Original Research Article

ASSESSMENT OF THE AWARENESS AND KNOWLEDGE ON STANDARD PRECAUTION OF TUBERCULOSIS AMONG PRIMARY HEALTHCARE WORKERS IN EDO STATE, NIGERIA

ABSTRACT

Aim: This study aimed to assess the knowledge and awareness of primary healthcare workers regarding tuberculosis (TB), its prevention and control measures, and standard precautions.

Methodology: This study employed a cross-sectional, descriptive research design to describe the level of knowledge on standard precautions for tuberculosis among primary health care workers. A total of four hundred and fifty (450) primary health care workers from selected Primary Health Centres (PHCs) in Edo State, Nigeria were recruited for this study. Participants were selected using a stratified random sampling method, ensuring representation from different facilities, professions, and geographical locations. A self-administered, structured questionnaire was used for data collection.

Results: A total of 450 questionnaires were distributed, with 435 deemed valid and analyzed. The majority of respondents were female (79.08%), married (55.86%), and nurses (50.80%). The results showed that 69.66% of the respondents correctly identified bacteria as the causative agent of TB, and 95.40% acknowledged that TB is an airborne disease. Respondents also demonstrated knowledge of common symptoms (66.90%), high-risk groups, and types of TB (79.08%). However, only 61.15% recognized that the Bacillus Calmette-Guérin (BCG) vaccine is not 100% effective in preventing TB. All respondents identified standard precautions for healthcare workers when dealing with suspected or confirmed TB cases, such as hand hygiene, wearing personal protective equipment, isolating the patient, and disposing of contaminated waste safely. The majority (73.33%) correctly identified the N95 respirator as the recommended mask for healthcare workers treating TB patients. Furthermore, 91.49% mentioned the necessary actions when a TB patient is identified. However, 60.69% of respondents reported that their workplaces' current TB prevention and control programs were not effective, and 91.72% had not received any formal training or education on TB and standard precautions in the past two years.

Conclusion: This study reveals that healthcare professionals possess a baseline understanding of TB and the necessary standard precautions. However, there are notable gaps in knowledge and misconceptions that could impact the effective management and control of TB in healthcare settings.

Keywords: Awareness and Knowledge; Primary healthcare workers; Standard Precautions; Tuberculosis

1. INTRODUCTION

Tuberculosis (TB) is a highly infectious airborne disease caused by the Mycobacterium tuberculosis complex [1]. The World Health Organization (WHO) has declared TB a global public health crisis due to its high morbidity and mortality rates, particularly in low- and middle-income countries. TB remains a significant public health concern worldwide, with a high burden of morbidity and mortality. According to the World Health Organization (WHO), an estimated 10 million people fell ill with TB in 2020 [2]. Despite the efforts to reduce its incidence, TB continues to be a leading cause of death from an infectious disease. Primary health care workers (PHCWs) play a crucial role in the prevention, detection, and management of TB, making it imperative for them to possess a comprehensive understanding of the standard

precautions to minimize the spread of infection and protect themselves and their patients [3,4].

The standard precautions for TB involve a set of guidelines and practices that health care workers must follow to prevent the transmission of Mycobacterium tuberculosis, the causative agent of TB [5]. These precautions include, but are not limited to, proper ventilation, administrative controls, environmental controls, and personal protective equipment (PPE). In addition, primary health care workers should be familiar with the correct procedures for diagnosing and treating TB to ensure that patients receive appropriate and timely care [6].

Several studies have shown varying levels of knowledge and adherence to standard precautions on TB among PHCWs in different countries [7-11]. Factors such as inadequate training, lack of resources, and insufficient emphasis on TB prevention within health care settings may contribute to these knowledge gaps. Consequently, health care workers may not be equipped with the necessary tools and understanding to manage TB cases effectively and minimize the risk of infection transmission. These factors can lead to suboptimal infection control practices, delayed diagnosis, and increased risk of transmission among patients, community members, and health care workers [10].

The WHO recommends standard precautions to prevent the transmission of TB in health care settings [2]. These precautions include administrative controls, environmental controls, and personal protective measures. Administrative controls involve prompt identification and isolation of suspected TB cases, proper triage, and efficient patient flow. Environmental controls include proper ventilation, air filtration, and ultraviolet germicidal irradiation. Personal protective measures involve the use of appropriate respiratory protection, such as N95 respirators, for health care workers when caring for patients with suspected or confirmed TB [12].

