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Application of Health Belief Model; Tuberculosis in Healthcare Workers: Risk Reduction Measures at Asokoro District Hospital (ADH) Abuja FCT Nigeria

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Abstract

Health Care workers (HCWs) in high tuberculosis (TB) burden settings are at increased risk of TB infection due to frequent exposure to TB patients and inconsistent implementation of TB risk reduction measures/TB Infection Prevention and Control (TB-IPC) practices. This study aimed to assess the risk of TB transmission and the practice of TB risk reduction measures among HCWs at Asokoro District Hospital (ADH), Abuja, FCT, Nigeria, utilizing the Health Belief Model (HBM). A quantitative study design was employed, using proportional stratified random sampling and purposive sampling, with data collected through Researcher-administered structured questionnaires via Open Data Kit (ODK) and a structured checklist. Results revealed high level of perceived susceptibility and severity among HCWs, with 87% acknowledging ADH as a high-TB burden health facility and 99% aware of TB's infectious nature. Nevertheless, barriers to practicing TB risk reduction measures were identified and the most notable one is the unavailability of N95 masks (reported by 99% of participants). Though, 94% of HCWs were willing to use alternative protection, albeit suboptimal, such as weak N95 masks. Perceived benefits of TB risk reduction measures practices were high, with 98% recognizing the importance of N95 masks and cross ventilation. Positive influence of cues to action, with 55% of participants receiving training on TB transmission and a strong association was found between training and adherence to TB risk reduction measures practices (B = 0.543, p = 0.000). The findings are mainly systemic inclined with few individualized ones: HCWs knowledge gap about TB mode of transmission, inadequate availability of protective equipment, limited training of HCWs on TB – IPC, lack of isolation unit and poor cross ventilation. Therefore, active interest and involvement of the hospital management in TB – IPC activities is critical to resolves all identified gaps.

Keywords: *Health Care Workers, Tuberculosis, TB Transmission, TB Risk Reduction Measures.*

Introduction

Tuberculosis (TB) is an infectious disease that affects mostly the lungs but other parts of the body could also be affected [1, 2]. It is caused by a type of bacteria known as Mycobacterium tuberculosis (Mtb) and it spreads through the air when infected person cough, sneeze or spit [1, 2]. Considerably, about a quarter of the global population is estimated to have been infected with TB bacteria and about 5–10% of people infected with TB will eventually develop TB disease [1, 3]. Some will be infected but may not become ill with the disease and those ones are described to be having Latent TB infection (LTBI) which is asymptomatic and cannot be transmitted [1, 4]. Worldwide, a total of 1.3 million people

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died from TB in 2022 (including 167, 000 people with HIV) and TB is the second leading infectious killer disease after COVID-19 (above HIV and AIDS) [1, 3]. TB remains a significant public health challenge globally, particularly in resource-limited settings [5].

Nigeria is ranked 6th among the 30 countries with highest TB burden globally and also has the highest TB burden in Africa [6, 7, 8]. Likewise, international TB data declared TB as a burdensome health problem in Nigeria [7, 8]. Additionally, on yearly basis, an estimate of 268,000 Nigerians die from TB, 590,000 new cases occur (of these, about 140,000 are also HIV-positive) [6, 7, 8]. Considerably, TB accounts for over 10% of all deaths and every hour nearly, 15 people die from the disease, despite the availability of TB treatment [6, 7, 8, 9]. Unfortunate, TB cases are under-reported especially in most developing countries in which Nigeria belong and this increased the high risk of transmission [6.8]. Significantly, it is estimated that one missed case can transmit TB to 15 people within a year [6.8]. Asokoro District Hospital (ADH) is one of the District Hospital in Abuja Federal Capital Territory in Nigeria – Africa. ADH has a Directly Observed Treatment Short-course Clinic where TB patients are referred to for diagnosis and treatment daily. In the past three years (2021 – 2023) as revealed by the hospital statistics, 361 individuals have been diagnosed and treated for TB [10]. Significantly, this high number of diagnosed TB patients made ADH to be rated as a TB high burden health care facility among others within the city [10]. Hence, this informed the Author of the need to assess the risk of TB transmission and TB risk reduction measures practice among all HCWs in the facility.

Significantly, World Health Organization (WHO) declared TB to be preventable if TB risk reduction measures/TB – Infection Prevention and Control (TB – IPC) is properly applied in any congregate setting [1, 11, 12]. TB risk reduction measures is a combination of actions planned to reduce the risk of TB transmission within populations [14.13]. Remarkably, most existing studies focused on policy compliance, infection prevention measures, and general TB control strategies [15]. However, there is a prominent gap in addressing the behavioral factors that influence HCWs' adherence to TB risk reduction measures in most health care settings [15]. By implication, Behavioral Health Theory Concepts (BHTC), such as the Health Belief Model, have been underutilized in this context. The HBM suggests that a person's health behavior is influenced by perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy [16].

Literature Review

Tuberculosis and Health Care Workers (HCWs)

TB remains one of the most serious infectious diseases worldwide and HCWs are at an increased risk of the disease/infection due to job-related exposure [18,19]. Unfortunately, HCWs are three times more likely to contract TB compared to the general population especially in TB high-burden country like Nigeria [15]. Studies have consistently shown that with effective practice of TB risk reduction measures, the risk of TB transmission should be controlled effectively [18]. However, poor adherence to TB – IPC, continues to elevate HCWs' vulnerability to TB disease/infection [20]. Significantly, in health care facility such as ADH Abuja, TB risk of transmission has been a major concern to the Author due to the enormous numbers of positive TB cases seen daily: In the past three years (2021 – 2023) as revealed by the hospital statistics, 361 individuals have been diagnosed and treated for TB, insufficient infrastructure and inconsistent implementation of TB risk reduction measures [10]. Hence, this calls for further investigation. Remarkably, the risk of TB transmission in health care facilities not only affect HCWs but also have the potential to spread within the

broader community, affecting family members, other patients, and visitors [21].

The Health Belief Model (HBM) in Tuberculosis Control

The Health Belief Model (HBM) is one of the most widely used theoretical frameworks in public health to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals [16, 22]. The HBM suggests that individuals' decisions regarding health behaviors are influenced by six key factors: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy [16, 22]. In the context of TB transmission risk and the practice of TB risk reduction measures, the HBM has been employed to understand the likely factors that could be responsible in influencing the practice of TB risk reduction measures among the HCWs in a health care facility like ADH. Therefore, this study will demonstrate the critical need for behavioral interventions in TB risk reduction measures by addressing systemic barriers, enhancing HCWs' confidence and motivation that will aid or improve compliance. By implication, this study will fill critical gap in the literature. The results will contribute to the development of more effective, behaviorally informed TB risk reduction measures in health care settings like ADH. HBM six constructs that will be used in the assessment include:

