ASSESSING UPTAKE AND COMPLETION OF TUBERCULOSIS PREVENTION THERAPY AMONG HEALTHCARE WORKERS IN NYANDARUA COUNTY, KENYA

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DECLARATION

Declaration by Candidate:

This thesis is my original work and has not been presented for a degree in any other university or any other award.

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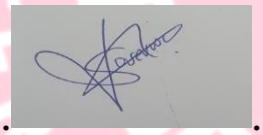
Approval by Supervisors:

This thesis has been submitted with our approval as university supervisors.



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DEDICATION

I thank my beloved parents Meshack Mugamangi, Edith Kabwagira, and my peers for their continuous and consistent emotional support and prayers. I dedicate this work to them. May the grace, peace and love of God be abundant unto them.

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Thank you to my family for the continuous spiritual and emotional support as this research was undertaken. This research would not have been possible without the support and encouragement of all my AMIU colleagues.

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ABBREVIATIONS AND ACRONYMS

3HP	Weekly dose of rifapentine plus a high dose of isoniazid for 12 weeks
3RH	Three months of daily rifampicin plus isoniazid
AIDS	Acquired Immunodeficiency Syndrome
AMREF	African Medical and Research Foundation
BCG	Bacillus Calmette-Guerin (Vaccine)
CNR	Case Notification Rate
DR	Drug-resistant
ESRC	ETHICS and Scientific Research Committee
HAI	Hospital Acquired Infections
HCW	Health Care Worker
HIV	Human Immunodeficiency Virus
IGRA	Interferon-Gamma Release Assay
IPC	Infection Prevention Control
IPT	Isoniazid Preventive Therapy
KII	Key Informant Interview
LMIC	Low Middle Income Country
LTBI	Latent Tuberculosis Infection
NACOSTI	National Commission for Science Technology & Innovation

PLHIV	People Living with HIV
TB	Tuberculosis
TBIPC	Tuberculosis Infection Prevention Control
TPT	Tuberculosis Preventive Therapy
TST	Tuberculin Skin Test
WHO	World Health Organization

OPERATIONAL DEFINITIONS OF TERMSN

Active Tuberculosis: Refers to disease that develops in someone infected with *Mycobacterium tuberculosis.* It is characterized by signs or symptoms of active disease or both, and it, is distinct from latent TB infection, which occurs without signs or symptoms of active disease

Health Care Worker: One who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians or even medical waste handlers (Joseph et al.,2016)

High Tuberculosis Incidence Country: a country with a WHO-estimated TB incidence rate of ≥ 100/100,00 population(WHO,2021)

Latent Tuberculosis: A state of persistent immune response to stimulation by *Mycobacterium tuberculosis* with no evidence of clinically manifested active TB(WHO,2022)

Low-TB-Incidence Country: Country with WHO estimated TB incidence rate of <100 per 100,000 population(WHO,2021)

Nosocomial Infection: An infection that is caught in a healthcare facility

TB Preventive Treatment: Treatment offered to individuals considered at risk for TB disease to reduce that risk. Also referred to as LTBI treatment or preventive therapy(WHO)

Tuberculosis: The disease state due to *Mycobacterium tuberculosis* and or *Mycobacterium bovis* (WHO,2022)

ABSTRACT

Introduction: Globally, tuberculosis (TB) remains one of the leading causes of death, with healthcare workers (HCWs) at heightened risk due to occupational hazards. Tuberculosis prevention therapy (TPT) for managing latent TB infection is increasingly important worldwide and in Kenya, aligning with the WHO's vision of 'A world free of TB' and Kenya's goal to eliminate tuberculosis by 2035. This study aimed to assess the uptake and completion of TPT among HCWs in Nyandarua County, Kenya.

Methodology: Utilizing both quantitative and qualitative approaches, the study included a sample of 219 HCWs from various sub-counties and levels of health facilities. Quantitative data were gathered through face-to-face interviews using a pretested structured questionnaire, while qualitative data were obtained from key-informant interviews with one county and four sub-county TB coordinators, as well as in-depth interviews with five health facility managers. Statistical analyses included the Chi-Square test and binary logistic regression, with a p-value <0.05 indicating significance and the odds ratio used as the final measure of association. Thematic analysis was used for qualitative data.

Results: Results showed that 74% of HCWs did not initiate TPT, though completion was above average, with 80% finishing the therapy. Significant factors influencing TPT uptake included health facility level (OR 28.4, 95% CI 2.7636-2.9120), awareness and training (OR 0.1, 95% CI 0.0188-0.1934), perceived TB risk (OR 7.2, 95% CI 1.1431-4.5088), department (OR 2.1, 95% CI 1.1055-4.0073), and having a co-worker with TB (OR 0.2743, 95% CI 0.1418-0.5304). Factors significant for TPT completion included awareness and training (OR 16.5, 95% CI 1.519-1.792) and mask-wearing (OR 0.8, 95% CI 0.979-1.334).

Conclusion: The study concluded that uptake and completion of TPT could be improved through capacity building and enhanced facility-level support, and recommended that policymakers at all levels ensure adequate funding, emphasize TB risk perception and reinforce protective measures to increase TPT completion rates.

CHAPTER 1: INTRODUCTION

1.1 Overview

This chapter incorporates the study's background information, problem statement, study objectives, research questions, justification, and significance of the study.

1.2 Background of Study

Tuberculosis (TB) is the ninth leading cause of death worldwide and it remains one of the leading causes of death from a single infectious agent ranking above HIV (WHO, 2019). According to the World Health Organization (WHO), in the year 2020, 10 million people fell ill globally with 1.5 million dying, despite it being preventable and treatable and 46% of the global deaths were in Africa.

Tuberculosis is also a co-infection in HIV/AIDS. It remains one of the leading causes of death in people living with HIV/AIDS (PLHIV) worldwide. A person infected with HIV is twenty times more at risk of contracting TB and three times more likely to die even when on TB treatment. Sub-Saharan Africa bears the highest TB/ HIV burden. By the end of 2021, it was estimated that 38.4 million (33.9-43.8 million) people were living with HIV and two-thirds (25.6 million) were in Africa (WHO, 2021).

In Kenya, TB remains a major public health concern. Kenya is listed by the World Health Organization (WHO) among the 30 high-burden TB states, with a recent prevalence of 426 cases per 100,000 populations, as per the National TB Prevalence Survey Report 2016. In the year 2021, Kenya was also listed among the 30 high multi-drug resistant (MDR)/ rifampicin-resistant (RR) burden countries. WHO estimates that 1.3% of new TB cases and 4.4% of previously treated TB cases have MDR/RR

Tuberculosis. The number of drug-resistant (DR) TB cases has increased significantly over the years. Multidrug and rifampicin-resistant TB contributes to approximately 70% of all DR TB cases (Ministry of Health Kenya, 2020).

Kenya's Vision 2030 aims to achieve a globally competitive and prosperous Kenya with a high quality of life by the year 2030. Health is one of the key components of the vision's social pillar since it plays a key role in maintaining the healthy and skilled workforce needed to drive the economy (Ministry of Health Kenya, 2016). Latent tuberculosis infection (LTBI) is defined as a state of persistent immune response to stimulation by Mycobacterium tuberculosis antigens with no evidence of clinically manifest active TB (WHO, 2018).

According to WHO, the global burden of latent tuberculosis infection is unknown but it is estimated that a quarter of the world population, that is 1.7 billion people, are infected. The estimated global prevalence rate however has slightly decreased from 30.66% in 1990 to 23.67% in 2019. Despite this, the rate at which it is decreasing is slow and may not be sufficient to meet the WHO tuberculosis elimination efforts by 2030. While about 23.67% of the world's population is estimated to be infected with M. tuberculosis, only 10% of the infected individuals develop clinically active TB disease and 90% remain in the latent phase. This constitutes a large reservoir of individuals with LTBI (WHO, 2018). It is also estimated that the majority of the LTBIs are in high-burden TB countries, with a number being in Africa.

People with latent tuberculosis pose a public health threat to the community as they act as reservoirs of the bacteria. They can transmit it to the people around them when they develop active tuberculosis. Moreover, 5-10% are at risk of developing active tuberculosis usually within 5 years. However, the risk increases severalfold in those

with immunosuppressive conditions such as HIV/AIDS, diabetes and cancer among others. This poses a barrier to TB control (WHO, 2018).

A healthcare worker (HCW) delivers care and services to the sick and ailing. They can do so directly either as doctors, nurses and clinical officers or indirectly as pharmacists, pharmaceutical technologists, laboratory technicians, patient assistants and even waste handlers (Joseph & Joseph, 2016)

Healthcare workers work in hazardous environments which exposes them to different occupational risks such as latent and active tuberculosis. They are at risk of nosocomial transmission as they handle active TB specimens in the laboratory, during the collection of sputum and as they care for both diagnosed and undiagnosed tuberculosis patients. Due to financial constraints, low-middle-income countries (LMICs) face constraints in the implementation of WHO-recommended infection control measures that aim to protect HCWs and those around them. This in turn leads to heavy pathogen exposure in most HCWs at work.

Studies have shown that the median prevalence of LTBI among healthcare workers in developed countries is 24% as compared to LMIC at 54%, with a correlation between LTBI prevalence and regional active TB prevalence. A high prevalence of active TB infection increases the risk of disease in HCWs making them have a higher probability of contracting the disease compared to the general population (Belo et al., 2017).

Tuberculosis preventive therapy (TPT) for managing latent TB infection is growing in importance both globally and regionally. It has been shown to have an efficacy of 60-90% in reducing latent TB. TPT enables the realization and achievement of the WHO vision of ‘A world free of TB’, the United Nations (UN) Sustainable Development

Goals (SDGs) and the National TB program which envisions Kenya free of tuberculosis—zero deaths, disease and suffering due to tuberculosis by 2035.

In the year 2020, Kenya introduced tuberculosis preventive therapy to prevent the progress of latent TB infection to its active state. The main target was the vulnerable populations, who are defined as those at a higher risk of contracting latent or active TB. HCWs were listed among that population (Ministry of Health, 2020).

The use of different treatment regimens that are effective and promote adherence is recommended for LTBI. Currently, available treatment options used in Kenya as recommended by WHO for the treatment of LTBI among different vulnerable populations are as follows: -

1. 6-month isoniazid daily (6H)-used in children who are HIV positive and pregnant women.

2. 3-month rifapentine plus isoniazid weekly (3HP) - preferred treatment option for LTBI management in individuals above 15 years of age in Kenya. However, it is contraindicated for People living with HIV on nevirapine and protease inhibitors - based ARVs.

3. 3-month isoniazid plus rifampicin daily (3RH) - used in children who are HIV-negative.

The regimen recommended to be used for TPT in HCWs is three months of rifapentine and isoniazid. Optimizing the treatment of LTBI is one of the key strategies for achieving the WHO 'End TB' targets which aim to reduce TB deaths by 95% and lower the incidence of new TB cases by 90% between 2015 and 2035 (Ministry of Health Kenya, 2020).

Control and treatment of LTBI are central to programmatic TB control and achieving the WHO and UN SDG vision and goal of elimination of TB by the year 2030. There has been an increase in LTBI cases worldwide from 1,599,070,892 in 1990 to 1,799,195,771 in 2019. Regions in Africa accounted for this increase. The prevalence rates however have been noted to have decreased from 30.66% in 1990 to 23.67% in 2019. Despite this reduction in global prevalence rates, some countries, such as Kenya, have been noted to have increased LTBI prevalence levels. The numbers increased from 5,759,752 cases in 1990 to 12,660,630 in 2019 (Ding et al., 2022).