Despite the existence of standard precautions and guidelines, studies have reported knowledge gaps and inadequate adherence to these measures among PHCWs [13-15]. Some of the challenges faced by PHCWs include lack of training, insufficient resources, and cultural barriers that may hinder the implementation of standard precautions. These gaps and challenges can negatively impact the effectiveness of TB prevention and control efforts in primary health care settings [16].

The primary objective of this research is to assess the level of knowledge on standard precautions for tuberculosis among primary health care workers. By identifying the areas in which knowledge is lacking, this study aims to contribute to the development of targeted interventions and educational programs to improve the understanding and implementation of TB standard precautions in primary health care settings. Ultimately, this research seeks to reduce the burden of TB morbidity and mortality by enhancing the capacity of health care workers to provide effective prevention, diagnosis, and treatment of the disease. This research study will focus on evaluating the knowledge of primary health care workers on standard precautions for TB, with the ultimate goal of informing targeted interventions and educational programs to bridge the identified gaps in knowledge. Through these efforts, we aim to reduce the impact of TB on global public health and contribute to the ongoing fight against this devastating disease.

2. RESEARCH METHODOLOGY

2.1 Study Area

Edo State is a state located in the South-South geopolitical zone of Nigeria. As of 2006 National population census, the state was ranked as the 24th populated state (3,233,366) in Nigeria. The state population figure is now about 8,000,000 [17]. The state's capital and city, Benin City, is the fourth largest city in Nigeria, and the centre of the country's rubber industry. Created in 1991 from the former Bendel State, Edo State is also known as the heartbeat of the nation. Edo State borders Kogi State to the northeast, Anambra State to the east, Delta State to the southeast and south--south and Ondo State to the west [18]. The main ethnic groups in Edo State are Bini, Etsako, Esan, Owan, and Akoko Edo. Virtually all the groups trace their origin to Benin City, hence their dialects vary with their distance from Benin City. The Bini speaking people occupy seven out of the 18 Local Government Areas (LGAs) of the state and constitute 57.54% of the total population. Others are as follows: Esan (17.14%), Etsako (12.19%),

Owan (7.43%), and Akoko Edo (5.70%) [19]. There are also Igbira speaking communities in Akoko Edo, Itsekiri communities in Ikpoba-Okha, and Ijaw Izons and Urhobos in Ovia North East and South West Local Government Areas, especially in the borderlands. Also, Igbo speaking communities exist in Igbanke (Ika) in Orhionmwon LGA. English is the official language of the state [17].

2.2 Study Design

This study employed a cross-sectional, descriptive research design, collecting data at a single point in time to describe the level of knowledge on standard precautions for tuberculosis among primary health care workers. The sampling unit for this study were trained primary health care workers. The formula for calculating sample for one proportion stated by Lemeshow *et al*. [20] was used to estimate the sample size and was based on a prevalence of 89.2% of satisfactory knowledge regarding tuberculosis among healthcare workers from a similar study carried out in Lesotho [21]. The estimated sample size was 450. The study population consisted of primary health care workers, including physicians, nurses, and other allied health professionals working in primary health care settings. A total of four hundred and fifty (450) primary health care workers from selected Primary Health Centres (PHCs) in Edo State, Nigeria were recruited for this study. Participants were selected using a stratified random sampling method, ensuring representation from different facilities, professions, and geographical locations.

A self-administered, structured questionnaire was used for data collection. The questionnaire was developed based on relevant literature and guidelines, and its content validity was ensured through expert review. The questionnaire was pilot-tested on a small group of primary health care workers to evaluate its clarity, relevance, and comprehensiveness. Necessary modifications were made based on the feedback received. After obtaining the required ethical approvals and permissions, the researchers visited the selected primary health care centres. The purpose of the study was explained to the participants, and their informed consent was obtained. Participants were given the self-administered questionnaire to fill out in a private space, ensuring confidentiality. Participants were given sufficient time to complete the questionnaire, and their anonymity and confidentiality were maintained throughout the study.