1. **Perceived Susceptibility**: This refers to HCWs' having understanding that they are at an increased risk of been infected with TB in their workplace since it is a high TB burden area. Hence, this understanding is expected to influence strong adherence to the practice of TB risk reduction measures by any HCWs who work in such setting [16, 22].
2. **Perceived Severity**: Generally HCWs know the seriousness of having TB disease/infection with due consideration given to both medical and social consequences that accompany it. Therefore, it is expected that this knowledge should influence HCWs compliance to the practice of TB risk reduction measures in an environment with high TB risk of transmission [16, 22].
3. Perceived Benefits: The perception of beneficial protective measures against the risk of TB transmission among HCWs within the facility should serve as sources of motivation to engage in the practice of TB risk reduction measures. Examples of those perceived benefits of TB risk reduction measures are: knowing that ensuring cross ventilation, usage of N95 mask in TB highly risky area and performance of prompt triage in the out - patient clinic would reduce TB transmission should encourage HCWs to put these strategies into daily practice [16, 22].
4. **Perceived Barriers**: Identifying hindrances to performing recommended TB risk reduction measures such as lack of N95 mask, inadequate training of HCWs on TB – IPC, poor administrative support and many more can significantly inhibit HCWs' adherence to the practice of TB risk reduction measures [16, 22].
5. **Cues to Action**: Understanding of external triggers by HCWs that support the practice of TB – IPC Measures is equally important in achieving full practicing of TB risk reduction measures. External triggers like: positive institutional policies, having TB - IPC team in the facility and daily monitoring of all TB – IPC activities by the team members. Hence, once all these triggers are functioning effectively it is expected that they would serve as means of motivations and evaluation which should bring in sustainability and effective practice of TB risk reduction measures by the HCWs [16, 22].
6. **Self-Efficacy**: This refers to HCWs' having full confidence in their capacity to

successfully practice TB risk reduction measures effectively. Assurance of having sufficient and expected capacities by HCWs should serve as a strong encouraging factor of adherence to the recommended practice of TB risk reduction measures in a health care facility. Significantly, the assurance is built up via intentional HCWs capacity building activities: HCWs training on TB risk reduction measures, N95 fit training test and many more [16, 22].

Gaps in the Literature

Globally, numerous studies have utilized TB transmission risk and it prevention using the HBM among HCWs in several health care facilities. Regrettably, there is limited focus on its application to TB prevention among HCWs in Nigeria. In addition, while studies have examined the barriers to TB prevention in resource-limited settings, there is need for more research on how behavioral models, such as the HBM, can be tailored to specific health care institutions like ADH. Considerably, rigorous databased searches revealed that no similar study has been carried out among HCWs in ADH. Therefore, the Author of this study affirmed that this is a novel research which aimed at using HBM and it six constructs to assess the risk of TB transmission and the practice of TB risk reduction measures among HCWs in ADH. Hence, this study will bridged the critical gap that has been discovered in the literature. Ultimately, this study will ascertain the critical need for behavioral interventions in the practice of TB risk reduction measures. Also, the study will become useful in discovering how behavioral models, such as the HBM, can be tailored to specific health care institutions like ADH in the practice of TB risk reduction measures. Equally, it will contribute to the development of more effective, behaviorally informed TB preventive strategies in health care settings. Furthermore, it will determine systemic barriers and enhancing factors that could influence or motivate HCWs' confidence to embrace the practice of TB risk reduction measures. In addition, the study will motivate ADH management to provide maximum support to the practice of TB risk reduction measures within the health care facility. Likewise, the study will become relevant to the society and scientific world because the discoveries will be properly disseminated. In due course, HCWs in ADH Abuja will become extremely focused in ensuring full implementation of TB risk reduction measures. At global level, this move will contribute to the comprehensive End TB targets which aim at reducing TB mortality by 95% and incidence by 90 % in 2035 [17].

Problem Statement

Tragically, TB is very transmissible in resource-limited health care facilities [12, 22]. Therefore, most HCWs are at increased risk of acquiring TB in such settings if TB risk reduction measures are not fully adhered to [12, 23]. Asokoro District Hospital (ADH) is where this study was conducted and it is one of the district health care facilities in Abuja, within the Federal Capital Territory (FCT) of Nigeria in West Africa. In ADH, Numerous individuals are diagnosed and treated for TB on daily basis. Significantly, between 2021 and 2021, 361 individuals have been diagnosed and treated for TB in the health care facility [10]. As a result, it has been declared as a high TB burden area within the city of Abuja FCT in Nigeria – West Africa.

Similarly, it has become a high-risk health care facility to all HCWs and patients. This increased risk TB transmission within the health care facility is heightened by the daily high patient caseloads, insufficient infrastructure and often inconsistent implementation of TB risk reduction measures which has been observed by the Author. By implication, HCWs in ADH are particularly vulnerable to the risk of TB transmission which could be attributed to occupational exposure.

Equally, there is potential TB transmission risk extending beyond hospital environment to HCWs' families and the entire communities. Considerably, the risk of TB transmission in this setting is not only a threat to HCWs but also to other patients, especially immunocompromised individuals such as those living with Human Immunodeficiency Virus (HIV). Hence, this informed the choice of using HBM to understand the likely factors that could be responsible in influencing the practice of TB risk reduction measures among the HCWs within the health care facility.

Broad Objective: The aim of the study is to assess the risk of TB Transmission and the practice of TB risk reduction measures using Health Belief Model (HBM) among HCWs in ADH Abuja FCT Nigeria.

Research Objectives

1. To determine the socio-demographic characteristics of Health Care Workers in ADH Abuja Nigeria
2. To appraise the level of perceived threats (susceptibility and severity) of TB transmission risk among HCWs in ADH
3. To identify perceived barriers against the practice of TB risk reduction measures among HCWs in ADH
4. To discover the level of perceived benefits of TB risk reduction measures among HCWs in ADH
5. To assess the relationship between cues to action and self – efficacy of HCWs in ADH with the practice of TB risk reduction measures

Research Questions

1. What are the socio-demographic characteristics of Health Care Workers in ADH Abuja Nigeria?
2. What is the level of perceived threats (susceptibility and severity) of TB transmission risk among HCWs in ADH?
3. What are the perceived barriers against the practice of TB risk reduction measures among HCWs in ADH?
4. What is the level of perceived benefits of TB risk reduction measures among HCWs in ADH?
5. Is there a relationship between cues to action and self – efficacy of HCWs in ADH with the practice of TB risk reduction measures?

Significance of the Study

In health sector, research plays essential role in discovering new facts that are relevant to generate evidence based interventions which become useful to tackle several health challenges. Moreover, TB is a global public health issue that requires up-to-date evidence based facts generated through research to tackle it. Therefore, this study's findings will become relevant to several health care facilities in FCT Abuja, within the country where the study is conducted and even at international level. The Author will ensure appropriate dissemination of the study's finding to yield positive outcomes such as: active involvement of all ADH management members in TB – IPC activities within the health care facility, increase awareness and encourage full implementation of appropriate TB risk reduction measures among HCWs in ADH, renew commitment of TB- IPC stakeholders in ADH to prioritize screening of all HCWs prior to starting job and ensure periodic one for those working in TB high risk areas, discover all the barriers (individualized and systemic) against full implementation of TB risk reduction measures and provide means to gradually tackled each one, reduce the risk of developing TB disease/infection among HCWs in ADH, patients, family members, or visitors and particularly to PLHIV, attract the support and involvement of some non – governmental bodies that are interested in TP - IPC activities, generate several findings that will become very useful to formulate or improve already existing

health policies, strategies and interventions regarding TB – IPC in ADH and beyond and ultimately, contribute to the national and international goal of eradicating TB within the country and globally by 2030 and 2035 respectively.