Several studies have investigated the prevalence of latent tuberculosis infection (LTBI) among healthcare workers (HCWs) in the sub-Saharan region, revealing high rates of infection. A systematic review showed that in Ethiopia, the median prevalence of LTBI among HCWs was reported to be around 62% and in Kenya, the prevalence was 60% among HCWs compared to 48.2% among school workers (Tiruneh, 2023).

This study assessed factors influencing the uptake and completion of TBT among HCWs, a group of individuals who are considered vulnerable to contracting both latent and active TB, in Nyandarua County Kenya.

1.3 Statement of the Problem

The healthcare industry is one of the most hazardous environments to work in. Healthcare workers (HCWs) are constantly exposed to a variety of health and safety hazards, including nosocomial infections, or healthcare-associated infections (HAIs) (Joseph et al., 2016). Among these HAIs, TB remains a significant concern.

Despite several Infection Prevention and Control (IPC) measures being in place to protect HCWs from HAIs, their implementation is often inadequate, particularly in low-

and middle-income countries (LMICs). In many healthcare settings in Kenya, infection control practices may be inadequate due to resource limitations. This can lead to insufficient use of personal protective equipment (PPE), overcrowded facilities, and poor ventilation, all of which contribute to higher TB transmission risk. The inadequate implementation of IPC measures is not only an LMIC challenge but a global issue. This is seen by how the COVID-19 pandemic highlighted the vulnerabilities and risks healthcare workers face worldwide. According to the WHO, from January 2020 to May 2021, approximately 115,000 (80,000-180,000) HCWs died globally from COVID-19 contracted in hospital settings. The challenges faced during the pandemic are similar to those plaguing the implementation of IPC measures for TB prevention and HCW protection. Common challenges include inadequate personal protective equipment (PPE), such as masks, insufficient training on IPC, and prolonged close contact with patients (WHO, 2021).

The pandemic also increased the risk of TB transmission among HCWs. It caused a shift in TB control efforts globally, reversing years of progress in providing essential TB services and reducing the TB disease burden. The pandemic led to a significant drop in the number of newly diagnosed TB cases due to inadequate diagnosis and reporting. Kenya was among the countries contributing to this decline (WHO, 2021). In 2020, Kenya reported an average decline in the Tuberculosis case notification rate (CNR) of 15.7%, with at least 48% of incident TB cases being missed or not notified that year (Ministry of Health, 2020; WHO, 2021).

Nyandarua County, in particular, was noted for having one of the lowest case notification ratios (CNR) in 2020 due to under-reporting and lack of prompt diagnosis, at 60-100 per 100,000 population, compared to counties such as Mombasa

(271/100,000) and Turkana (262/100,000) (Ministry of Health Kenya, 2020). This under-reporting increases the risk of TB transmission among HCWs in Nyandarua County, as active TB cases are not promptly identified, diagnosed, or treated.

Globally, the burden of latent TB infection (LTBI) is significant, with an estimated one-third of the world's population infected and at risk of progressing to active TB within five years (WHO, 2018). The majority of these cases are in LMICs, where HCWs are at a heightened risk. Kenya is classified by WHO as a high TB, MDR/RR and HIV/AIDS burden country. This means that TB is widespread in the general population, increasing the likelihood of exposure and transmission. Kenya also faces significant challenges with multidrug-resistant TB (MDR-TB). MDR-TB is more difficult to treat and requires longer, more complex treatment regimens. The presence of MDR-TB strains further complicates control efforts and increases the risk of transmission, especially in healthcare settings. Kenya has a high prevalence of HIV/AIDS, which weakens the immune system and makes individuals more susceptible to TB infection. HIV-positive HCWs are more likely to develop active TB if exposed to the TB bacteria. This co-infection increases the overall TB burden and transmission risk. There is limited specific research available on the prevalence of tuberculosis (TB) among healthcare workers (HCWs) in Nyandarua County and Kenya. However, broader studies and reports indicate that HCWs are at a higher risk of TB infection compared to the general population due to their occupational exposure. Without accurate local data, it is difficult to assess the true risk that HCWs in Nyandarua County and the country as a whole face, leading to potential underestimation of the problem. Insufficient data hampers the development of effective policies and strategies tailored to protect HCWs from TB. Lack of data affects the allocation of resources for TB prevention and control measures specifically targeting HCWs. Without knowing the prevalence rates, training

programs for HCWs on TB prevention may be insufficient or misdirected. There may be gaps in implementing and reinforcing protective measures such as regular screening, use of personal protective equipment (PPE), and infection control practices. Inadequate data makes it difficult to monitor and evaluate the effectiveness of existing TB prevention programs for HCWs, hindering continuous improvement. A lack of foundational data can limit further research and innovation in TB prevention tailored to the needs of HCWs. TB-IPC measures, as stated earlier, are poorly implemented in LMICs, posing an increased danger to HCWs. One recommended WHO TB-IPC measure is reducing patients' time in healthcare facilities. Government hospitals in Kenya serve large patient numbers, and the HCW-to-patient ratio is below WHO standards across all cadres (Ministry of Health, 2015). The disparity in HCW numbers, increased patient loads, and suboptimal TB-IPC measures collectively elevate the risk of TB transmission. Additionally, the HCW population includes older individuals still in clinical practice, further increasing the risk of LTBI and subsequent active TB. A study in South Africa found that 10 HCWs out of 285 acquired clinical TB during their employment (Malotle et al., 2017).

HCWs with LTBI who develop active TB pose a risk of transmitting the infection to patients, household members, and the broader community, as they act as reservoirs of the bacteria. TB can lead to HCW attrition, reduced productivity, and decreased quality of life mentally, physically, and financially, particularly for those contracting MDR/RR TB. Furthermore, TB can increase morbidity and mortality among immunosuppressed HCWs. Co-infection with TB and HIV/AIDS poses a significant threat, as individuals with HIV are more likely to die from TB than the general public. This is a critical concern for HCWs with HIV or other immunosuppressive conditions like diabetes, cancer, and systemic lupus erythematosus (WHO, 2021).

Evidence shows that TB preventive therapy has an efficacy of 60-90% in reducing LTBI. Despite this, studies indicate inadequate uptake and compliance among HCWs, undermining TB eradication efforts. For instance, a study in the USA found that only 73% of HCWs complied with LTBI treatment (Abad et al., 2013), while a study in Korea revealed suboptimal initiation rates of LTBI treatment among HCWs (Lee et al., 2018). The high prevalence of TB among HCWs, as shown by several studies, and the high prevalence of TB in the setting of underreporting and delayed diagnosis of active TB cases in Nyandarua County, influenced this study's focus. The study aims to evaluate the effectiveness of existing TB prevention strategies, with a focus on Tuberculosis Preventive Therapy and identify gaps in implementation. Understanding these issues is crucial for developing targeted interventions to protect HCWs and improve overall TB control in the region. This study will generate evidence on the barriers to their implementation. The findings will be used to advocate for policy changes that enhance TB prevention among HCWs. By translating knowledge into actionable policies, this research aims to strengthen TB control efforts and protect HCWs in Nyandarua County and beyond.

1.4 Research Questions

i. What are the personal factors influencing the uptake and completion of tuberculosis preventive therapy among HCWs in Nyandarua County?

ii. What are the health systems factors impacting the uptake and completion of TPT among HCWs in Nyandarua County?

iii. What are the risk factors for LTBI affecting the uptake and completion of TPT among HCWs in Nyandarua County?

iv. How does the uptake and completion of tuberculosis preventive therapy compare among the different levels of public hospitals (levels 3, 4 and 5) and the main faith-based hospital in Nyandarua County?

1.5 Objectives of the Study

1.5.1 Broad Objective

The broad objective of this study is to identify and analyze the factors that affect the uptake and completion of TPT among healthcare workers in Nyandarua County.

1.5.2 Specific Objectives

i. To assess the personal factors that influence the uptake and completion of TPT among healthcare workers in Nyandarua County.

ii. To evaluate the health system factors that impact the uptake and completion of TPT among healthcare workers in Nyandarua County.

iii. To identify the risk factors for LTBI that affect the uptake and completion of TPT among healthcare workers in Nyandarua County.

iv. To compare the uptake and completion rates of TPT among different levels of health facilities in Nyandarua County.

1.6 Justification of the Study

Healthcare workers (HCWs) in low- and middle-income countries (LMICs), such as Kenya, face significant occupational risks associated with tuberculosis (TB). These risks include the high prevalence of drug-resistant strains, inadequate infection control measures, and delays in TB diagnosis. Such factors contribute to HCWs having a

heightened risk of contracting latent TB infection (LTBI), which can potentially progress to active TB disease, compromising their health, the safety of patients under their care and the community at large.

In Kenya, Tuberculosis Prevention Therapy (TPT) was introduced for HCWs in 2020, with Nyandarua County being among the first 11 counties to implement this initiative out of the 47 counties in the country. Despite this national effort, there remains a gap in understanding the uptake and completion rates of TPT specifically among HCWs in Nyandarua County. Internationally, studies have highlighted suboptimal uptake and completion of TPT among HCWs, emphasizing the need for tailored interventions in local settings. However, there is currently no specific research conducted in Kenya on TPT uptake and completion rates among HCWs, underscoring the significance of this study.

This research aims to assess the uptake and completion rates of TPT among HCWs in Nyandarua County, Kenya, and to identify the factors influencing these rates. By focusing on a high TB burden setting where TPT implementation is relatively new, the study seeks to provide crucial data that can inform national policies and facilitate the scaling of TPT interventions across other counties in Kenya. The findings from this study will not only contribute to filling the research gap in Kenya but also provide evidence-based insights that can guide the adaptation and enhancement of TPT programs nationwide. Specifically, the data gathered will aid in refining guidelines and protocols to improve TPT uptake and completion rates among HCWs, thereby enhancing TB prevention efforts within healthcare settings.

Aligning with the WHO's End TB Strategy and Kenya Vision 2030, this research aims to support broader public health goals by safeguarding HCWs and the community from

TB transmission. By leveraging local data and experiences, this study seeks to pave the way for effective TB control strategies that are tailored to the needs of Nyandarua County and serve as a model for other regions in Kenya facing similar challenges. There is a significant gap in understanding the uptake and completion rates of TPT among HCWs in Nyandarua County, Kenya. This study addresses this gap by providing empirical data and analysis of the effectiveness of TPT implementation in this specific context. This research is crucial as it provides targeted interventions for a high-risk group, focusing on HCWs in a specific region that has been at the forefront of TPT implementation.

The study findings are justified by its potential to significantly impact TB prevention strategies among healthcare workers in Nyandarua County. By addressing the specific needs and challenges faced in this region, the study will provide valuable insights and data that can inform national policies and enhance the effectiveness of TB prevention efforts across Kenya. The choice of Nyandarua County is informed by its early adoption of TPT and the need to understand the specific dynamics and outcomes of this initiative in a high TB burden setting. This early adoption provides a unique opportunity to assess the effectiveness and challenges of TPT implementation in a real-world setting, contributing valuable insights that can guide future efforts both within the county and across other regions in Kenya.

1.7 Significance of the Study

This research will provide insights into the gaps in TB prevention among HCWs by highlighting the critical need to improve TB infection prevention measures through upscaling TPT among HCWs. Similarly, the study revealed barriers and facilitators of TPT among HCWs and the need for more research on TB prevention among this group.