2.3 Data Analysis

Data were entered into a statistical software package (SPSS), and descriptive statistics were computed to summarize the participants' demographic characteristics, knowledge of tuberculosis and standard precautions against tuberculosis

3. RESULTS

A total of four hundred and fifty (450) questionnaires were administered to respondents and they were all retrieved. Out of these, four hundred and thirty five (435) questionnaires were valid. This was due to irregular, incomplete and inappropriate responses to some questionnaires. These 435 questionnaires were cleansed for analysis. The results for the demographic information of the respondents as presented in Table 1 revealed that 158 representing 36.32% of the respondents were between the age categories of 35-44 years, 106 (24.37%) of the respondents were between the ages of 25 and 34 years, 89 (20.46%) of the respondents were between the ages of 45 and 54 years, 54 (12.41%) of the respondents were between the ages of 18 and 24 years, and the least age category was 6.44% of the respondents (more than 55 years). More than two-third (79.08%) of the respondents were female and the remaining 91 representing 20.92% were males. The majority of the respondents (55.86%) were married, 101 (23.22%) were single, and 91 (20.92%) of the respondents were separated, divorced or widowed. According to the professional roles of the respondents, 221 (50.80%) were Nurses, 74 (17.01%) were Physicians, 29 (6.67%) were community health workers, and 111 representing 25.52% of the respondents identified themselves as others. Out of the 435 valid respondents, 119 (27.36%) had 6 to 10 years of experience, 96 (22.07%) had between 11 and 15 years of experience, 95 (21.84%) had 1 to 5 years of experience, 85 (19.54%) had between 16 and 20 years of experience, 23 (5.29%) had more than 20 years of experience and only 17 (3.91%) said they had less than 1 year of experience.

The participants' response on their knowledge of tuberculosis is presented in table 2. The results

showed that 303 (69.66%) of the respondents identified bacteria as the causative agent of tuberculosis, 84 (19.31%) said tuberculosis was caused by fungi, 38 (8.74%) said tuberculosis is a viral disease and 10 (2.30%) identified parasite as the causative agent of tuberculosis. Almost all (95.40%) of the respondents said tuberculosis is an airborne disease, 12 (2.76%) said it is a blood-borne disease and 8 (1.84%) said the disease is primarily transmitted through fecal-oral mode. Most (66.90%) of the respondents identified persistent cough, fever, night sweats, unintentional weight loss and chest pain as the common symptoms of tuberculosis. Majority (79.08%) of the respondents said latent and active are the two types of tuberculosis, 61 (14.02%) said the two types of tuberculosis are active and passive, and 30 (6.90%) of the respondents said identified the types of tuberculosis as primary and secondary. Similarly, most (66.21%) of the respondents identified people with HIV/AIDS, healthcare workers, children and smokers to be at higher risks of tuberculosis infection. When asked how long does a person with active tuberculosis needed to be on medication to be considered non-infectious, most (71.49%) of the respondents said two weeks, 73 (16.78%) said one month, 31 (7.13%) said two months and 20 (4.60%) said one week. Out of the 435 valid respondents, 266 (61.15%) said Bacillus Calmette-Guérin (BCG) vaccine is not 100% effective in preventing tuberculosis and 169 (38.85%) said the vaccine is 100% effective.

Table 3 showed the participants' responses on standard precautions against tuberculosis. From the results, it was observed that all the respondents (100.00%) said the standard precautions that primary health care workers should take when dealing with a suspected or confirmed case of tuberculosis are hand hygiene, wearing personal protective equipment (PPE) such as gloves, masks, and gowns, isolation of the patient, as well as safe disposal of contaminated waste. When asked what type of mask is recommended for primary health care workers when treating a patient with suspected or confirmed tuberculosis, most (73.33%) of the respondents said N95 respirator, 84 (19.31%) said surgical mask, and 32 (7.36%) said cloth mask. In the same vein, almost all (91.49%) of the respondents said notifying public health authorities, educating the patient on the importance of medication adherence, monitoring the patient's progress and response to treatment, as well as implementing airborne precautions are actions to be taken when a patient with suspected or confirmed tuberculosis is identified. When asked how effective are their workplaces' current tuberculosis prevention and control programs, majority (60.69%) of the respondents said it is not effective, 101 (23.22%) said it is somehow effective, 10.11% and 5.98% said it is effective and very effective respectively. Almost all (91.72%) of the respondents said they have not received any formal training or education on tuberculosis and standard precautions in the past two years. It was also observed that most (79.31%) of the respondents said that the purpose of standard precautions in healthcare settings are to prevent the spread of infection, to protect healthcare workers from injury as well as to ensure patient confidentiality. When asked what is the minimum distance recommended for separating patients with suspected or confirmed TB from other patients in a waiting area, most (55.17%) of the respondents said there is no specific distance recommended, 16.55%, 15.86% and 11.04% of the respondents said 1, 2, and 3 meters respectively. Majority (61.61%) of the respondents said adequate ventilation, UV germicidal irradiation, negative pressure isolation rooms, as well as regular screening of healthcare workers for TB should be implemented in healthcare settings to reduce the risk of TB transmission. More than two-third (68.97%) of the respondents said hand hygiene practice was important in preventing the spread of tuberculosis. When asked how often should the air in a room housing a patient with TB be exchanged, 189 (43.45%) of the participants said at least 6-12 air exchanges per hour, 123 (28.28%) said at least 2-4 air exchanges per hour, 113 (25.98%) said at least 1 air exchange per hour while 10 (2.30%) said air exchange is not necessary. When asked what type of room should a patient with suspected or confirmed TB be placed, 117 (26.29%) of the respondents said negative pressure isolation room, 75 (17.24%) said standard patient room, 20 (4.60%) said room with an open window, 214 (49.20%) said airborne infection isolation room while 9 (2.07%) of the respondents said no specific room prescribed for a patient with suspected or confirmed TB. Furthermore, most (54.25%) of the respondents said wearing a surgical mask and N95 respirator by the patient and healthcare professional respectively as well as limiting the transport of the patient to essential medical purposes only as precautions