Hypothesis

Null hypothesis (HO): There is no relationship between cues to action and self – efficacy of ADH HCWs with the practice of TB risk reduction measures

Alternate Hypothesis (HA): There is relationship between cues to action and self – efficacy of ADH HCWs with the practice of TB risk reduction measures

Materials and Methods

Study Design

Quantitative cross-sectional descriptive design was used in conjunction with Health Belief Model (HMB) Model Six Constructs to determine the level of perceived threats (susceptibility and severity), perceived barriers, perceived benefits, self - efficacy and cues to actions regarding the risk of TB transmission and the practice of TB risk preventive measures (TB - Infection Prevention and Control) among Health Care Workers (HCWs) in Asokoro District Hospital (ADH).

Furthermore, participant observational study was use to observe the practice of TB risk reduction measures among HCWs in selected out patients units within ADH. This is a research method that creates room for researcher to be involved in a particular setting or group with the sole aim of gathering information through observation of their practices [24]. The researcher has option to adopt the weakest (non-participatory) or strongest (most intensive) level of participation [24]. In this study, the weakest level of participatory (non-participatory) was used in order to reduce bias and at the same time an in-depth understanding into the practice of TB risk reduction measures was observed from insiders' perspective. Furthermore, Participant observation Study is a valuable method in a situation where unique practices and self - report of a practice may not generate desired information [24]. All these benefits mentioned above informed the Authors' decision to use the method because it created opportunity for a more detailed natural observation of TB risk reduction measure practices within the health care facility. Ultimately, this increase the validity of the study's' findings.

Study Site

Asokoro District Hospital (ADH) is the study area with bed capacity of 143 and the Hospital has since been providing comprehensive health care services in both clinical, training and research to FCT population and her environs (Health and Human Services Secretariat [25]. ADH is located at 31, Julius Nyerere crescent in Asokoro District of Abuja Federal Capital Territory (FCT). It is one of the 14 hospitals managed by the Hospitals Management Board (HMB) of the HHSS of the Federal Capital Territory Administration [25]. The Hospital was commissioned on the 3rd of December 2001 by the then President of the Federal Republic of Nigeria, Chief Olusegun Obasanjo [25]. ADH has a bed capacity of 143 and has been providing comprehensive health care services in clinical areas, training and research to FCT population and her environs [25]. Administratively the principal officers include: the Medical Director (MD), head of Clinical Services, the Hospital Secretary and heads of units: administrative and technical heads in units [25]. ADH has twenty four units and thirteen out patients departments [25].

Description of the Thirteen Outpatient Units

The participant observation study utilised Thirteen outpatient units (13) where diverse patients converge daily before being allocated to see Doctor and these include: Accident and Emergency, General Outpatient Department,

Medical Outpatient Department, Surgical Outpatient Department, Paediatric Outpatient Department, Ante Natal Clinic, Immunisation clinic, DOTS Clinic (Public Health), Social Work waiting bay, Physiotherapy waiting bay, Radiology waiting bay, Pharmacy waiting bay and Nutrition waiting bay. Moreover, a focal person from each unit was available during the observation for clarification concerning some situation and issues.

Population and Sample

The study population included all the HCWs in Asokoro District Hospital Abuja.

Sampling area 1: all HCWs in ADH who have one-on-one contact with patient on daily basis and have worked for minimum of 6 months in the health care facility were included.

Sampling area 2: all outpatient clinics were observed using participant observation.

Inclusion Criteria

1. All Healthcare workers who have had one –on-one contact with patient mostly on daily basis
2. All those that have worked for 6 months and above in the Health Care Facility
3. All HCWs that give consent
4. A representative of each outpatient unit that give consent
5. All outpatient clinic where more than one patients congregate daily

Exclusion Criteria

1. All healthcare workers that have no one-on-one contacts with patient
2. All those who has not worked up to 6 months in the Health Care Facility
3. All HCWs that do not to give consent
4. A representative of each outpatient unit that do not give consent
5. All outpatients clinic where only one patient stay on daily

Sample Size Determination

The populations' characteristics are diverse, therefore proportional stratified random sampling was used to ensure good representation of every characteristics [26]. At the end, the sample size of each stratum is proportionate to the population size of the stratum [26]. This sample side determination process prevents research bias (under coverage bias). Likewise, generalization and validity of the study is definite [26].

Stratified Sampling Formula = Total Sample Size / Entire Population * Population of Subgroups [27].

Sampling Technique for questionnaire (Stage 1)

A stratified multistage sampling technique (probability sample) was used to select the participant's for the quantitative design through the use of researcher – administered questionnaire (Table 1).

Table 1. List of All Units of HCWs in ADH

S/N	Units	Population Size	Meet Inclusion Criteria
1	Medical Doctors	110	Yes
2	Radiology	4	Yes
3	Physiotherapy	3	Yes
4	Optometry	5	Yes
5	Nursing	157	Yes
6	Pharmacy	32	Yes

7	Medical Laboratory	36	Yes
8	Health records	14	Yes
9	Hospital Health Assistant	47	Yes
10	Nutrition	4	Yes
11	Maintenance	9	No
12	Scientific Officers	2	No
13	Finance & Accounts	20	No
14	Auditors	2	No
15	Administrative	18	No
16	ICT	7	No
17	Prosthesis orthosis	1	Yes
18	Orthopedic plaster Technician	1	Yes
19	Institute of Human Virology of Nigeria (IHVN)	13	Yes
20	DOTS Clinic	5	Yes
21	Immunization & Family Planning	10	Yes
22	Social Work	3	Yes
23	NHIS	9	Yes
24	SERVICOM	2	No
	TOTAL	514	

Stage 2

The selection of HCWs that were used for the study was made using stratified sampling. The basis of the choice of sampling was informed by the already stated inclusion and exclusion criteria.

Stratified Sampling Formula: **Total Sample Size / Entire Population * Population of Subgroups** [27]:

Total sample size: This entails all the HCWs population in ADH= 454

Entire Population: This entails the target population based on the study inclusion and exclusion criteria =514

Population of subgroups: This entails the population of different group of participants in all the selected work units for the study e.g. Doctors are: 110; Nurses are: 157; Pharmacists are: 32 etc.

Example 454/514*110 (Doctors) = 97.1595 which is: 97 approximately (Number of Doctors to be used for the study Table 2.