The findings from this research will serve as a crucial resource for future studies, guiding further investigations into innovative solutions and best practices. The insights gained will also be instrumental in shaping regional health strategies for TB eradication and contributing to the broader goal of TB eradication.

The study results will be useful in providing region-specific interventions tailored for HCWs in our country. These findings can be considered by the Ministry of Health, policymakers, health administrators, and public health practitioners in the upscaling of TPT and other TB-IPC measures among HCWs in different regions of the country. This will enable safeguarding these essential workers' health, enhancing their longevity and productivity, and ensuring a safer healthcare environment for all.

1.8 Scope of the Study

This research investigates how healthcare professionals (HCWs) globally are adopting and completing TPT and implementing TB-IPC practices, concentrating on Africa, specifically sub-Saharan Africa and Kenya. It delves into different elements that affect adherence, such as individual anxieties, perceived dangers, and the success of educational initiatives, employing a cross-sectional design study that used a mixed-method approach. By pinpointing shared and area-specific obstacles, the study seeks to guide policy suggestions and enhance strategies for TB control, to decrease TB spread among HCWs and boost the implementation of preventive actions.

1.9 Assumptions of the Study

This study operates on the assumption that the methodologies and safeguards implemented will effectively mitigate potential biases and data gaps. Despite the challenges posed by recall bias, the study assumes that the thorough interview process,

which allows ample time for recall and focuses on specific, memorable questions, will result in accurate self-reporting from participants. Including new HCWs in the study sample is assumed to offset any potential bias introduced by the transfer of participants who had undergone TPT, maintaining the study's relevance and applicability.

Furthermore, the study assumes that the measures taken to protect personal information will maintain participant confidentiality and encourage honest reporting, thus enhancing data integrity. The secure handling of consent forms and the anonymization of data during analysis are presumed to foster a trustworthy environment, thereby minimizing the risk of data contamination due to privacy concerns. These methodological strengths are expected to produce robust findings that can significantly inform policy and practice, aiming to improve TPT uptake and completion rates among HCWs nationwide.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter explores existing research on the effectiveness of TB preventive therapy (TPT), barriers to its implementation among HCWs and health system interventions aimed at reducing TB transmission. It introduces the theoretical framework, occupational risks and prevalence of TB among healthcare workers and the effectiveness of Tuberculosis Preventive Therapy (TPT). Further, the implementation of tuberculosis infection control measures, barriers to tuberculosis prevention among HCWs and interventions to improve tuberculosis prevention among healthcare workers are explored thus informing the conceptual framework of the study.

2.2 Theoretical Framework

2.2.1 Health Belief Model (HBM)

The Health Belief Model (HBM) was used as one of the guides for this study. It provided a theoretical framework for understanding HCWs' behaviour and perceptions towards TPT and infection prevention and control measures. It provided a structured approach to understanding and addressing factors that influence their acceptance and adherence to TPT and IPC measures. HBM posits that an individual's health-related behaviour is influenced by several key factors: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Rosenstock, 1974).

2.2.1.1 Components of the Health Belief Model.

1. **Perceived Susceptibility**: This component refers to HCWs' beliefs about their vulnerability to contracting TB infection due to their occupational exposure. HCWs who perceive themselves to be at high risk of acquiring TB are more likely to consider taking preventive measures such as TPT.

2. **Perceived Severity**: The HBM emphasizes the HCWs' beliefs about the seriousness of TB infection and its potential consequences for their health and ability to work. If HCWs perceive TB as a severe disease that can lead to significant health issues or even death, they are more likely to engage in behaviors aimed at preventing its transmission.

3. **Perceived Benefits**: HCWs' assessment of the effectiveness and advantages of TPT and IPC measures in reducing their risk of TB infection is crucial. Perceived benefits include beliefs that TPT can effectively prevent latent TB from progressing to active TB, thereby safeguarding their health and ensuring their ability to continue working without interruption.

4. **Perceived Barriers**: This component involves identifying and understanding the obstacles and concerns that HCWs face regarding TPT and IPC. Barriers may include concerns about potential side effects of medications, logistical challenges in accessing TPT, or doubts about the efficacy of preventive measures.

5. **Cues to Action**: External factors or triggers that prompt HCWs to initiate or adhere to TPT and IPC measures are categorized as cues to action. These may include workplace policies mandating TPT, training sessions on TB prevention,

peer influence, or personal experiences with TB cases among colleagues or patients.

6. **Self-Efficacy**: HCWs' confidence in their ability to successfully comply with TPT and IPC measures despite perceived barriers is crucial. Self-efficacy is influenced by training, support from healthcare facilities, and personal beliefs in the efficacy of preventive measures.

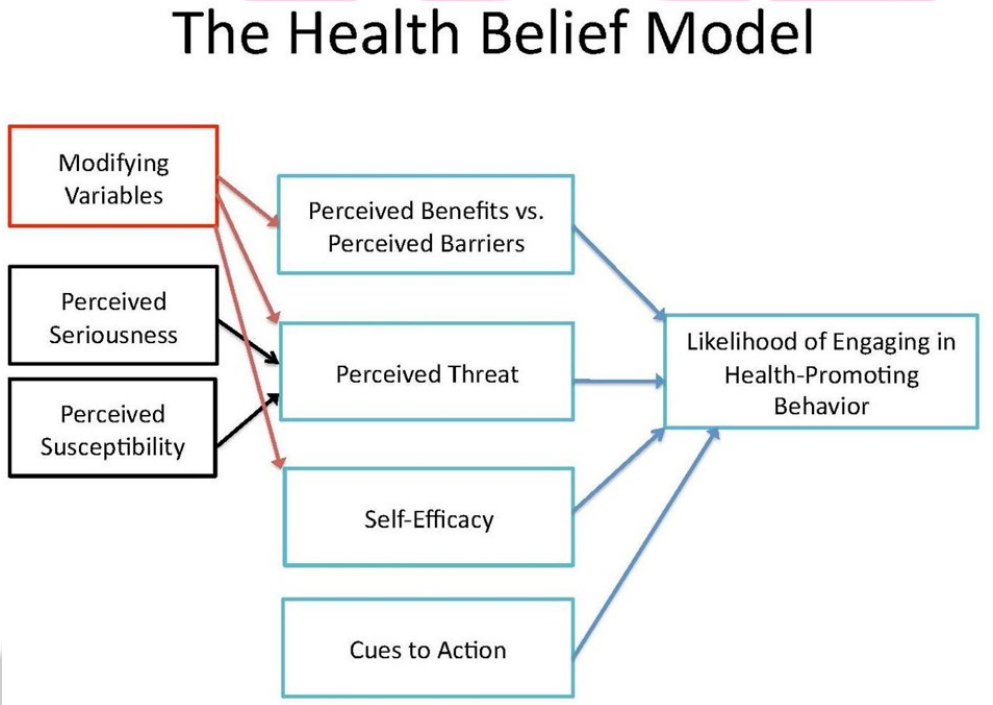


Figure 1: The Suggested Health Belief Model for HCWs' Behaviour and Perceptions towards TPT and Infection Prevention and Control measures

Source: http://bit.ly/2i9Lw0Ehbm.jpg

2.3 Review of Related and Empirical Literature

2.3.1 Occupational Risks and Prevalence of TB Among Healthcare Workers

2.3.1.1 Global Perspective.

Globally, HCWs are disproportionately affected by LTBI due to their occupational exposure to TB. Studies highlight regional disparities in TB burden among HCWs, with higher prevalence rates observed in settings with poor TB control measures and limited access to healthcare resources (Alele et al., 2019). Not only are they more susceptible than the general population but HCWs from high burden TB settings are at a higher risk of LTBI. A systematic review and meta-analysis found that approximately 50% of HCWs in high TB burden settings test positive for LTBI, indicating a significant occupational risk (Apriani et al., 2019). Most of these high-burden states also happen to LMICs.

A prospective study carried out in India, a high TB burden country and LMIC, to assess the risk of TB infection among HCWs who directly engage in medical duties found that one-third of the HCWs had LTBI. A tuberculin skin test (TST) carried out suggested that 36.8% (76/206) were infected with TB using a TST induration of greater or equal to 10mm as the cutoff point. All 76 TST-positive HCWs showed no evidence of active TB in clinical evaluation and chest radiography. Furthermore, the statistical analysis also suggested that age, duration of employment as a HCW, literacy status and working in medical wards, outpatient and intensive care units were significantly associated with TB infection (Janagond et al., 2017).

2.3.1.2 Africa and Sub-Saharan Africa.

In Africa, particularly in sub-Saharan Africa, where TB incidence is high, studies consistently report elevated rates of LTBI among HCWs. A systematic review of the presence of occupational tuberculosis in HCWs in Sub-Saharan Africa (SSA) found that the median prevalence of LTBI in HCWs was 62% (IQR 22%) and the median incidence of TB disease was 3871/100,000 (IQR 9314/100,000). Some of the risk factors associated with LTBI or active TB disease were workplace, history of contact with TB patients and longer duration of employment. The findings of the review demonstrate that the risk of acquiring TB among HCWs in SSA is high and it underscores the need for effective TB prevention strategies control to protect HCWs and have a positive impact on the recruitment, longevity and retention of HCWs (Alele et al., 2019).

A study conducted in HCWs in South Africa documented incident LTBI using IGRA at 26% (29 cases /100 person-years) and 27% using TST (29 cases/ 100 person-years) (McCarthy et al., 2015). A study on the prevalence of active TB among HCWs and support staff in Amhara region, Ethiopia found that the magnitude of TB among HCWs and support staff in health care settings was higher than the general population (140 per 100,000 populations) and that 15.9%of HCWs and 19.7% support staffs were identified as presumptive TB based on reported symptoms. A cough of two weeks or more was reported by 13.8% of HCWs. Weight loss, night sweats and fever were reported by 7.2% of HCWs and active TB was found in 1.4% of them (Shiferaw et al., 2021).

2.3.1.3 Kenya

In Kenya, HCWs face substantial risks of TB infection due to high TB prevalence and inadequate infection control measures in healthcare facilities. Studies have documented the urgent need for targeted interventions to protect HCWs and reduce TB transmission.

The non-state health sector/ private health sector has been recognized to play an important role in the delivery of health services in Kenya including TB services. They account for approximately 50% of facilities and providers and 90% offer TB services. A patient pathway analysis in 2017 revealed that an average of 42% of patients initially visit them (Ministry of Health, 2022). HCWs who work in the private sector need adequate protection from TB. This is because they come into contact with a significant number of patients. Some of these patients might have active TB and might be missed and undiagnosed. The national TB survey carried out in 2016 showed that about 41% of TB patients are being missed to be diagnosed and treated (Ministry of Health, 2016)

A case series was conducted in Kiambu and Makindu, two district hospitals in Kenya. A total of 16 active TB cases were reported among HCWs. Those affected were 4 laboratory technicians (25%), 4 nurses (25%), 2 occupation therapists (13%), 2 clinical officers (13%) and 1 pharmacist, telephone operator, driver and casual worker. The facilities lacked high-efficiency particulate air filters, bio-safety cabinets, windows were often closed and suspected TB patients shared a common crowded outpatient waiting area where sputum was collected. The mean working time lost recuperating was 14 (range 0-28) weeks (Kanyina et al., 2017).