to be taken when a patient with suspected or confirmed TB is transported within the healthcare facility.

Table 1: Demographic Distribution of Respondents

Demographic Information	Frequency (n = 435)	Percentage (%)
Age (in years)		
18 – 24	54	12.41
25 – 34	106	24.37
35 – 44	158	36.32
45 – 54	89	20.46
55 and Above	28	6.44
Gender		
Male	91	20.92
Female	344	79.08
Marital Status		
Single	101	23.22
Married	243	55.86
Separated/Divorced/Widowed	91	20.92
Professional Role		
Physician	74	17.01
Nurse	221	50.80
Community health worker	29	6.67
Others	111	25.52
How many years of experience do you have working in primary health care?		
Less than 1 year	17	3.91
1 – 5 years	95	21.84
6 – 10 years	119	27.36
11 – 15 years	96	22.07
16 – 20 years	85	19.54
21 or more years	23	5.29

Table 2: Knowledge on Tuberculosis

Variable	Frequency (n)	Percentage (%)
Which of the following is the causative agent of tuberculosis?		
Virus	38	8.74
Bacteria	303	69.66
Fungus	84	19.31

Parasite	10	2.30
What is the primary mode of transmission of tuberculosis?		
Blood-borne	12	2.76
Airborne	415	95.40
Fecal-oral	8	1.84
Sexual	00	0.00
Which of the following are common symptoms of tuberculosis?		
Persistent cough	55	12.64
Fever	09	2.07
Night sweats	00	0.00
Unintentional weight loss	13	2.99
Chest pain	67	15.40
All of the above	291	66.90
What are the two forms of tuberculosis?		
Active and passive	61	14.02
Latent and active	344	79.08
Bacterial and viral	00	0.00

Primary and secondary	30	6.90
Which of the following groups are at higher risk for tuberculosis infection?		
People with HIV/AIDS	57	13.10
Healthcare workers	27	6.21
Children	18	41.38
Smokers	45	10.34
All of the above	288	66.21
How long does a person with active TB need to be on medication to be considered non-infectious?		
1 week	20	4.60
2 weeks	311	71.49
1 month	73	16.78
2 months	31	7.13
Is Bacillus Calmette-Guérin (BCG) vaccine 100% effective in preventing tuberculosis?		
Yes	169	38.85
No	266	61.15

Table 3: Standard Precautions against Tuberculosis

Variable	Frequency (n)	Percentage (%)
Which of the following are standard precautions that primary health care workers should take when dealing with a suspected or confirmed case of tuberculosis?		
Hand hygiene	0.00	0.00
Wearing personal protective equipment (PPE) such as gloves, masks, and gowns	00	0.00
Isolation of the patient	00	0.00
Safe disposal of contaminated waste	00	0.00
All of the above	435	100.00
What type of mask is recommended for primary health care workers when treating a patient with suspected or confirmed tuberculosis?		
Surgical mask	84	19.31
N95 respirator	319	73.33
Cloth mask	32	7.36
No mask is required	00	0.00
Which of the following actions should be taken when a patient with suspected or confirmed tuberculosis is identified?		
Notify public health authorities	7	1.61
Educate the patient on the importance of medication adherence	10	2.29
Monitor the patient's progress and response to treatment	9	2.07
Implement airborne precautions	11	2.53

