTAL	391	100.0SS
Received training on TB P/C		
Yes	390	99.7
No	1	0.3
Total	391	100.0
Ever screened for TB		
Yes	391	100.0
No	0	0.0
Total	391	100.0

Slightly more than half of the respondents 221 (56.5%) were within 30-39 years, were males (249 (63.7%)), divorced (239 (61.1%)), and were Community Health Extension Workers (CHEWs) 236 (60.4%). Majority had a Diploma (351 (89.8%)), had spent 5-10 years in practice (286 (73.1%)), and nearly half of them were in the OPD (188 (48.1%)). Almost all, 390 (99.7%) had received training on TB IPC and all had been screened for TB (391 (100.0%)).

Table 2: Table showing knowledge of TB transmission and prevention among the respondents

Statement	Frequency	Percentage
Transmitted via airborne droplets		
Yes	391	100.0
No	0	0.0
I don't know	0	0.0
Total	391	100.0
Cough >2 weeks suggests TB		
Yes	391	100.0
No	0	0.0
I don't know	0	0.0
Total	391	100.0
Health workers at risk from general population		
Yes	389	99.4
No	1	0.3
I don't know	1	0.3
Total	391	100.0
Use N95 respirators reduces transmission		
Yes	359	91.8
No	28	7.2
I don't know	4	1.0
Total	391	100.0
Adequate ventilation reduces transmission in health care setting		

Yes	390	99.7
No	1	0.3
I don't know	0	0.0
Total	391	100.0
Early diagnosis and treatment reduce TB spread		
Yes	384	98.2
No	4	1.0
I don't know	3	0.8
Total	391	100.0

All the respondents agreed that TB was airborne, and cough >2 weeks was suggestive of TB. Nearly all believed that health workers were at risk of TB (389 (99.4%)), and knew the importance of the use of N95 (359(91.8%)). Majority of the respondents also knew that adequate ventilation 390 (99.7%) could reduce transmission and almost all, 384 (98.2%), believed that early diagnosis and treatment would reduce spread of the disease.

Table 3: Table showing Knowledge score among the respondents

Score	Frequency	Percentage
Good	387	99.0
Fair	4	1.0
Poor	0	0.0
Total	391	100.0

Majority of the respondents, 387 (99.0%) had a good knowledge of the transmission and prevention of pulmonary tuberculosis.

Table 4: Table showing the practice of TB IPC among the respondents

Practice	Frequency	Percentage
I screen patients for TB symptoms at initial contact		
Never	27	6.9
Rarely	148	37.9
Sometimes	206	52.7
Always	10	2.6
Total	391	100.0
I separate suspected TB patients from other patients		
Never	12	3.1
Rarely	125	32.0
Sometimes	235	60.1
Always	19	4.9
Total	391	100.0
I use N95 when caring for suspected or confirmed TB patients		
Never	13	3.3
Rarely	147	37.6
Sometimes	216	55.2
Always	15	3.8
Total	391	100.0
I educate patients on cough etiquettes and respiratory hygiene		
Never	10	2.6
Rarely	131	33.5
Sometimes	233	59.6
Always	17	4.3
Total	391	100.0
I ensure adequate ventilation in patient care areas		
Never	4	1.0
Rarely	104	26.6
Sometimes	244	62.4
Always	39	10.0
Total	391	100.0

I follow national/institutional TB infection control guidelines		
Never	6	1.5
Rarely	134	34.3
Sometimes	219	56.0
Always	32	8.2
Total	391	100.0
I reported suspected TB cases promptly according to protocol		
Never	4	1.0
Rarely	109	27.9
Sometimes	212	54.2
Always	66	16.9
Total	391	100.0
I undergo regular TB screening as a healthcare worker		
Never	10	0.2
Rarely	126	32.2
Sometimes	205	52.4
Always	50	12.8
Total	391	100.0
I properly dispose of sputum and contaminated materials		
Never	3	0.8
Rarely	93	23.8
Sometimes	213	54.5
Always	82	21.0
Total	391	100.0

Just a little above half of the respondents, (206 (52.7%)) sometimes screened patients for PTB at initial contact. About two-thirds of the respondents, 235 (60.1%), sometimes separated suspected PTB patients from other patients. Sometimes, N95 was used when attending to suspected or confirmed case of PTB, 216 (55.2%). More than half of the respondents, 233 (59.6%) educated patients on cough etiquette and respiratory hygiene. Nearly two-thirds, 244 (62.4%) ensured adequate ventilation in patient areas. Just a little above half of the respondents 219 (56.0%) sometimes followed the National Guidelines on TB control. Just about half, 212 (54.2%) reported the suspected cases as per National Guidelines. Similarly, about half of the respondents, 205 (52.4%) sometimes underwent regular TB screening and promptly disposed of sputum and contaminated materials, 213 (54.5%).