A study done to compare the prevalence of latent TB infection among HCWs at 3 facilities in Kisumu, Kenya and school workers found that HCWs who offer TB and

HIV services are 1.5 times more likely to be infected with LTBI than the school workers. The prevalence of self-reported history of TB disease was 7.4% among HCWs and 3.6% among school workers. The prevalence of latent TB infection was 60% among HCWs and 48% among school workers. HCWs at all 3 facilities had a similar prevalence of latent TB infection. This shows that HCWs are at an increased risk of LTBI compared to the general population. Increasing years of employment was associated with increased odds of LTBI (Agaya et al., 2015).

2.3.2 Effectiveness of Tuberculosis Preventive Therapy (TPT)

Tuberculosis Preventive Therapy (TPT) has been a critical strategy in combating the spread of tuberculosis (TB), particularly among healthcare workers who are at high risk due to their occupational exposure. Various studies globally and regionally have examined the effectiveness of TPT in this vulnerable group. TPT, primarily using isoniazid (INH) and rifapentine (RPT), has demonstrated varying effectiveness in preventing latent TB infection (LTBI) from progressing to active TB.

A study done in the USA indicated effectiveness rates ranging from 60% to 90%. However, despite its efficacy, compliance rates among HCWs remain suboptimal due to several factors. Recent research has explored alternative regimens such as the combination of INH and RPT administered once weekly for three months, showing promising results in terms of acceptance and completion rates among HCWs (Abad et al., 2013).

A cohort study in Nigeria assessed TPT's impact on TB incidence among healthcare workers in tertiary hospitals. The study found a significant reduction in TB cases among those who completed the TPT course compared to those who did not. The findings

support the effectiveness of TPT in high TB burden settings and highlight the need for robust TB control programs targeting healthcare workers (Nguyen et al., 2018).

Another study done in South Africa investigated the effectiveness of TPT among healthcare workers, a country with a high TB/HIV co-infection rate. The retrospective cohort study demonstrated that TPT significantly reduced the incidence of active TB among healthcare workers, particularly those co-infected with HIV. The study highlighted the critical role of integrating TB and HIV services in optimising TPT outcomes (Kufa et al., 2020).

2.3.3 Implementation of Tuberculosis Infection Control Measures

2.3.3.1 World Health Organization Guidelines.

According to WHO, health systems consist of all organizations, people and actions which promote, restore or maintain health. The WHO has developed comprehensive guidelines for TB infection control in healthcare settings. The provision of prevention and care interventions for health workers is one of the measures at the health care facility level. Others include- implemented activities at the managerial level, personal protective equipment for HCWs, administrative controls such as prompt identification of people with TB symptoms(triage), separation of infectious patients, minimizing time spent by patients in health care facilities and environmental controls such as ventilation systems (WHO, 2018)

2.3.3.2 Challenges in LMICs.

LMICs often struggle to implement WHO guidelines due to financial constraints and resource limitations. Addressing these challenges is crucial for reducing TB transmission among HCWs and patients alike (Shiferaw et al., 2021).

2.3.4 Barriers to Tuberculosis Prevention Therapy and TB-IPC among Healthcare Workers

Despite the effectiveness of TPT, several barriers hinder the effective implementation of TPT among HCWs. Noncompliance rates have been reported in several studies from diverse global contexts, particularly in low- and middle-income countries (LMICs), high-income countries, and regions within Africa. The studies reviewed also highlighted common barriers such as inadequate training, fear of side effects, difficulties transitioning from policy and systemic challenges in healthcare infrastructure across different global and regional contexts. Addressing these barriers is essential for improving TB prevention efforts among healthcare workers.

A study in the USA found that HCWs are less willing to accept treatment than other populations—only 41.1% accepted treatment while 29.1% completed treatment (Swift et al*.,* 2020). A retrospective study conducted in the same country showed that 67% of the HCWs were compliant, 6% were partially compliant and 27% were non-compliant. Other studies done in the past show that compliance has not improved over the decades. In a study done three decades ago, only 41.3% of HCWs with a positive TST-initiated therapy, although the majority 71% of those completed treatment (Barrett-Connor, 1979). Another study found a 55% compliance rate (Camins et al., 1996). A different study found that compliance rates of HCWs were low at 47% and that HCWs were less likely to initiate LTBI treatment (Gershon et al., 2004).

Healthcare systems in low- and middle-income countries (LMICs) face significant challenges in implementing effective TB prevention strategies. These include limited resources, inadequate training in IPC measures, and poor infrastructure for infection control (Alele et al., 2019). A systematic review conducted in the sub-Saharan region

to identify barriers and facilitators of IPC in LMIC showed shortages of funding and resources to be a challenge. This led to the prioritization of patients over HCWs. It also noted that healthcare facilities lacked a TBIPC manager whose role is to disseminate the healthcare facility's policy and conduct surveillance on TBIPC implementation within the facility. A lack of any formal policy within the health care facility despite a national policy being available and a knowledge action gap were some of the other barriers preventing the implementation of IPC (Tan et al., 2020). Support from TBIPC administrators was shown to play a positive role. Those who visited wards and offered verbal encouragement were viewed as supportive. Findings from a study in South Africa found that visits from district officials to reassure facility managers equally played a positive role. The study also highlighted how the HCW's perception of TPT played a role. The HCWs who felt a strong duty of care towards their patients were motivated to adhere to TBIPC measures (Tan et al., 2020).

HCWs who work in such settings have higher rates of infection compared to the general population, particularly with a background of a high prevalence of undiagnosed TB in healthcare facilities and TB infection control (TB-IC) programs that are absent or poorly implemented. This increased risk of TB affects all healthcare personnel including community health workers (CHWs), clinical support staff, laboratory workers and health science students. Clinical staff nurses and doctors appear to be at the highest risk (Nathavitharana et al., 2017).

Several studies show the necessity of capacity building in terms of knowledge of TB prevention training and talks. Knowledge is empowering to HCWs. A systematic review conducted in the sub-Saharan region to identify barriers and facilitators of IPC in LMIC highlighted the need for training in improving the uptake and completion of

TPT. Some HCWs were unaware and unfamiliar with their healthcare facility's TBIPC policy. Lack of HCW training and selective training promoted an attitude that TPT as part of TB IPC was solely a role for HCWs who had received training while those who had no role to play. Difficulty in understanding written policy among facility managers thus making them feel ill-equipped to train their staff or clarify any misconceptions (Tan et al., 2020).

A study conducted in India found that the depth of knowledge of TB prevention and control among HCWs should be improved through regular infection control training (Janagond et al., 2017). Similarly, a study conducted in Israel found that medical recommendation that was perceived by HCWs as ambiguous was the main reason for not accepting LTBI treatment (Bar-Meir et al., 2021).

A different study conducted in South Africa found that 10 HCWs had acquired clinical TB during their period of employment, 62.8% were unaware of the hospital's TB management protocol and there was a need for improved coordination and uptake of TB infection prevention training (Malotle et al., 2017). This echoes the need for TB infection training as a means of improving the uptake of TPT.

Another study conducted in Ethiopia found that about 90% of the participants had not received TB infection prevention and control training ever, more than half (54%) of the study participants worked in poorly ventilated rooms and triage of coughing patients was not practiced in 32% of the studied facilities (Shiferaw et al., 2021).

Fear of side effects and perceived low risk of TB exposure are major barriers to HCWs accepting and completing TPT. HCWs' perceived risk towards themselves and those around them also played a role in the implementation of TBIPC. The HCWs who felt a

strong duty of care towards their patients were motivated to adhere to TBIPC measures (Tan et al., 2020).

Research in the United States explored the barriers to TPT among HCWs in hospitals. The study found that while infrastructure and resources were adequate, complacency due to the low prevalence of TB, fear of medication side effects, and lack of perceived risk were significant barriers. Additionally, there was a lack of continuous education on the importance of TPT (Stagg et al., 2014).

Another study done in the same country showed that HCWs often underestimate their risk of TB infection, leading to reluctance to initiate preventive therapy (Swift et al., 2020). Healthcare workers with liver disease or currently taking hepatotoxic drugs, those who have been employed for more than 20 years compared to those who had worked for 10 years and below were less likely to receive LTBI treatment due to the fear of drug interactions and the side effects brought about (Lee et al., 2019).

A different study conducted in the USA noted that female HCWs who were contemplating pregnancy had lower treatment and acceptance rates, fear of side effects, low perceived risk of TB, history of BCG vaccination and length of treatment were significant barriers to TPT (Swift et al., 2020). It was noted that the use of a combination treatment of isoniazid and rifapentine (RPT) given once weekly under directly observed therapy (DOT) for 3 months as an alternative to the 9 months Isoniazid standard of care showed favorable attention based on results from three randomized controlled trials (Abad et al., 2013).

A study conducted in India, a country with a high TB burden, investigated the challenges faced by HCWs in adhering to TPT. The study identified several barriers,

including lack of awareness and training about TPT, fear of side effects, and stigma associated with TB. HCWs also reported an insufficient supply of medications and poor implementation of TB control (Shewade et al., 2017).

In South Africa, a country with a high TB and HIV burden, researchers examined the barriers to TB preventive therapy among HCWs. Barriers included high workload, insufficient staffing, inadequate training on TB preventive therapy, fear of side effects, and stigma. The dual burden of HIV and TB further complicated adherence to preventive therapy among HCWs (Claassens et al., 2013).

A study in Nigeria focused on the implementation of TB preventive therapy among HCWs in healthcare facilities. Major barriers identified were lack of knowledge and awareness about TB preventive therapy, fear of adverse drug reactions, stigma, and inadequate supply of medications. Additionally, poor policy implementation and lack of training were significant issues (Ogbuabor & Onwujekwe, 2019).

A study in Uganda examined the barriers to TB preventive therapy among HCWs in public healthcare facilities. Barriers identified were insufficient funding for TB control programs, lack of continuous training for HCWs, fear of medication side effects, and stigma associated with TB. Poor implementation of TB prevention policies was also noted (Asiimwe et al., 2017).

In Tanzania, the focus was on the systemic and operational barriers to TB preventive therapy among HCWs. Significant barriers included inadequate healthcare infrastructure, lack of regular TB screening, insufficient training, and fear of side effects. There was also a reported lack of awareness and education on TB preventive therapy among HCWs (Mollel et al., 2019).

The study in Ethiopia explored the challenges faced by HCWs in accessing and adhering to TB preventive therapy. Barriers included limited resources for TB prevention, inadequate training on TB preventive therapy, fear of medication side effects, and lack of PPE. HCWs also reported high levels of occupational exposure due to insufficient preventive measures (Habteyes et al., 2020).

A study in Rwanda examined the effectiveness of TB preventive therapy among HCWs in public hospitals. The main barriers were inadequate training on TB preventive therapy, insufficient supply of medications, fear of side effects, and poor implementation of TB prevention guidelines. Additionally, stigma and discrimination deterred HCWs from adhering to preventive therapy (Uwimana et al., 2021).

2.3.5 Interventions to Improve Tuberculosis Prevention Among Healthcare Workers

2.3.5.1 Training and Capacity-building Initiatives.

Training HCWs in IPC measures and TB prevention strategies is essential for enhancing compliance with TPT and improving overall infection control practices. Studies have shown that structured training programs can significantly improve HCWs' knowledge and adherence to IPC guidelines (Tan et al., 2020).