Table 2. List of all Units of HCWs in ADH (Stratified Sample)

S/N	Units (strata)	Population size	Stratified sample size
1	Medical Doctors	110	97
2	Medical Laboratory	36	33
3	NHIS	9	8
4	Nursing	157	142
5	Radiology	4	4
6	Physiotherapy	3	3
7	Optometry	5	5
8	Pharmacy	32	29
9	Health records	14	13
10	Hospital Health Assistant	47	43
11	Nutrition	4	4
12	Prosthesis orthosis	1	1
13	Orthopedic plaster Technician	1	1
14	Institute of Human Virology of Nigeria (IHVN)	13	12
15	DOTS Clinic	5	4
16	Immunization & Family Planning	10	9
17	Social work	3	3
	TOTAL	454	412

Sampling Technique for observation method

Purposive sampling was used for the participant observational study which is the second part of quantitative study. Purposive sampling is one of the non – probability sample techniques where the target population is selected because such population will provide accurate information needed to achieve the study's objectives [28]. This sampling technique is commonly used in mixed methods research where rich information is required. Hence, to ensure rich and accurate information required for this study, the choice of purposive sampling was made by the Author based on the study's inclusion and exclusion criteria. Hence, thirteen (13) selected out patients units were used for the participant observational study. Below is the list of all the outpatient units that were observed using structured checklist during participant observational study.

1. Accident and Emergency
2. General Out Patient
3. Medical Out Patient
4. Surgical Out Patient
5. Pediatric Out patient
6. Ante Natal Clinic
7. Immunization clinic
8. DOTS Clinic (Public Health)
9. Radiology waiting bay
10. Pharmacy waiting bay
11. Social Work waiting bay
12. Physiotherapy waiting bay
13. Nutritionist waiting bay

Instruments for Data collection

researcher-administered structured questionnaire via open data kit (odk) and structured checklist (participant observation study) were used for the data collection

validity and reliability of Instruments

To ensure the content validity, the questionnaire and the structured checklist, their contents were reviewed with prior validated questionnaires and structured checklist of several similar validated studies. Likewise, the two data collection instruments were thoroughly reviewed by Six (6) senior public health experts including my well experienced supervisor using Lawshe's model [29]. Subsequently, a number of modifications were done based on expert's suggestions and modifications to endorse their suitability for this particular study. Furthermore, a pilot study was conducted on twenty – five (25) respondents out of 416 respondents. Consequently, all the respondents that participated in the pilot study were excluded from the main study. To guarantee an effective and efficient data collection process, three (3) research assistants were recruited and trained for two days on the objectives, methodology of the study and how to administer the questionnaire and the structured checklist appropriately. Anonymity were strictly adhered to during all the data collection processes which ultimately reassured the respondents that their status will be unidentified. Subsequently, this resulted into the respondents becoming very free while responding genuinely to all the questions.

Data Collection

The three trained research assistants collected the data using Open Data Kit (ODK) for over a period of three months (April to June 2023). Researcher - administered questionnaire was used to the stratified HCWs from different professions. The questionnaire sought to measure Socio – demographic and other general/work characteristics: gender, age, religion, marital status, educational level, job location, current profession and duration of employment.

Other measures that were taken include: HCWs perceived threats (susceptibility and perceived severity), perceived barriers, perceived benefits, self - efficacy and cues to actions regarding risk of TB transmission and the practice of TB risk reduction measures.

Similarly, structured checklist was used on the spot to assess the implementation and

practice of TB risk reduction measures in the thirteen (13) outpatients units.

Data Analysis

Data editing and validation was done on daily basis as soon as the already-filled questionnaires and structured checklists were submitted via ODK. All issues /problems detected were corrected instantly. Two separate files were created in the computer system to ensure double entries of data for safety and backup. The analysis of the questionnaire data was conducted using descriptive statistics, regression analysis, and correlation analysis. Descriptive statistics were employed to summarize the data and provide frequency distributions and percentage responses from healthcare workers (HCWs) regarding TB transmission risks, perceived barriers, and perceived benefits of TB risk reduction measures. The means and standard deviations were calculated to show the central tendencies and variations in participants' responses.

Regression analysis was conducted using SPSS version 24 to model the relationship between the dependent variable (practice of TB risk reduction measures) and independent variables (perceived threats, benefits, and barriers). The R^2 value was used to determine the proportion of variance in TB risk reduction practices explained by the predictors, and the significance of these predictors was evaluated using beta coefficients (β) and p-values.

Correlation analysis was performed to assess the relationships between perceived threats, barriers, and benefits. Pearson correlation coefficients were calculated to quantify the strength and direction of these relationships, with significance levels (p-values) indicating the reliability of the associations. The structured checklists was analyzed descriptively.

Ethical Issue

Ethical approval was obtained from the Medical Ethic Committee Asokoro District Hospital Abuja FCT Nigeria. Likewise, informed consent was obtained from each participant and the head of each outpatient unit before the commencement of data collection.

Results

The aim of the study is to assess the risk of TB Transmission and the practice of TB risk reduction measures using Health Belief Model (HBM) among HCWs in ADH Abuja FCT Nigeria. This is a quantitative study; researcher – administered questionnaire and structured checklist were used for data collection. HBM and it six constructs were utilised in this study to determine the risk of TB Transmission and the practice of TB risk reduction measures among HCWs in ADH Abuja FCT Nigeria.

Quantitative study results using researcher- administered questionnaire

Socio – demographic characteristics of study population

A total of 391 HCWs participated in the study which give a response rate of 100% (55% females and 45% males) as participants. 17.4% were below age 30, 34.8% were between 31 and 40 years, 32.5% were between 41 – 50 years and 15.3% were between 51 and 60 years. Majority of the participants are Christians (83.9%) with 70.8% married among them. Above half (62.7%) of the study participants have 1st degree, while 16.9% have 2nd degree and above, 9.0% are with diploma and 11.5% possess secondary school education and below. Majority of participants (42.2%) work in diverse units which is classified as others and 21.7% work in the wards, 11.3% work at Out Patients Department, 8.4% work in Laboratory, 7.7% work in Pharmacy and participants who work in Health Records are just 3.3%. In terms of profession, 33% of the participants are Nurses, Doctors are 21.7%, Laboratory Scientists are 8.4%, Pharmacists are 7.9%, Health Record Officers are 5.4% others are 19.2%. Bulk of participants (43.7%) fall within 4 – 9 years duration of employment, 33% of

participants have spent 10 years and above and 23.3% participants are within 1 – 4 years duration of employment. Table 3.