Table 5: Table showing TB IPC practice score for the respondents

Score	Frequency	Percentage
Good	61	15.6
Fair	279	71.4
Poor	51	13.0
Total	391	100.0

Majority of the respondents, 279 (71.4%), had a fair practice of TB IPC and far below one-third, 61 (15.6%) had a good practice of TB IPC.

Table 6: Table showing relationship between knowledge score and the practice score of the respondents

Knowledge score	Practice score			Exact-value
	Good	Fair	Poor	
Good	60	277	50	
Fair	1	2	1	0.324
Poor	0	0	0	

There was no statistically significant association between having knowledge of TB transmission and prevention and the practice of TB IPC (Fisher's exact =0.324) among the respondents.

DISCUSSION

The socio-demographics of the respondents in this study showed that slightly more than half of the respondents were within 30-39 years, were males, divorced, and are CHEWs, and majority had diploma. Majority had spent 5-10 years in practice and nearly half were in the OPD; almost all had received training on TB IPC and all had screened for TB. The mean age of respondents in a similar study in Ondo State in 2019 (Adebimpe *et al*) was 34+/- 8.1 years. It indicates that young health care workers form a very significant number in the health workplace, whether recent graduates, young professionals, or community health workers and are responsible for recognition of early signs and symptoms, accurate diagnosis of disease including Lassa fever, and starting treatment.

This study revealed a good level of knowledge of TB transmission and prevention among health care workers, similar to a study in Ondo state ((Adebimpe *et al, 2019*) where 83% of health care workers had a good knowledge. This is in contrast to another finding from a study among health workers in Osun state Nigeria where just half of the respondents demonstrated overall good knowledge of TB (Ohiengbomwan O.T, 2025). Similarly, a study in Kano among health workers showed that just one-third of the respondents had a good knowledge of multidrug resistant tuberculosis (Aliyu S.A., et al, 2020). The same average performance in knowledge was recorded among health workers in China (Zhang CJ et al, 2024). The high knowledge of TB transmission and prevention among the respondents in this study could be due to the fact that all the respondents had undergone training concerning PTB. The public health significance of this finding is that training and retraining of health workers may improve their knowledge.

This study discovered that the high knowledge of TB transmission and prevention among the participants did not translate into high practice of TB IPC. Across all the areas of enquiry, most of the participants 'sometimes practice TB IPC'. This is sub-optimal for quality assurance purposes. Majority of the respondents had a fair practice of TB IPC while far below one-third of the respondents had a good practice of TB IPC. So, it wasn't surprising that there was no significant association between knowledge and the practice of TB-IPC in this study. Similar findings were seen from a study in Ondo state, where majority of the health-care workers had good knowledge of IPC, while only about two-third of the health-care workers had good practice. Although the proportion of those with good practice is higher than in the present study, high knowledge did not translate into high degrees of practice (Olalekan WA et al, 2019). A 2021 study revealed that there were limited access and usage of N95 masks (20.6%) while usage of surgical masks was higher (48%) (Oladele et al,2021) during COVID-19. Pulmonary tuberculosis is an infectious disease like COVID-19. In this study, only 3.8% of health care workers in Doma LGA always used N95 masks when caring for TB patients while 55.2% sometimes did. This limited use of N95 masks when the knowledge level is high on its use, necessitates urgent attention and implementation of TB infection control guidelines at health facility level. Just over 50% health care workers acknowledged in this study that 'sometimes' the TB infection control guidelines are followed. Only 62% of health care workers acknowledged having good ventilation at patient care areas. Worrisome still, is that only 12.8% are regularly having TB screening when they are at risk due to their occupational roles. In 2021, a cross-sectional research study in Nigeria found a larger percentage of health care workers (46.1%) performing COVID 19 and TB screening for themselves (Okoro et al,2021). Routine TB screening and for infectious diseases should be institutionalized in the Nigerian health system.

Similar to the finding in this study, a study on the relationship between knowledge and practice of TB-IPC in South Africa found no statistically significant association (ssMasuku S., et al,2023) but contrary to the findings from a study in Kenya where majority of participants had a fair attitude and complied to TB-IPC guidelines (Wangari JM et al, 2023). The dissonance between knowledge and practice could be due to unavailability of TB-IPC guidelines to refer to, lack of enforcement or supervision of the health workers. If this assumption is true, it highlights the need for administrative measures to ensure compliance with TB IPC at work place.

CONCLUSION

This study revealed that the participants had good knowledge of transmission and prevention of TB. However, their knowledge did not translate into good practice of TB IPC highlighting the need to provide 'National TB IPC Guidelines', mentor health care workers on it, and integrate TB IPC into the routine supportive supervision to enhance compliance.

Declaration by Authors

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