2.3.5.2 Support Programs and Follow-Up.

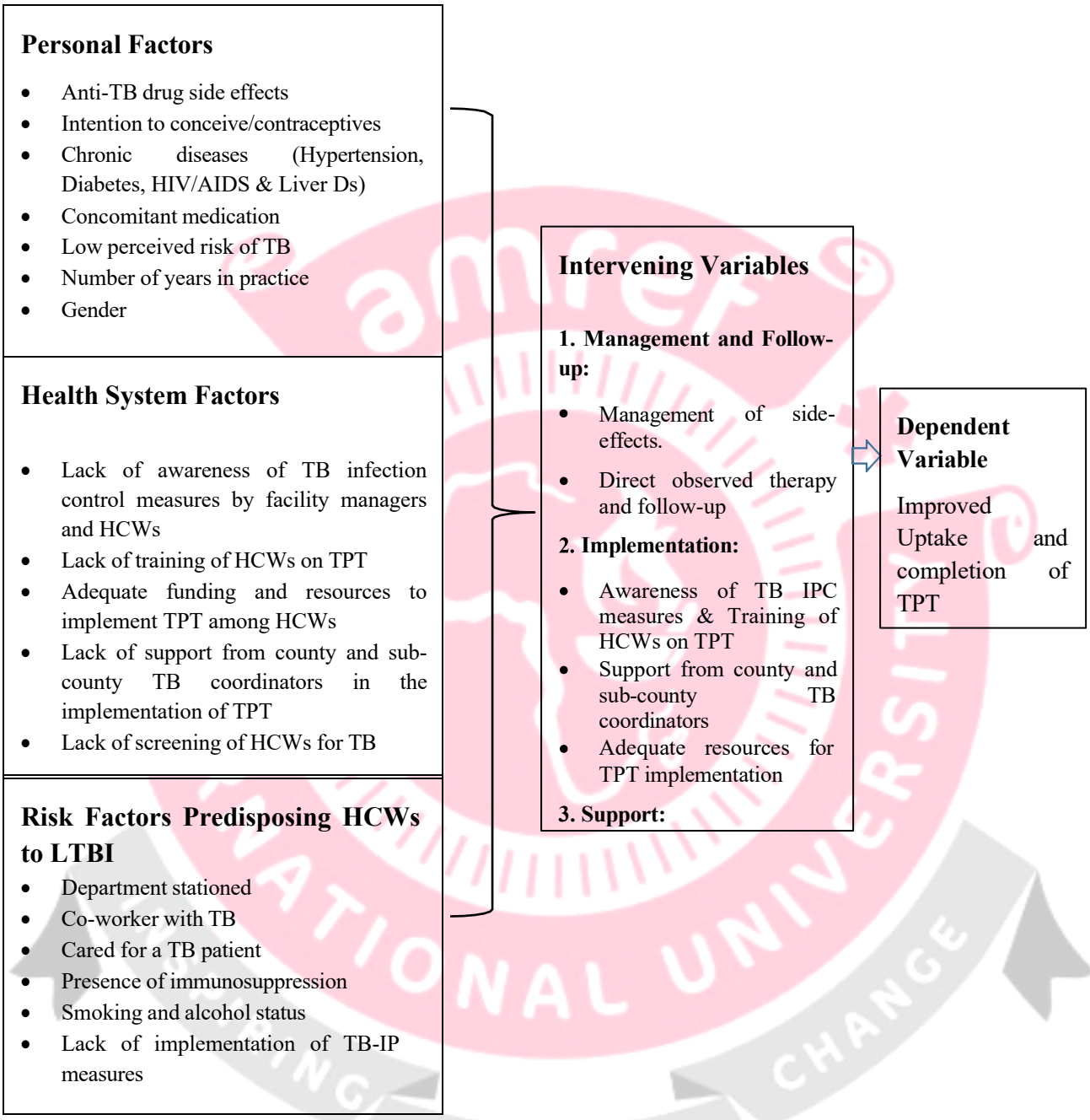
Implementing support programs such as LTBI screening among HCWs and structured follow-up mechanisms, such as pharmacist-managed clinics and regular counselling sessions, has been effective in improving HCWs' adherence to TPT and reducing TB transmission risks within healthcare settings. The most common reason for treatment discontinuation was a lack of follow-up in the majority of participants who were treated with the longest isoniazid regimen (Eastment et al., 2017).

Compliance with LTBI prevention treatment was however noted to be much higher in studies where more aggressive and systematic approaches were implemented. In a study done in the USA, the compliance rate was 80%, and there was active follow-up, consisting of physician counselling and monthly consultations with nurses from the hospital's occupational health department (Shukla et al., 2002). In a different study, a pharmacist-managed TB clinic was created to help improve compliance with the treatment of LTBI, which was a dismal 0.8%. The clinic provided monthly medication refills, face-to-face follow-up for the first three months, and monthly telephone interviews until completion of the regimen. Compliance rates improved to 90-100% after the intervention (Abad et al., 2013).

2.4 Identification of Knowledge Gap

Despite the substantial evidence supporting the effectiveness of Tuberculosis Preventive Therapy (TPT) among healthcare workers, there are significant gaps in the data, particularly within the current study area and country. Existing studies often focus on high TB burden countries and do not sufficiently address the local variations in healthcare infrastructure, TB prevalence, and the specific experiences and perceptions of healthcare workers in our region. Furthermore, there is limited data on barriers faced by healthcare workers in different settings within our country. This research aims to address these insufficiencies by providing localized evidence on the effectiveness of TPT, identifying specific challenges and facilitators in its implementation, and assessing the long-term outcomes for healthcare workers.

2.5 Conceptual Framework



Independent Variables

Source: Author 2023.

Figure 2: 2 Study Conceptual Framework

CHAPTER 3: METHODOLOGY

3.1 Introduction

This section describes the technique that was applied in this research. It describes the research area, study population, sampling techniques, sample size estimation, inclusion and exclusion criteria, data collection strategies, instrument validity and ethical considerations. It also describes the techniques for data processing and outcomes presentation.

3.2 Research Design

A cross-sectional study design that used mixed methods was used to collect both quantitative and qualitative data. Questionnaires were administered to HCWs to collect quantitative data. Key informant interviews and in-depth interviews were administered to the facility medical superintendent, and county and sub-county TB co-coordinators to collect qualitative data.

3.3 Study Area

The study was carried out in Nyandarua County, Kenya as shown in the map (appendix1). It lies within the Latitude: 0° 32' 59.99" N Longitude: 36° 36' 59.99" E. It is located in the Central region of Kenya. The total population is 638,289 as per the last census in 2019. The county has a total of 5 sub-counties namely: Kinangop (the largest with 8 administrative wards), Kipipiri (4 administrative wards), Ol Jorok (4 administrative wards), Ndaragwa (4 administrative wards) and Ol'Kalou (5 administrative wards). The county has a total of 193 health facilities spread across the 5 sub-counties. Kenya currently has a total of 14,251 health facilities; this translates to Nyandarua County having 1.35% of the country's total facilities. In the county, 7.3%

of these health facilities are faith-based (14), 44.6% belong to the Ministry of Health, 44.7% are private health facilities (92) and 0.5% are under NGOs (1). Among the health facilities under the Ministry of Health, there is one level 5 hospital JM Kariuki Hospital, which is the main referral hospital of the county, one level 4 hospital Engineer Hospital located in Kinangop sub-county, eight level 3 (health center) and 55 level two (dispensaries). Kinangop sub-county has 62 health facilities. This makes up 32% of the health facilities in the county and 0.44% of the total number in the county. Kipipiri sub-county has a total of 26 health facilities. This makes up 13% of the health facilities in the county and 0.18% of the total number in the county. Ol'Kalou sub-county has a total of 41 health facilities. This makes up 21% of the health facilities in the county and 0.29% of the total number in the county. Ol Jorok sub-county has a total of 31 health facilities. This makes up 16% of the health facilities in the county and 0.22% of the total number in the county. Ndaragwa sub-county has a total of 33 health facilities. This makes up 17% of the health facilities in the county and 0.23% of the total number in the county. The distribution of the health facilities in the sub-counties is shown in Table 1.

Table 1: Health Facilities in Nyandarua County

SUB-COUNTY	MINISTRY OF HEALTH FACILITIES	NON-GOVERNMENTAL ORGANIZATION	FAITH-BASED HOSPITALS	PRIVATE HOSPITALS
Kinangop	25	0	6	31
Kipipiri	14	1	6	31
Ol'Kalou	29	1	3	20
Ol Jorok	13	0	2	16
Ndaragwa	17	0	1	15

3.4 Study Population

Healthcare workers in the chosen sub-counties and health facilities were recruited as primary participants in the study. They were defined as those who are involved in the direct and indirect management of patients in the various departments of the hospital. Inclusion criteria for the health care workers included:

a) Those engaged in the care of all patients directly and indirectly for a minimum of 6 months in that facility. This included doctors, nurses, laboratory technicians, pharmacists and clinical officers.

Exclusion criteria for the HCWs:

a) Patient assistants and waste handlers.

3.5 Sampling

3.5.1 Sample size determination

The health facilities were chosen purposively, based on the high volume in the number of HCWs and the level of health facility, to ensure adequate data is collected. The high-volume facilities include J.M Kariuki County referral hospital which acts as the County's referral hospital (level 5) and is situated in Ol'Kalou sub-county, Engineer level 4 hospital located in Kinangop sub-county, Manunga Health Center a level 3 health facility located in Kipipiri sub-county and North Kinangop Catholic level 5 hospital which is the largest non-governmental health facility in the county and is located in Kinangop sub-county in North Kinangop ward. According to the current records of the chosen health facilities, the total number of HCWs is five hundred and two. The HCWs were distributed per sub-county hospital as illustrated in the figure below:

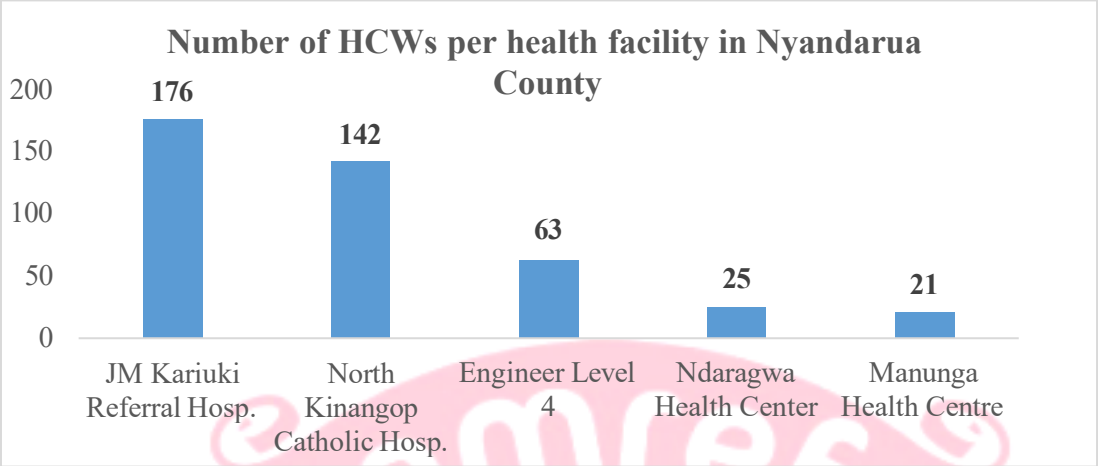


Figure 3: Healthcare Workers in Chosen Study Healthcare Facilities

Source: County-TB coordinator- Ol'Kalou Office (16/9/2022)

The Fisher exact formula for a population size of less than 10,000 was used to calculate the sample size of HCWs to be included in the study.

$$n = \frac{Z2pq}{d2}$$

n=desired sample size

Z=standard normal deviation usually set at 1.96, which corresponds to the 95% confidence interval

p= proportion of the target population estimated to have the characteristic of interest-50% (0.5)

d = the degree of accuracy desired-0.05 at 95% CI

q = 1 – p

$$nf = \frac{n}{1+n/N}$$

nf = computed sample size when the target is < 10,000

n = sample size when the population is greater than 10,000

N = the total target population

Total target population= 502

$$n = \frac{(1.96)2(0.5*0.5)}{(0.0.5)2} = 384$$

$$nf = \frac{384}{1+384/502} = 219 \text{ as the total sample size}$$

Sampling in the qualitative approach was conducted using purposive sampling, targeting key informants and in-depth interview participants. Key informant interviews targeted five medical superintendents or managers of each health facility. These participants were selected based on their administrative roles and knowledge regarding factors influencing the uptake and completion of TPT among HCWs. This enabled the gathering of insights from an administrative perspective on the factors influencing TPT uptake and completion rates within their respective health facilities. Participants for the in-depth interview included one County and four sub-county TB coordinators representing different sub-counties within Nyandarua County. These participants were chosen for their expertise in TB management and their broader perspective on TPT uptake and completion across the county. The purpose was to obtain expert opinions and understand the general challenges and strategies for enhancing TPT uptake and completion among HCWs in Nyandarua County.