Table 3. Frequency Distribution of the Socio-Demographic Characteristics of Study Population (N=391)

Variables	Categories	Frequency	Percentage
Gender	Female	215	55%
	Male	176	45%
Age (years)	< 30 years	68	17.4%
	31 - 40 years	136	34.8%
	41 - 50 years	127	32.5%
	51 - 60 years	60	15.3%
Religion	Christianity	328	83.9%
	Islam	62	15.9%
	Others	1	0.3%
Marital status	Married	277	70.8%
	Single	107	27.4%
	Widowed	5	1.3%
	Divorced	1	0.3%
	Others	1	0.3%
Educational level	1st degree	245	62.7%
	2nd degree and above	66	16.9%
	Secondary level and below	45	11.5%
	Diploma	35	9.0%
Job location	Others	165	42.2%
	Ward	85	21.7%
	OPD	44	11.3%
	Laboratory	33	8.4%
	Pharmacy	30	7.7%
	Health record	13	3.3%
	NHIS	9	2.3%
	Radiology	4	1.0%
	DOTS clinic	4	1.0%
	Physiotherapy	4	1.0%
Participant's profession	Nurse	129	33%
	Doctor	85	21.7%
	Others	75	19.2%
	Laboratory Scientist	33	8.4%
	Pharmacist	31	7.9%
	Health Record Officer	21	5.4%
	Community Extension workers	5	1.3%
	Nutritionist/Dietitian	4	1.0%
	Radiologist	4	1.0%

	Physiotherapist	3	0.8%
	Health Record Officer	1	0.3%
Duration of employment (years)	4 – 9 years	171	43.7%
	10 years and above	129	33.0%
	1 - 4 years	91	23.3%

To Appraise the Level of Perceived Threats (susceptibility and severity) of TB Transmission Risk among HCWs in ADH

Frequency Distribution

Majority of participants (87%) are aware that ADH is a TB high burden Health Care Facility whereas just few (13%) showed lack of awareness of that fact. Almost all participants (99%) know that TB is highly infectious, similarly, most participants agreed to the fact that an individual with TB infection can develop TB disease several years later. A greater percentage (83%, 82% & 95%) of the participants also know that TB can spread from infected patient through: laughing, singing and talking. Furthermore, most participants (are also aware that TB bacteria can survive in the air for more than 6 hours, TB bacteria can survive for 6 months on surfaces and in humid, dusty and dark environments. 75% participants equally know that having had BCG is not an absolute guaranty that one cannot develop TB later in life. Table 4

Table 4. Frequency Distribution for Level of Perceived Threats (susceptibility and severity) of TB Transmission Risk among HCWs in ADH

Variables	**True (%)**	**False (%)**
Knowledge that ADH is a TB high burden area	339 (86.7%)	52 (13.3%)
TB is often spread from person to person through sex	161 (41.2%)	230 (58.8%)
TB is often spread from person to person through the air	389 (99.5%)	2 (0.5%)
TB is often spread from person to person through blood	346 (88.5%)	45 (11.5%)
Only people with active TB disease in the lungs or throat are infectious	346 (88.5%)	45 (11.5%)
People can be infected with TB and have TB infection	387 (99.0%)	4 (1.0%)
People with TB infection can develop TB disease some years later	380 (97.2%)	11 (2.8%)

Patients with active TB disease can infect people by laughing	323 (82.6%)	68 (17.4%)
Patient with active TB disease can infect people by singing	319 (81.6%)	72 (18.4%)
Patients with active TB disease can infect people by sharing same plate	206 (52.7%)	185 (47.3%)
Patients with active TB disease can infect people by sharing bed linens	278 (71.1%)	113 (28.9%)
Patients with active TB disease can infect people by talking	372 (95.1%)	19 (4.9%)
TB bacteria can survive for up to 6 hours in the air	343 (87.7%)	48 (12.3%)
TB bacteria can survive on surfaces for up to 6 months if it is protected from direct sunlight	319 (81.6%)	72 (18.4%)
TB Bacteria can survive in dusty, humid and dark environment for up to 6 months	261 (66.8%)	130 (33.2%)
Baccile Calmette – Guerin (BCG) Vaccination does not completely protect people from having TB	294 (75.2%)	97 (24.8%)
Usage of Household Bleach (Sodium Hypochlorite) as disinfectant to clean surfaces destroys TB bacteria	366 (93.6%)	25(6.4%)

Descriptive Statistics

The descriptive statistics findings indicated that most participants are aware of key aspects of TB transmission risks. The mean score for awareness that ADH is a TB high burden area is 1.1330 (SD = 0.34000), which is an indication of high level TB transmission perception. Participants strongly agreed that TB spreads through the air (mean = 1.0051, SD = 0.07143), while there is less agreement about TB spreading through sexual contact (mean = 1.5882, SD = 0.49278) or blood (mean = 1.8389, SD = 0.36812). Participants also recognized that TB can be transmitted by actions such as laughing (mean = 1.1739, SD = 0.37952), singing (mean = 1.1841, SD = 0.38810), and talking (mean = 1.0486, SD = 0.21529). Also, participants showed strong knowledge of the survival of TB bacteria in the air for up to six hours (mean = 1.1228, SD = 0.32858) and on surfaces for six months (mean = 1.1841, SD = 0.38810). There is broad understanding that BCG vaccination does not fully protect against TB (mean = 1.2481, SD = 0.43245), and that bleach can effectively

destroy TB bacteria (mean = 1.0639, SD = 0.24496). Table 5

In summary the study revealed high level of perceived threats (susceptibility and severity) of TB transmission risk among HCWs in ADH with the mean score of 1.1330 (SD = 0.34000)

Table 5. Descriptive Statistics for Level of Perceived Threats (susceptibility and severity) of TB Transmission Risk among HCWs in ADH

Variables	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Do you know that ADH is a TB high burden area?	391	1.00	2.00	1.1330	.34000
TB is often spread from person to person through sex?	391	1.00	2.00	1.5882	.49278
TB is often spread from person to person through the air	391	1.00	2.00	1.0051	.07143
TB is often spread from person to person through blood	391	1.00	2.00	1.8389	.36812
Only people with active TB disease in the lungs or throat are infectious	391	1.00	2.00	1.1151	.31954
People can be infected with TB and have TB infection	391	1.00	2.00	1.0102	.10075
People with TB infection can develop TB disease some years later	391	1.00	2.00	1.0281	.16556
Patients with active TB disease can infect people by laughing	391	1.00	2.00	1.1739	.37952
Patient with active TB disease can infect people by singing	391	1.00	2.00	1.1841	.38810
Patients with active TB disease can infect people by sharing same plate	391	1.00	2.00	1.4731	.49992
Patients with active TB disease can infect people by sharing bed linens	391	1.00	2.00	1.2890	.45388
Patients with active TB disease can infect people by talking	391	1.00	2.00	1.0486	.21529
TB bacteria can survive for up to 6 hours in the air	391	1.00	2.00	1.1228	.32858

TB bacteria can survive on surfaces for up to 6 months if it is protected from direct sunlight	391	1.00	2.00	1.1841	.38810
TB Bacteria can survive in dusty, humid and dark environment for up to 6 months	391	1.00	2.00	1.3325	.47171
Baccile Calmette – Guerin (BCG) Vaccination does not completely protect people from having TB	391	1.00	2.00	1.2481	.43245
Usage of Household Bleach (Sodium Hypochlorite) as disinfectant to clean surfaces destroys TB bacteria	391	1.00	2.00	1.0639	.24496
Valid N (listwise)	391				

To Identify Perceived Barriers Against the Practice of TB Risk Reduction Measures among HCWs in ADH

Frequency Distribution

83% of participants believed that the usage of surgical masks by HCWs could prevent TB bacteria from being breath in. 94% participants agreed that a weak N95 mask/FFP2 can be used if there is no new one available. Significantly, majority of participants (99%) agreed that unavailability of N95 masks for usage by the HCWs is a major barrier towards the practice of TB risk1 reduction measures. Table 6.