All of the above	398	91.49
In your opinion, how effective is your workplace's current tuberculosis prevention and control program?		
Very Effective	26	5.98
Effective	44	10.11
Somehow Effective	101	23.22
Not Effective	264	60.69
Have you received any formal training or education on tuberculosis and standard precautions in the past two years?		
Yes	36	8.27
No	399	91.72
What is the purpose of standard precautions in healthcare settings?		
To prevent the spread of infection	26	5.98
To protect healthcare workers from injury	41	9.43
To ensure patient confidentiality	23	5.29
All of the above	345	79.31
What is the minimum distance recommended for separating patients with suspected or confirmed TB from other patients in a waiting area?		
1 meter (3 feet)	72	16.55
2 meter (6 feet)	69	15.86

3 meter (10 feet)	50	11.04
No specific distance is recommended	240	55.17
Which of the following should be implemented in healthcare settings to reduce the risk of TB transmission?		
Adequate ventilation	46	10.57
UV germicidal irradiation	52	11.95
Negative pressure isolation rooms	29	6.67
Regular screening of healthcare workers for TB	40	9.20
All of the above	268	61.61
Is hand hygiene practice important in preventing the spread of tuberculosis?		
Yes	300	68.97
No	135	31.03
How often should the air in a room housing a patient with TB be exchanged?		
At least 6-12 air exchanges per hour	189	43.45
At least 2-4 air exchanges per hour	123	28.28
At least 1 air exchange per hour	113	25.98
Air exchange is not necessary	10	2.30
In which type of room should a patient with suspected or confirmed TB be placed?		

Negative pressure isolation room	117	26.29
Standard patient room	75	17.24
Room with an open window	20	4.60
Airborne infection isolation room	214	49.20
None of the above	9	2.07
Which of the following actions should be taken when a patient with suspected or confirmed TB is transported within the healthcare facility?		
The patient should wear a surgical mask	91	20.92
Healthcare workers should wear N95 respirators	71	16.32
Transport should be limited to essential medical purposes only	37	8.51
All of the above	236	54.25
No special precautions are necessary	00	0.00

4. DISCUSSION

Tuberculosis (TB) remains a significant public health issue globally, particularly in low-income and middle-income countries like Nigeria [22]. Primary health care workers play a crucial role in controlling the spread of TB, and their knowledge of standard precautions is essential to effectively manage the disease [23,24]. This study aimed to assess the knowledge on standard precaution on tuberculosis among primary health care workers using a questionnaire-based research design.

The findings of this study provide valuable insights into the knowledge of healthcare professionals regarding tuberculosis (TB) and its standard precautions. Demographic analysis of the respondents revealed a diverse range of age groups, professional roles, and years of experience in the healthcare sector. The majority of the respondents were female, married, and nurses. This composition reflects the general demographics of the healthcare workforce, in which nursing is often the most predominant profession and tends to be female-dominated. This is consistent with the findings of Wang *et al*. [25] who reported the prevalence of and risk factors for tuberculosis among healthcare workers in Chinese tuberculosis facilities.

In terms of TB knowledge, most respondents correctly identified bacteria as the causative agent of TB and acknowledged that it is an airborne disease. However, a significant proportion of respondents incorrectly identified fungi, viruses, or parasites as the cause of TB, which highlights potential gaps in healthcare professionals' understanding of the disease. Respondents generally demonstrated a good understanding of the common symptoms of TB, the high-risk populations, and the duration of medication needed for a person with active TB to be considered non-infectious. However, nearly 40% of respondents mistakenly believed that the BCG vaccine is 100% effective in preventing TB, indicating a need for further education on the vaccine's limitations. This corresponds to the study of Aboh [22] who reported the knowledge and practices regarding tuberculosis infection control among nurses in Ibadan, south-west Nigeria.

Regarding standard precautions against TB, all respondents identified key practices such as hand hygiene, wearing PPE, patient isolation, and safe disposal of contaminated waste. This is encouraging, as it suggests a general awareness of the necessary precautions for minimizing the spread of TB. However, some respondents showed uncertainty regarding the type of mask recommended for healthcare workers treating TB patients and the minimum distance for separating TB patients from others in waiting areas. The majority correctly identified the N95 respirator as the recommended mask type, but a notable proportion suggested surgical or cloth masks, which may not provide adequate protection. These results are similar to those of Narhari *et al*. [23] who investigated the risk of infection among primary health workers in the Western Development Region, Nepal: knowledge and compliance.