3.5.2 Sampling procedure

Multistage sampling was done. The health facilities to be included in the study were identified through non-probability purposive sampling based on their high number of HCWs and the tier level of the health facility. This allowed for easier and more efficient identification of health facilities with a high number of healthcare workers, ensuring that the study targets relevant and information-rich settings. It also reduced the financial and logistical resources required compared to probability sampling methods, making it feasible within the study's budget and time constraints.

Non-probability sampling enabled the collection of detailed and context-specific data, enhancing the depth and relevance of the findings in the context of tuberculosis prevention therapy (TPT) uptake and completion. Proportional allocation of HCWs was employed per healthcare facility to identify the number of HCWs per hospital. HCWs were divided into different cadres and a proportionate number was chosen in each cadre with the questionnaires distributed randomly to the chosen participants.

Table 2: Proportional Distribution of Respondents per Facility

Health Facility	Total number of HCWs in the health facility	The number of HCWs Sampled
JM Kariuki Referral Hosp.	176	$\frac{219 \text{ x } 176}{427} = 90.2 \approx 90$
Engineer Level 4	63	$\frac{219 \text{ x } 63}{427} = 32.3 \approx 32$
North Kinangop Catholic Hosp.	142	$\frac{219 \text{ x } 142}{427} = 72.8 \approx 73$
Manunga Health Centre	21	$\frac{219 \text{ x } 21}{427} = 10.8 \approx 11$
Ndaragwa Health Center	25	$\frac{219 \text{ x } 25}{427} = 12.8 \approx 13$
Totals	**427**	**219**

Source: Author (25/1/2023)

3.6 Data Collection Procedures

Primary data was collected. Three instruments were employed for primary data collection: a structured questionnaire for quantitative data, a key informant interview guide and an in-depth interview guide for qualitative data.

3.6.1 Quantitative Data Collection Instrument

3.6.1.1 Structured Questionnaire

For the quantitative data collection, a pretested structured questionnaire (see Appendix 5) was employed. This questionnaire was designed by the principal investigator and adapted from previous literature and studies related to tuberculosis preventive therapy (TPT). It was administered to 219 healthcare workers (HCWs) to gather primary data.

The structured questionnaire included variables covering socio-demographic information, personal, and health systems factors together with risk factors for LTBI.

3.6.2 Qualitative Data Collection Instruments

3.6.2.1 Key Informant Interview Guide

The key informant interview guide (see Appendix 6) was utilized to conduct interviews with the medical superintendents or managers of each health facility. These interviews aimed to gather insights from an administrative perspective regarding the factors influencing the uptake and completion of TPT among HCWs. Information gathered included their experiences and views on how uptake and completion rates could be improved within their respective health facilities.

3.6.2.2 In-Depth Interview Guide

In-depth interviews (see Appendix 7) were conducted with TB experts, specifically the County and sub-county TB coordinators representing different sub-counties within the study area. These interviews provided a broader perspective on the factors influencing TPT uptake and completion across the county. Expert opinions were sought to understand general challenges and strategies for enhancing TPT uptake and completion among all HCWs in Nyandarua County.

3.7 Data Validity and Reliability

Two research assistants with relevant health backgrounds were recruited as data collectors and were trained by the principal investigator to ensure they were familiar

with the research purpose and the administration of interview guides and questionnaires. Daily supervision by the principal investigator provided feedback and addressed any inconsistencies during data collection. The study ensured the validity of the data by pre-testing the data collection tools before official data collection, targeting 5% of the sample size. To ensure validity 11 health workers were randomly chosen in the neighboring Ol-Jorok Sub-County in Nyandarua, specifically in Ol Jorok Health Centre and Gatimu Health Centre Level 3 Hospital however, the final results were not used in the final project. The tool was adjusted accordingly based on the findings from the pilot study to improve clarity. Data was checked daily by the lead researcher during the data collection duration for completeness. To minimize bias during data collection, qualitative data was collected from different sources, including key informant interviews (KIIs) with medical superintendents/managers and in-depth interviews (IDIs) with county and sub-county TB coordinators. This approach ensured diverse perspectives were captured, reducing the likelihood of bias from a single source. Standardized guides for KIIs and IDIs were used to ensure consistency in the questions asked, which minimized interviewer bias and allowed for comparability across interviews. Conducting interviews in private settings encouraged participants to provide honest and uninfluenced responses, reducing social desirability bias.

3.8 Data Collection Procedures

3.8.1 Quantitative Data Collection Procedures

Quantitative data collection procedures involved administering the pretested structured questionnaire to 219 HCWs. The questionnaires were distributed in person, and data collection was conducted systematically to ensure consistency and completeness of

responses. Each participant was briefed on the purpose of the study, and informed consent was obtained before questionnaire administration. Data were entered into a secure database for analysis following the completion of data collection.

3.8.2 Qualitative Data Collection Procedures

Qualitative data collection procedures encompassed conducting key informant interviews and in-depth interviews with relevant stakeholders. Key informant interviews were arranged with medical superintendents or managers, and conducted in private settings to ensure confidentiality. Similarly, in-depth interviews with TB experts, namely County and sub-county TB coordinators, were conducted to examine broader perspectives on TPT uptake and completion. Interviews were audio-recorded with participants' consent, transcribed verbatim, and analyzed thematically to identify key insights and recommendations.

3.9 Data Analysis and Presentation

3.9.1 Quantitative Data

Quantitative data were imputed directly into SPSS (Statistical Package for the Social Sciences) version 28 for analysis. Descriptive statistics such as frequency distribution tables were used for categorical data, while measures of central tendency such as mean, mode, and median, and measures of dispersion such as standard deviation were used for continuous data. Graphs and pie charts were used to present data where applicable. Bivariate analysis using chi-square was done to test for significance, and all independent variables with a p-value of ≤ 0.05 were retained for multivariate analysis.

Associations between independent variables and uptake and completion of TPT were established using a binary logistic regression model. A p-value < 0.05 and adjusted odds ratio (AOR) with 95% CI were considered statistically significant and used to determine predictors of uptake and completion of TPT in the final model. The final measure of the association was the odds ratio.

3.9.2 Qualitative Data

Qualitative data were collected through KII and IDI with five health facility managers and one county & four sub-county TB coordinators in Nyandarua County, Kenya. The interviews were conducted in a private setting to ensure confidentiality and encourage open, honest responses. All interviews were audio-recorded with the consent of the participants to ensure accurate data capture.

The audio recordings of the interviews were transcribed verbatim. This process was conducted manually to ensure the accuracy and integrity of the participant's responses. Manual transcription allowed for the capture of nuances and context-specific details that automated transcription might miss thus reducing bias in analysis. The transcribed data were analyzed using thematic analysis. Thematic analysis was chosen because it is a flexible method that allows for identifying, analyzing, and reporting patterns (themes) within the data. This method also allowed for an objective identification of themes and minimized subjective interpretation. It was particularly useful as well for exploring the perspectives of different participants, highlighting similarities and differences, and generating insights aligned with the study objectives.

Triangulation of the analyzed information from both quantitative and qualitative methods was conducted to enhance the validity and reliability of the findings. By comparing and contrasting quantitative data with qualitative insights, relationships were identified, and a comprehensive understanding of the uptake and completion of tuberculosis prevention therapy (TPT) among HCWs was developed. While the thematic analysis was conducted manually, NVivo software was also used to manage and organize the qualitative data efficiently. NVivo facilitated the coding process and helped visualize connections between themes, ensuring a systematic and rigorous analysis. Data was recorded using a recorder. Transcription from audio to text was done using the thematic analysis method to identify emerging themes related to the study objectives. Triangulation of qualitative findings with quantitative data helped cross-validate results and identify any discrepancies or convergences, enhancing the credibility and reliability of the study.

3.10 Ethical Consideration

The study was conducted in strict adherence to ethical principles, ensuring participants' rights and confidentiality were upheld throughout. Before data collection, ethical approval was obtained from the Amref Ethics and Scientific Review Committee (ESRC) and the National Commission for Science, Technology, and Innovation (NACOSTI). Permission to conduct the study was also obtained from Nyandarua County TB offices. Participants' informed consent was obtained in writing after a clear explanation of the study's purpose, procedures, and potential risks and benefits. It was emphasized that participation was voluntary, and participants could withdraw at any time without consequence. The voluntary nature of participation was underscored to

avoid any coercion or pressure. Participants were assured that their decision to participate or withdraw had no future repercussions.

To ensure data privacy and confidentiality, all personal identifiers were omitted from data collection tools, and interviews were conducted in private settings to protect participants' identities. Data were stored securely in password-protected laptops and physical documents were kept under lock and key. A data confidentiality form was signed by the principal investigator and team members involved in data handling to reinforce confidentiality measures. Throughout the study, compliance with relevant regulations, guidelines, and ethical standards was strictly adhered to. Measures were taken to minimize risks to participants, such as providing masks during interviews to mitigate potential COVID-19 transmission risks. There were no conflicts of interest that could have influenced the study's integrity or findings.

The study aimed not only to generate knowledge about TB infection prevention therapy (IPT) among healthcare workers but also to contribute to improving healthcare policies and practices. Findings were disseminated to stakeholders including Nyandarua TB offices, the Ministry of Health, and participating healthcare facilities. Additionally, the results were shared through peer-reviewed publications and conference presentations to support evidence-based decision-making and promote the health and safety of healthcare workers in similar settings.

3.11 Study Constraints and Limitations Management & organization of study

This study's robustness is underscored by its carefully selected sample size and systematic data collection methods. The sample of 219 Healthcare workers was chosen to provide a representative view across different health facilities in Nyandarua County, ensuring diversity in experiences and perspectives. A mixed-method approach was employed to capture a comprehensive range of factors influencing TPT uptake and completion among HCWs. Moreover, rigorous pretesting of data collection instruments was conducted to enhance data quality and validity, minimizing potential biases and ensuring the reliability of findings.