Table 6. Frequency Distribution for Perceived Barriers against the Practice of TB Risk Reduction Measures among HCWs in ADH

Variables	**Yes (%)**	**No (%)**
Usage of surgical masks by HCWs prevent TB bacteria from being breathed in	325 (83.1%)	66 (16.9%)
A weak N95 mask/FFP2 can still be used in the absence of none	270 (93.6%)	121 (30.9%)
Lack of N95 masks for healthcare workers in high-risk areas exposes them to higher risk of developing TB infection/disease	386 (98.7%)	5(1.3%)

Descriptive statistics

The descriptive statistics results indicated that most participants agree that using surgical masks by healthcare workers can help prevent the inhalation of TB bacteria, with a mean score of 1.1688 and a standard deviation of 0.37505. Regarding the use of weak N95 masks or FFP2 in the absence of better alternatives, participants displayed moderate agreement, with a mean score of 1.3095 and a standard deviation of 0.46286. There is a strong consensus among participants that a lack of N95 masks for healthcare workers in high-risk areas exposes them to a higher risk of developing TB infection or disease, as indicated by a mean score of 1.0128 and a low standard deviation of 0.11250. Table 7.

The findings discovered that insufficient supply of N95 masks could increase risk of TB transmission (mean score of 1.0128 and a low standard deviation of 0.11250). Also, demonstration of extremely low understanding of the content of TB risk reduction measures was displayed by having most participants believing that surgical mask or weak N95 mask can prevent TB transmission with mean score of 1.1688 and SD of 0.37505 and mean score of 1.3095 and SD of 0.46286 respectively.

Table 7. Descriptive Statistics for Perceived Barriers against the Practice of TB risk Reduction Measures among HCWs in ADH

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Usage of surgical masks by HCWs prevent TB bacteria from being breathed in	391	1.00	2.00	1.1688	.37505
A weak N95 mask/FFP2 can still be used in the absence of none	391	1.00	2.00	1.3095	.46286
Lack of N95 masks for healthcare workers in high-risk areas exposes them to higher risk of developing TB infection/disease	391	1.00	2.00	1.0128	.11250
Valid N (listwise)	391				

To discover the level of perceived benefits of TB risk reduction measures among HCWs in ADH

Frequency Distribution

98% participants stated that the usage of N95 mask is a great TB risk reduction measures among HCWs and 89% agreed that the usage of surgical masks by TB patients will greatly help to prevent the spread of TB. Most participants (98%) also stated that keeping windows and doors open will surely prevent the spread of TB within the Health Care Facility. Table 8.

Table 8. Frequency Distribution for Level of Perceived Benefits of TB Risk Reduction Measures among HCWs in ADH

Variables	Yes (%)	No (%)
Usage of N95 masks/ Filtering Face Piece (FFP2) by HCWs prevent TB bacteria from being breathed in	384 (98.2%)	7 (1.8%)

Usage of surgical mask by TB patient prevent from expelling TB bacteria into the air	349 (89.3%)	42 (10.7%)
Keeping doors and windows open helps to reduce the spread of TB bacteria	384 (98.2%)	7 (1.8%)

Descriptive statistics

The findings showed that almost all participants agreed that using N95 masks or Filtering Face Pieces (FFP2) by healthcare workers can prevent TB bacteria from being inhaled, with a mean score of 1.0179 and a standard deviation of 0.13277. Similarly, most participants approved that the usage of surgical masks by TB patients helps prevent the expulsion of TB bacteria into the air, with a mean score of 1.1074 and a standard deviation of 0.31004. There is also strong consensus that keeping doors and windows open reduces the spread of TB bacteria, as reflected by a mean score of 1.0179 and a standard deviation of 0.13277. Table 9

The study emphasised high level of perceived benefits of TB risk reduction measures and practices among ADH HCWs were revealed. Usage of N95 masks by HCWs: mean score of 1.0179 and SD 0.13277, usage of surgical masks by TB patients: mean score of 1.1074 and SD of 0.31004 and strong consensus of keeping doors and windows open: mean score of 1.0179 and SD of 0.13277.

Table 9. Descriptive Statistics for Level of Perceived Benefits of TB Risk Reduction Measures among HCWs in ADH

Variables	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Usage of N95 masks/ Filtering Face Piece (FFP2) by HCWs prevent TB bacteria from being breathed in	391	1.00	2.00	1.0179	.13277
Usage of surgical mask by TB patient prevent from expelling TB bacteria into the air	391	1.00	2.00	1.1074	.31004
Keeping doors and windows open helps to reduce the spread of TB bacteria	391	1.00	2.00	1.0179	.13277
Valid N (listwise)	391				

To Assess the Relationship between Cues to Action and Self – Efficacy of HCWs with TB Risk Reduction Measures Practices

Frequency Distribution

All participants (100%) agreed with the statement that the spread of TB should be prevented in any Health Care Facility and there should be official TB infection control policy. Nevertheless, only 55% and 47% participants have received training on TB transmission and TB transmission risk reduction measures respectively. Table 10

Table 10. Frequency Distribution for Relationship between Cues to Action and Self – Efficacy of HCWs in ADH with the Practice of tb Risk Reduction Measures

Variables	**Yes (%)**	**No (%)**
It is very important to prevent the spread of TB in any Healthcare Facility	390 (99.7%)	1 (0.3%)
It is important for every Healthcare Facility to have an official TB infection control policy	391 (100%)	0 (0%)
Have you received training on TB Transmission	214 (54.7%)	117 (45.3%)
Have you received training on TB Transmission Risk Reduction Measures (TB Infection Prevention and Control) i.e IPC on TB	185 (47.3%)	206 (52.7%)

Descriptive Statistics

According to the result, the importance of preventing the spread of TB in healthcare facilities is universally acknowledged, with all participants (mean = 1.0000, SD = 0.00000) agreeing that it is very important to prevent the spread of TB in any healthcare facility. Additionally, almost all participants (mean = 1.0026, SD = 0.05057) believe it is important for every healthcare facility to have an official TB infection control policy. Regarding training, a significant portion of participants (mean = 1.4527, SD = 0.49839) have received training on TB transmission, though not all. Similarly, slightly more participants (mean = 1.5269, SD = 0.49992) have received training specifically on TB transmission risk reduction measures or infection prevention and control (IPC) related to TB. Table 11

Table 11. Descriptive Statistics for Relationship between Cues to Action and Self – Efficacy of HCWs in ADH with the Practice of TB Risk Reduction Measures

Variables	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
It is very important to prevent the spread of TB in any Healthcare Facility	391	1.00	1.00	1.0000	.00000
It is important for every Healthcare Facility to have an official TB infection control policy	391	1.00	2.00	1.0026	.05057
Have you received training on TB Transmission	391	1.00	2.00	1.4527	.49839