Most respondents recognized the importance of notifying public health authorities, patient education, and adherence to medication, as well as airborne precautions in managing TB cases. However, the majority also reported that their workplaces' current TB prevention and control programs were not effective, and a high proportion of respondents had not received any formal training or education on TB and standard precautions in the past two years. This highlights an urgent need for targeted training initiatives and the implementation of robust TB prevention and control measures in healthcare settings.

Respondents demonstrated a good understanding of the purpose of standard precautions and the importance of hand hygiene in preventing the spread of TB. However, there was some confusion about the recommended air exchange rates in rooms housing TB patients, the type of room in which TB patients should be placed, and the precautions to be taken during patient transport within healthcare facilities. These findings suggest that while healthcare professionals have a general awareness of TB and its standard precautions, there are still areas of uncertainty and potential misinformation that need to be addressed.

5. CONCLUSION

This study reveals that healthcare professionals possess a baseline understanding of TB and the necessary standard precautions. However, there are notable gaps in knowledge and misconceptions that could impact the effective management and control of TB in healthcare settings. As such, targeted educational interventions and ongoing training should be considered to ensure that healthcare professionals are adequately equipped to handle TB cases and minimize the spread of this infectious disease. Additionally, healthcare facilities should evaluate and improve their existing TB prevention and control programs to ensure maximum efficacy in curbing the spread of TB.

6. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to enhance the knowledge and understanding of tuberculosis and improve the effectiveness of tuberculosis prevention and control programs among healthcare professionals:

a. **Continuous Education and Training**: Healthcare facilities should provide regular and updated training programs for healthcare workers to improve their knowledge and understanding of tuberculosis, its causative agents, symptoms, types, and high-risk populations. Emphasis should be placed on the importance of hand hygiene, personal protective equipment, and

airborne precautions in preventing the spread of tuberculosis.

b. **Strengthening Tuberculosis Prevention and Control Programs**: Healthcare facilities should assess and improve their existing tuberculosis prevention and control programs to ensure they are effective in reducing the risk of transmission. This may include implementing adequate ventilation, UV germicidal irradiation, negative pressure isolation rooms, and regular screening of healthcare workers for TB.

c. **Standard Precautions and Guidelines**: Healthcare facilities should ensure that all staff adheres to standard precautions and guidelines for the management of patients with suspected or confirmed tuberculosis. This includes proper hand hygiene, use of N95 respirators, patient isolation, and safe disposal of contaminated waste.

d. **Education on Mask Usage**: Healthcare workers should be educated on the appropriate types of masks to use when dealing with suspected or confirmed cases of tuberculosis. This includes emphasizing the importance of using N95 respirators instead of surgical or cloth masks.

e. **Patient Isolation and Room Management**: Healthcare facilities should provide clear guidelines on the appropriate type of room for patients with suspected or confirmed tuberculosis, such as airborne infection isolation rooms or negative pressure isolation rooms. Additionally, guidelines should specify the minimum distance recommended for separating TB patients from others in waiting areas.

f. **Precautions during Patient Transport**: Healthcare facilities should establish protocols for transporting patients with suspected or confirmed tuberculosis within the facility. These protocols should include wearing appropriate masks by both the patient and healthcare professional and limiting the transport of the patient to essential medical purposes only.

g. Monitoring and Evaluation: Regular monitoring and evaluation of tuberculosis prevention and control programs should be conducted to identify areas for improvement and ensure their effectiveness in reducing the risk of transmission. This may involve seeking feedback from healthcare workers, conducting regular audits, and tracking key performance indicators.

7. LIMITATIONS OF THE STUDY

i. The study had a relatively small sample size of 435 valid questionnaires. This may affect the generalizability of the results to the larger population of healthcare professionals. Additionally, the majority of the respondents were female (79.08%), and nurses (50.80%), which may also limit the applicability of the results to other demographic groups and professional roles within the healthcare field.

ii. The study relied on self-reported data from the respondents, which may be subject to recall bias or inaccuracies. This may impacts the validity of the results, as participants may have over- or under-reported their knowledge, experience, or opinions related to tuberculosis and standard precautions.

iii. The study employed a cross-sectional design, which limits the ability to establish causal relationships between variables. This design also does not allow for the examination of changes over time in the participants' knowledge, attitudes, or practices.

8. Ethical Approval and Consent

The research was conducted in accordance with ethical principles, including informed consent, confidentiality, and data protection. Participants were informed of the purpose of the research and had the option to withdraw at any time without any consequences.

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