While the study's findings are valuable for informing local policies and practices within Nyandarua County, generalizability to broader contexts may be limited due to the specific geographic and demographic characteristics of the study population. External validity could be affected by variations in TB control programs and healthcare settings across different regions or countries. Resource limitations posed challenges during the study, potentially impacting the scope and depth of data collection. Looking ahead, future research could explore longitudinal studies to assess long-term adherence to TPT among HCWs, considering factors such as the sustainability of intervention strategies and evolving healthcare policies. Strengthening collaboration with national and international partners could enhance the external validity of findings, allowing for comparisons across diverse healthcare settings.

CHAPTER 4: RESULTS

4.1 Introduction

This research investigated the uptake and completion of tuberculosis prevention therapy among healthcare workers in Nyandarua County, Kenya. This chapter presents the research findings in subsections per the research objectives. The socio-demographic factors of the respondents were addressed before handling the four study objectives as they add value to the topic of investigation.

4.2 Characteristics of the Respondents

4.2.1 Socio-demographic Characteristics of Healthcare Workers

Nearly 41.10% of the respondents were from JM Kariuki Hospital while 33.33% were from North Kinangop catholic hospital as shown in Figure 4 below.

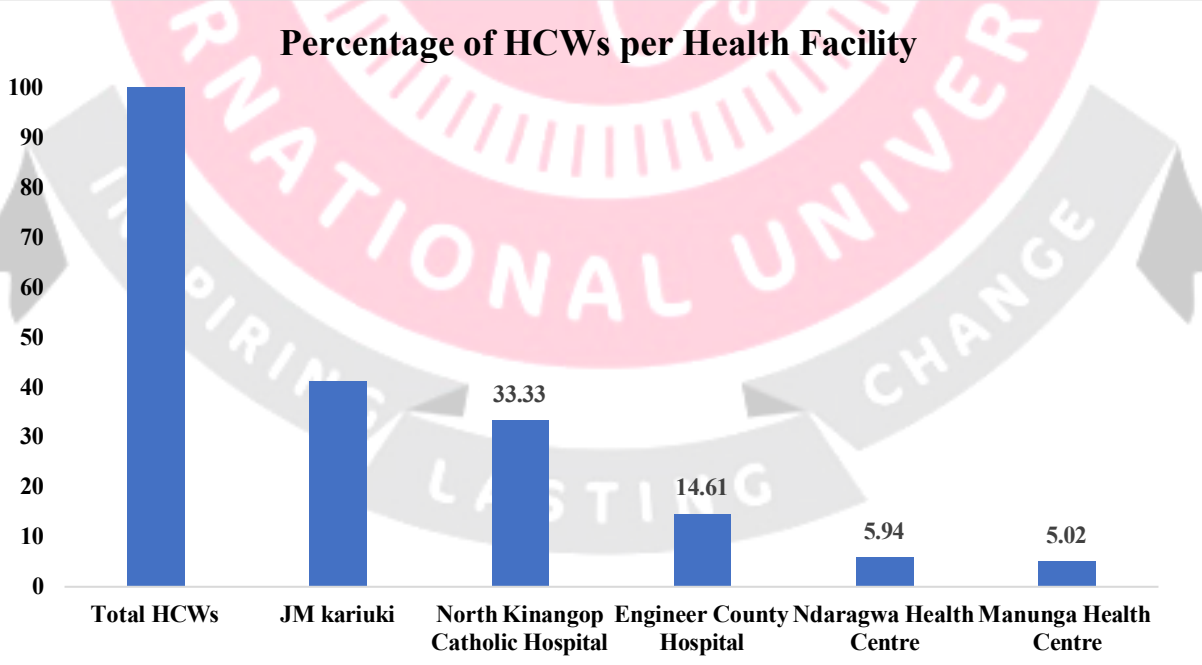


Figure 4: Percentage of HCWs per Health Facility

Source: County-TB coordinator- Ol'Kalou Office (16/9/2022)

The majority (74.89%) of the respondents were from level 5 health facilities as seen in Figure 5

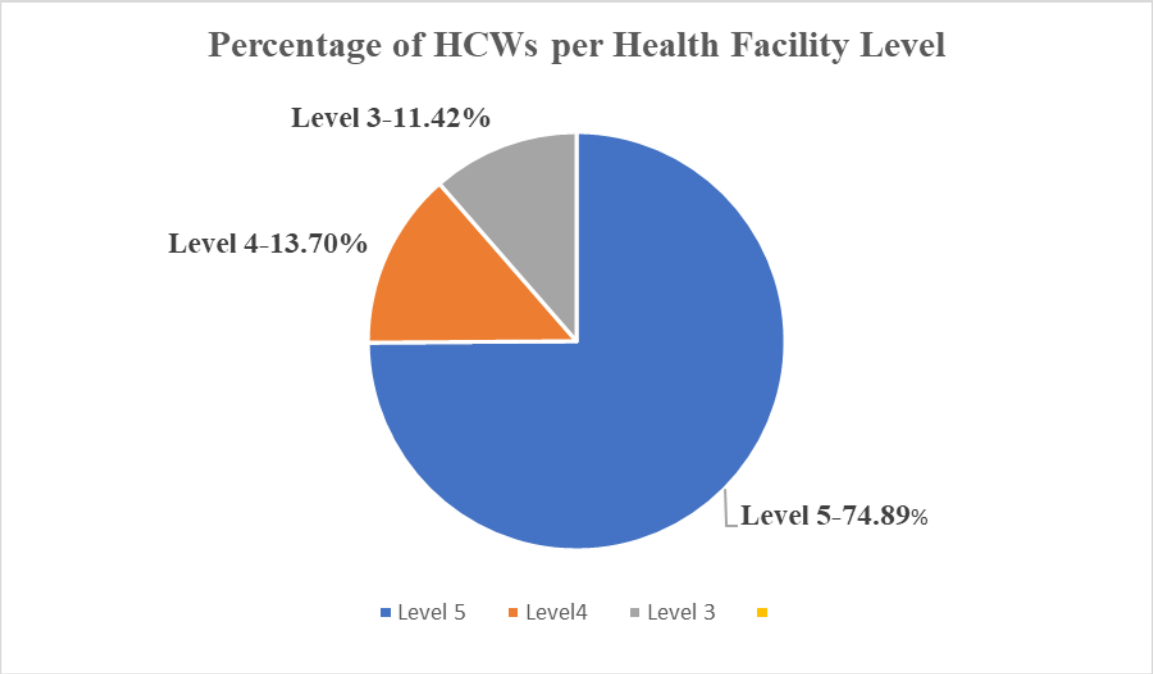


Figure 5: Percentage of HCWs per Health Facility Level

Source: County-TB coordinator- Ol'Kalou Office (16/9/2022)

Most respondents (63.93%) were females and most (59.82%) were nurses. Additional details on the socio-demographic characteristics are shown in Table 3.

Table 3: Socio-Demographic Characteristics of Healthcare Workers

Variable	Frequency	Percentage (%)
Gender		
Female	140	63.93%
Male	78	35.62%
Others	1	0.46%
Age		
Below 50 Years	199	90.87%
Above 50+ Years	20	9.13%
Carders		
Doctor	20	9.13%
Clinical officer	34	15.53%
Nurse	131	59.82%
Pharmacist	12	5.48%
Laboratory technician	22	10.05%
Department		
Out-patient	88	40.18%
Wards	131	59.82%

4.2.2 Characteristics of the Respondents of the Qualitative Component of the Research

The qualitative component of the study included 11 participants. They were divided into 3 categories: County, sub-county, and health facility representatives as seen in Table 4 below.

Table 4: Characteristics of the Respondents of the Qualitative Component of the Research

Characteristics of key informants	Frequency	Percentage
County TB Co-Ordinator	1	9%
Sub-County TB Co-Ordinator		
1. Ndaragwa	1	9%
2. Kinangop	1	9%
3. Kipipiri	2	18%
4. JM Kariuki	1	9%
Health Facility Representatives		
1. JM Kariuki	1	9%
2. North Kinangop	1	9%
3. Engineer	1	9%
4. Manunga	1	9%
5. Ndaragwa	1	9%

4.3 Personal Factors Influencing Uptake and Completion of Tuberculosis Prevention Therapy

4.3.1 Side Effects of Tuberculosis Prevention Therapy

Most respondents (74.43%), chose not to undergo TPT. Among the 25.57% who opted for TPT, the majority (80.36%) completed the prescribed dosage, while 16.07% did

not. Among those who underwent TPT, most (58.93%) reported experiencing side effects as shown in Figure 6 below.

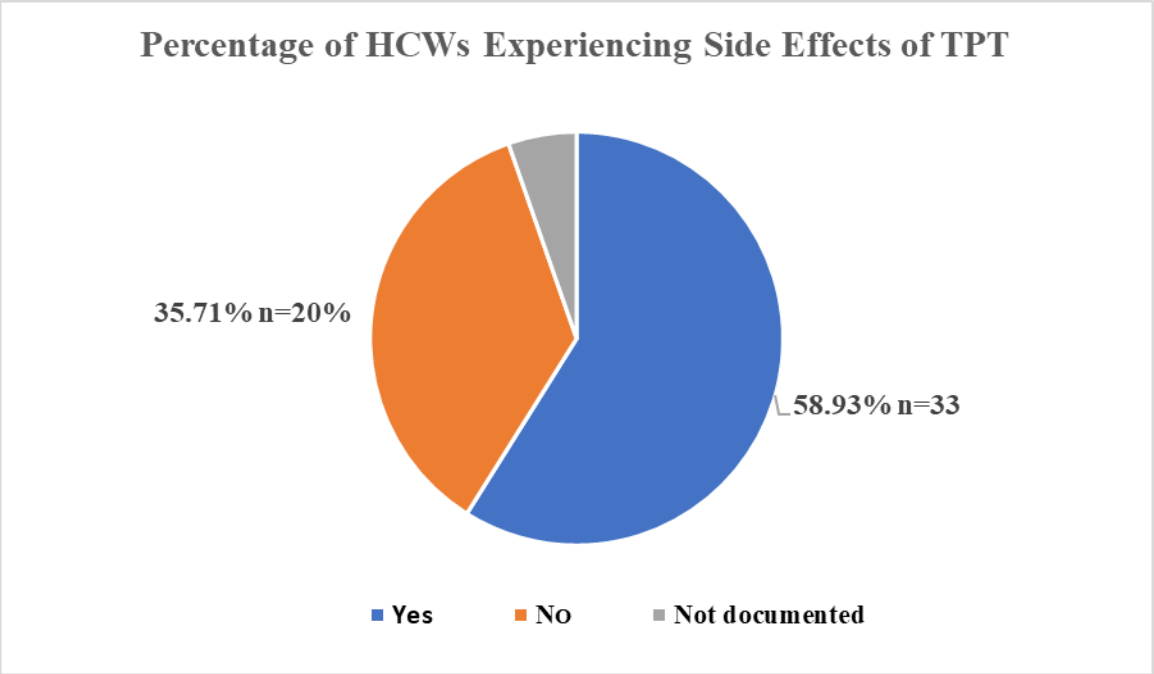


Figure 6: Percentage of HCWs who Experienced Side Effects

The most common side effects experienced by the respondents were changes in urine colour followed by nausea as seen in Figure 7.