Have you received training on TB Transmission Risk Reduction Measures (TB Infection Prevention and Control) i.e IPC on TB	391	1.00	2.00	1.5269	.49992
Valid N (listwise)	391				

Regression Analysis to assess relationship between cues to action and self – efficacy of HCWs in ADH with the practice of TB risk reduction measures

The regression analysis shows that the model, including the variables related to training on TB transmission, TB infection prevention and control (IPC), and the presence of an official TB infection control policy, explains 19.2% of the variance in TB risk reduction (R^2 = 0.192). The F-statistic is 30.242, with a p-value of 0.000, indicating that the model is statistically significant. In terms of the coefficient of variance, the results show that training on TB transmission has a positive impact on TB risk reduction (B = 0.193, p = 0.004). Receiving training on TB transmission risk reduction measures, such as IPC on TB, has a strong positive effect on TB risk reduction (B = 0.543, p = 0.000), signifying that this type of training is highly effective. On the other hand, having an official TB infection control policy in healthcare facilities was not a statistically significant predictor (B = 0.346, p = 0.416), suggesting that simply having a policy without adequate training may not be enough to drive significant risk reduction. The results suggest that receiving training on TB transmission and TB risk reduction measures, as well as having an official TB infection control policy in healthcare facilities, significantly contribute to reducing TB transmission risk among HCWs. Tables 12, 13, 14

Table 12. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.439[a]	.192	.186	.41939

a. Predictors: (Constant), Have you received training on TB Transmission Risk Reduction Measures (TB Infection Prevention and Control) i.e IPC on TB, It is important for every Healthcare facility to have an official TB infection control policy, Have you received training on TB Transmission

Table 13. Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	15.958	3	5.319	30.242	.000[b]
	Residual	67.014	381	.176		
	Total	82.971	384			

a. Dependent Variable: TB risk reduction

b. Predictors: (Constant), Have you received training on TB Transmission Risk Reduction Measures (TB Infection Prevention and Control) i.e IPC on TB, It is important for every Healthcare Facility to have an official TB infection control policy, Have you received training on TB Transmission

Table 14. Coefficient of Variance

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	.416	.431		.964	.335
	It is important for every Healthcare facility to have an official TB infection control policy	.346	.425	.038	.813	.416
	Have you received training on TB Transmission	.193	.074	.207	2.621	.004
	Have you received training on TB Transmission Risk Reduction Measures (TB Infection Prevention and Control) i.e IPC on TB	.543	.073	.583	7.390	.000

a. Dependent Variable: TB risk reduction

Thus, based on the results of the descriptive and regression analyses, the Author can infer the following regarding the hypotheses:

Null Hypothesis (H0): There is no relationship between cues to action and self-efficacy of ADH healthcare workers (HCWs) with the practice of TB risk reduction measures.

The regression analysis indicates that the model is statistically significant ($F = 30.242$, $p = 0.000$), with the training on TB transmission risk reduction measures ($B = 0.543$, $p = 0.000$) being a strong predictor of TB risk reduction. This suggests that cues to action, such as training on TB transmission and infection prevention, significantly impact TB risk reduction practices. Therefore, based on these findings, **we would reject** the null hypothesis because the results demonstrate a clear relationship between training (a cue to action) and TB risk reduction measures.

Alternate Hypothesis (HA): There is a relationship between cues to action and self-efficacy of ADH HCWs with the practice of TB risk reduction measures.

The positive and significant regression coefficient for training on TB transmission risk reduction measures ($B = 0.543$, $p = 0.000$) strongly supports the alternate hypothesis. It implies that healthcare workers' self-efficacy, as influenced by the training they receive, positively affects their ability to practice effective TB risk reduction measures. Therefore, **we would accept** the alternate

hypothesis, as the analysis shows that cues to action, such as targeted training, are strongly associated with the effective practice of TB risk reduction.

Participant Observational Study (Spot Check)

Quantitative Study Results Using Structured Checklist

To assess TB risk of transmission and the TB risk reduction measures practices in the health care facility, the followings were revealed: all the 13 (100%) outpatient units it was observed that there is compliance to prompt identification and separation of TB suspects among other patients, only 7 units (54%) have available waiting areas for TB suspects, 9 (69%) units indicated that there is prompt diagnosis and commencement of treatment for TB confirmed cases, no unit (0%) has isolation ward for TB confirmed cases, just 2 units (16%) have a well-designed windows for effective natural ventilation, no unit (0%) has exhaust fans or ultraviolet germicidal irradiation (UVGI) fixtures, 6 units (46%) showed availability of N95 masks and 8 units (62%) indicated their prompt usage when need arises. Lastly, no unit (0%) has ever had Periodic provision of respirator fit test for HCWs before usage of N95 mask/FFP2. Table 15

In summary, the observation study revealed high risk of TB transmission and poor implementation of TB risk reduction measures.

Frequency Distribution

Table 15. TB Risk of Transmission and the TB Risk Reduction Measures Practices in ADH (Participants' Observational Study (Spot Check)

Categories	Yes	Percentage	No	Percentage
Prompt identification and separation of TB suspects among other patients	13	100%	0	0%
Availability of separate waiting area for TB suspects	7	53.8%	6	46.2%
Availability of prompt means of diagnosis of TB disease in TB suspect case	9	69.2%	4	30.8%
Prompt commencement of TB effective treatment to confirmed TB Cases among Patients/ HCWs	9	69.2%	4	30.8%
Availability of isolation ward for confirmed TB patients when need of admission is required	0	0%	13	100%
Presence of Natural ventilation (open windows on opposite sides)	2	15.4%	11	84.6%

Use of ventilation systems (Presence of exhaust fans)	0	0%	13	100%
Use of ultraviolet germicidal irradiation (UVGI) fixtures	0	0%	13	100%
Availability of N95 mask/FFP2 to HCWs	6	46.2%	7	53.8%
Periodic provision of respirator fit test to HCWs before usage of N95 mask/FFP2	0	0%	13	100%
Prompt usage of N95 mask/ FFP2 by HCWs when need arises	8	61.5%	5	38.5%

Discussion

Evidence – based studies affirmed that compliance of HCWs to TB risk reduction measures in health care facility is very important to prevent and control the risk of TB transmission in any health care facility [15, 30]. Nevertheless, HCWs behavioral inclination has a huge impact on how well HCWs would comply to TB risk reduction measures [15]. The study titled "Application of Health Belief Model; Tuberculosis in Healthcare Workers: Risk Reduction Measures at Asokoro District Hospital (ADH) Abuja FCT Nigeria" aims to assess the risk of TB transmission and the practice of TB risk reduction measures among HCWs using the HBM. The HBM is grounded on the constructs of perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy. These elements outline how individuals assess health risks and adopt preventive behaviors, which in this study, focus on the practice of TB risk reduction among HCWs in a high-burden health care facility.

Perceived Threats (Susceptibility and Severity) of TB Transmission

The results demonstrated a high level of awareness regarding the threat of TB transmission among HCWs in ADH. Almost all participants (87%) are aware that ADH is a TB high-burden health facility and 99% acknowledged that TB is highly infectious. The awareness of TB transmission routes, such as through laughing, singing, and talking, is also high among participants, indicating a strong perceived susceptibility to TB infection. This finding is in line with the studies conducted by [31, 32, 33]. Which revealed high risk of TB transmission among HCWs as a result of failure to compliance with TB – IPC measures especially in resource - limited facilities. The health belief model posits that individuals are more likely to engage in preventive behavior if one perceives a high risk of contracting a disease. In this case, the high awareness levels among participants suggest a heightened sense of susceptibility, which should theoretically drive stronger adoption of TB risk reduction measures.

Moreover, the study found that HCWs understood that TB bacteria could survive for extended periods in the air (up to six hours) and on surfaces (up to six months), reinforcing the perceived severity of the infection. These findings align with the HBM construct that perceived severity—understanding the seriousness of the disease and its potential

consequences—motivates individuals to adopt preventive measures. However, despite this awareness, barriers to practicing risk reduction measures persist among ADH HCWs.

Perceived Barriers Against TB Risk Reduction Measure Practices

The study identified significant barriers that hinder the practice of TB risk reduction measures among HCWs in ADH. The unavailability of N95 masks was expressed by 99% of participants as a key barrier, limiting their ability to fully protect themselves from TB disease/infection. Additionally, while 94% of participants agreed that using weak N95 masks or FFP2 could be sufficient in the absence of standard alternatives, this reflects a compromise in standard protective measures. Furthermore, the participant observational study discovered that there is no isolation and poorly designed building structure leading to lack of cross ventilation in most out patients units where patients converged in multiple numbers daily. These findings are consistent with the studies carried out in Dominican Republic by [34]. Similarly, it is in agreement with a systematic review that was conducted by [35] to discover the barriers and facilitators of tuberculosis infection prevention and control in low- and middle-income countries from the perspective of healthcare workers. Furthermore, a study conducted by [36] revealed similar barriers to be responsible for the poor TB risk reduction measures practice in most DOTS facilities in Nigeria. According to the HBM, perceived barriers which could be individualized like: low level of TB transmission threat or systemic such as: poor management involvement, would significantly impact the adoption of health behaviors. In this context, despite high level of perceived threat, the lack of adequate protective measures, no isolation unit, poor cross ventilation remain critical obstacles to the full implementation of TB risk reduction strategies in the health care facility.

Perceived Benefits of TB Risk Reduction Measures

The study also highlights the strong belief among HCWs in the effectiveness of TB risk reduction measures. Nearly all participants (98%) recognized the importance of using N95 masks to prevent TB transmission, and 89% agreed that surgical masks worn by TB patients could prevent the spread of TB bacteria. The belief in the effectiveness of environmental controls, such as keeping windows and doors open to prevent the spread of TB, was also prevalent (98%). These findings are consistent with the study conducted by [36,37].The HBM suggests that when individuals perceive significant benefits from preventive actions, they are more likely to adopt those behaviors. In this study, the high perceived benefits of using appropriate masks and maintaining cross ventilation align with the adoption of TB risk reduction practices. Therefore, to ensure their full implementation depends on the positive yielding of the management in addressing all the identified systemic barriers which will ultimately motivate HCWs adopting the TB risk reduction measures.

Cues to Action and Self-Efficacy with TB Risk Reduction Measures Practices

Cues to action, such as the availability of training and institutional policies are fundamental in promoting TB risk reduction measures practices. The study found that all participants (100%) agreed on the importance of preventing TB in healthcare facilities, and 55% had received training on TB transmission. While an official TB infection control policy was supported by most participants, the study revealed that simply having a policy is not enough to drive significant behavior change. The regression analysis demonstrated that training on TB transmission and TB infection prevention and control has strong positive effect on the practice of TB risk reduction measures ($B = 0.543$, $p = 0.000$), significantly more than the presence of a policy alone.

Self-efficacy, the confidence in one's ability to perform a behavior, is another critical HBM construct that is closely tied to cues to action. In this study, HCWs with higher levels of training on TB transmission risk reduction measures were more likely to adopt effective protective behaviors. This suggests that while awareness and perceived threats drive the intention to act, the actual adoption of risk reduction measures is heavily influenced by the availability of training and resources that build HCWs' confidence in their ability to protect themselves from TB disease/infection. The findings in this study is in line with the study conducted by [35] among HCWs on challenges in the implementation of TB – IPC in Mozambique. Similarly, [37,38,39,40] studies confirmed the importance of building HCWs capacity and having continuous mentorship as great instruments to successful TB risk reduction measures practice. Therefore, to every effort to build up HCWs capacity that will motivate the full implementation of TB risk reduction measures practice should be encouraged

Conclusion

Globally, TB remains an occupational health risk among HCWs, with the risk of transmission present throughout healthcare settings [41,42]. TB risk reduction measures is a combination of measures planned to reduce the risk of TB transmission within populations [13]. A declaration was made by [15] that HCWs behavioral inclination has a huge impact on how well they would comply to TB risk reduction measures practices [15]. Hence, this informed the decision of the Author utilizing HMB to assess the risk of TB transmission and TB risk reduction measures practices among HCWs in discovering their perceptions.

The study revealed both individualized and systemic related findings that are negatively affecting the full implementation of TB risk reduction measures in ADH: HCWs knowledge gap about TB mode of transmission, inadequate availability of protective equipment, limited training of HCWs on TB – IPC, lack of isolation unit and poor cross ventilation. On critical review of the study findings, it is crucial to point out that systemic related findings need to be addressed first because they have strong influence to alter the individualized inclined findings. This is because, the study has already revealed high levels of perceived threats of TB transmission risk and perceived benefits of the practice of TB risk reduction measures among ADH HCWs. These are individualized perceptions based on HMB usage which automatically would promote effective practice of TB risk reduction measures if positive systemic measures to motivate are well established within the system. Therefore, there is an urgent need of active involvement of the hospital management in all TB – IPC activities within the system. This is a critical requirement to tackle the findings in this study.

Limitation of the Study

One health care facility was utilized; in future other district health care facilities could be involved to ensure generalization of findings.

Recommendations

Based on the findings in this study, the followings are therefore recommended:

Active involvement of the hospital management in TB – IPC activities is crucial to the success of achieving full implementation of TB risk reduction measures within the health care facility since most findings are systemic inclined. Hence there is need to have TB – IPC committee with a designated professional to monitor and evaluate TB – IPC activities on daily basis, hospital - based TB – IPC policy should be developed as a guiding principle, budgetary allocation for TB – IPC activities should be given priority to ensure sufficient and constant supply of all required protective equipment, address the structural issues regarding poor ventilation and lack of isolation unit. Similarly, consistent periodic training of

all HCWs on TB – IPC measures to fill already identified HCWs knowledge gaps, opportunity for HCWs periodic TB screening is critical to protect all those working in highly risky unit within the health care facility, further research on TB – IPC involving more district health care facilities within the FCT to give room for multiple data collections and good generalization of findings.

Conflict of Interest

The study has been carried out with highest transparency and veracity, and no conflict of interest has been found

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