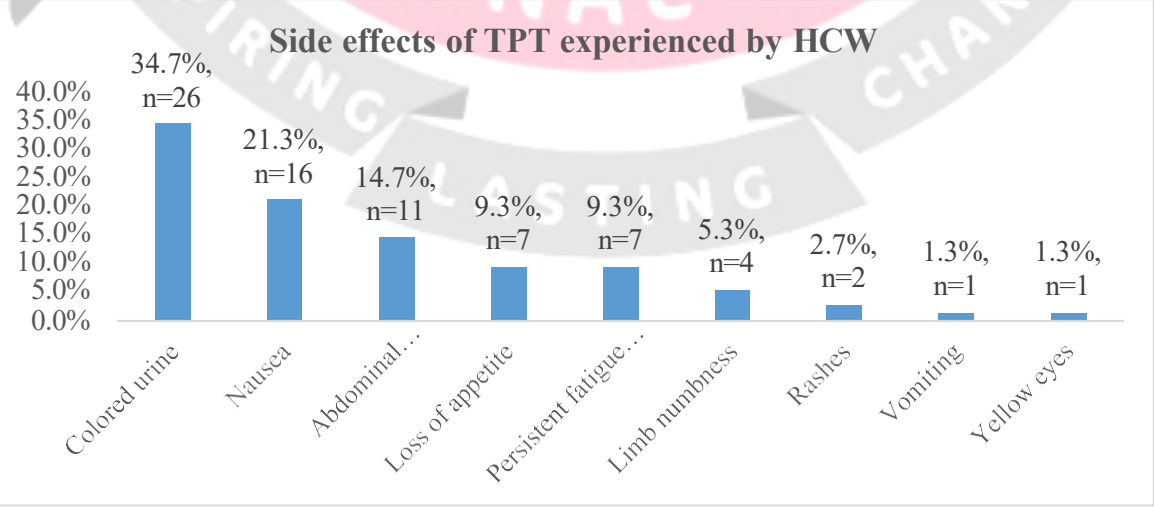


Figure 7: Proportion of Side Effects Experienced by HCWs on TPT

Other side effects such as loss of appetite, abdominal discomfort, persistent fatigue and weakness were statistically significant for completion of TPT as seen in Table 5.

Table 5: Side Effects Significant for Completion of TPT

Side Effect	Coef.	Std. Er.	p-value	95% Confidence Interval (C.I)	
				Lower	Upper
Loss of appetite	6.15	5.527	**0.043***	1.057	3.58
Abdominal discomfort	2.775	2.297	**0.018***	1.057	35.8
Colored urine	1.045	0.802	0.954	0.548	14.059
Limb numbness	2	2.449	0.571	0.232	4.705
Nausea	2.75	2.154	0.197	0.181	2.056
Persistent fatigue and weakness	6.15	5.527	**0.043***	0.592	1.768

*** Significant at P <0.05*

Statistical analysis indicated a significant link between side effects and completion of TPT (P=0.002) as shown in Table 6.

Fear of adverse drug reactions, such as the discolouration of urine and potential interactions with hormonal contraceptives, influenced the decision-making process. HCWs who feared side effects were more likely to be hesitant about initiating and completing TPT. Some HCWs expressed concerns about the pill burden and difficulties adhering to oral medication. This factor was identified as a challenge, particularly among those who found it hard to be on any medication. Some HCWs however felt the dosage regimen was favorable.

"The issue of dual family planning was not taken positively by female HCWs of reproductive age"

IDI, respondent.

"The once-weekly dosage motivated most HCWs to initiate TPT since the pill burden was reduced"

IDI, respondent.

HCWs with chronic diseases and those with existing medical conditions were cited as a factor for the lack of uptake of TPT as they were concerned about potential side effects. The fear of adverse drug reactions, such as the side effect of discolouration of urine, was mentioned as a factor negatively influencing the uptake and completion of TPT.

For instance, a respondent reported:

"I am already on medications for diabetes and hypertension, I don't want to add more medications, yet I am not at risk for LTBI"

KII, respondent.

4.3.2 Chronic Disease

Some HCWs reported having a chronic disease (16.61%). Among HCWs with chronic disease, the majority (71.9%) did not undergo tuberculosis preventive therapy (TPT). Among those who initiated TPT, only 17.78% completed the prescribed regimen. The reported chronic diseases encompassed eight categories as shown in Figure 8.

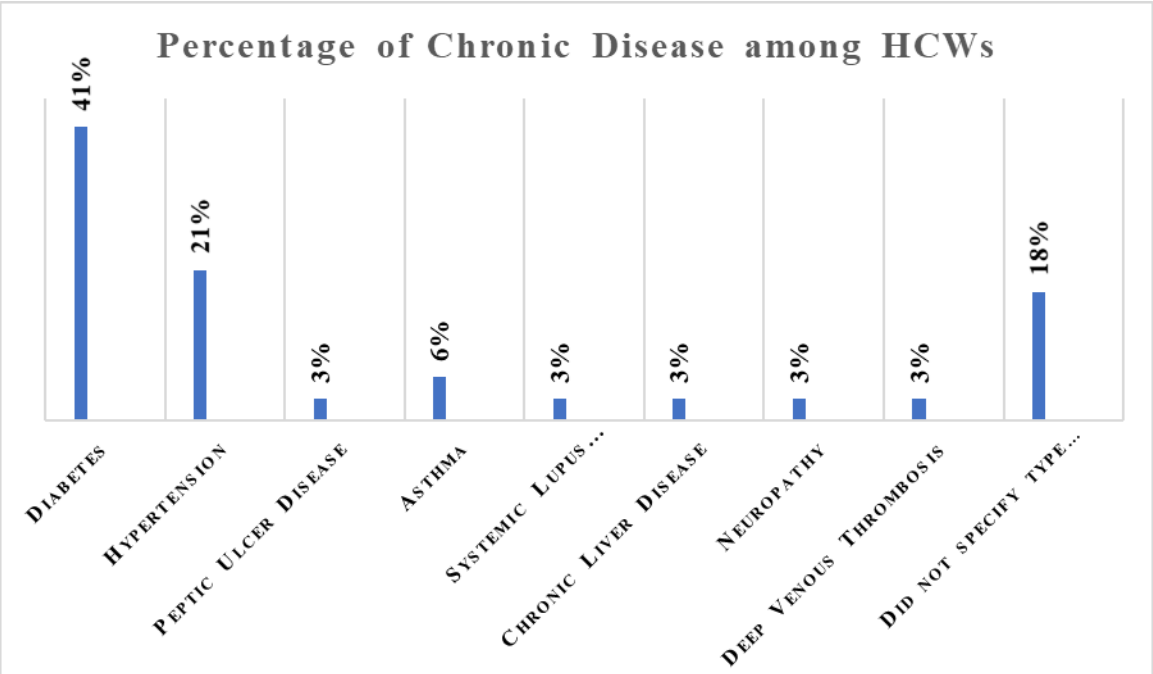


Figure 8: Percentage of Chronic Disease among HCWs

Statistical analysis showed no significance between chronic disease and uptake (P=0.720) and completion of TPT (P=0.725) as shown in Tables 5 and 6.

4.3.3 Perceived Risk of TB

The study revealed that a majority (53%) of respondents perceived their risk of contracting TB in the workplace as high shown in Figure 9.

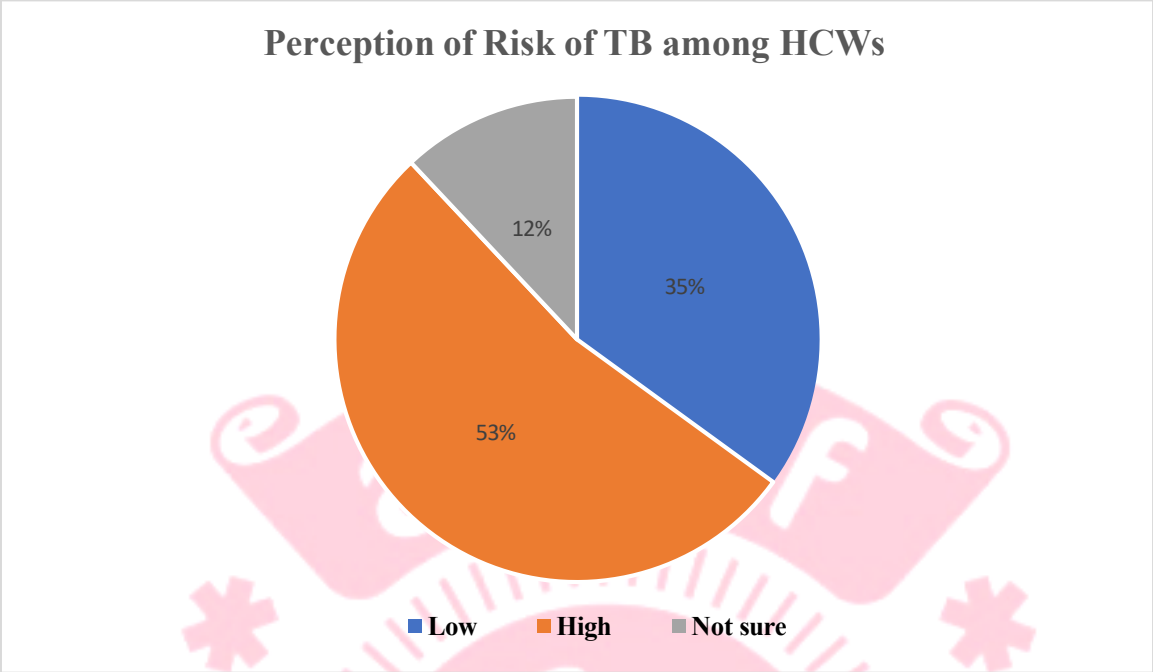


Figure 9: Perception of Risk of TB among HCWs

The uptake of TPT was below average. Among those who perceived their risk as high, only 30% initiated TPT. Among those who classified their risk as low, only 25% initiated TPT, and among those who were unsure, only 7% initiated TPT.

However, completion was above average among those who initiated TPT. The majority (74%) of respondents who perceived their risk as high completed their prescribed dose. A majority (89%) of those who perceived their risk as low completed TPT. Interestingly, 100% of those who were unsure of their risk completed their TPT regimen.

Statistically, there was a significant association between the perceived risk of TB and completion (P=0.019) but there was no significant association between perceived risk and uptake (P=0.05) as seen in Table 4.5 and Table 4.6.

4.3.4 Number of Years in Practice

Uptake was below average among both groups. Only 23% of HCWs practising for 10 years or less initiated TPT, while 29% of HCWs practising for over 10 years initiated TPT. However, completion was above average, with 74% of HCWs who have practised for 10 years or less completing TPT and 88% of HCWs who have practised for over 10 years completing TPT. Statistical analysis revealed no significant association between years of practice and both TPT uptake (P=0.3) and completion (P=0.5), as shown in Table 5 and Table 6.

4.3.5 Gender

There was sub-optimal uptake across the genders. Only 25% of females and 26% of males initiated TPT. Completion was above average among both genders with over 80% completion rates.

There was however no statistical significance between gender and uptake (P=0.4) and completion (P=0.3) as shown in Table 5 and Table 6.

4.3.6 HIV status

Most (96.8%) of the respondents were aware of their HIV status. Among those who knew their HIV status only 25% initiated TPT and only 20% of the respondents who were unaware of their HIV status initiated TPT. Regarding completion of TPT, a majority (81%) of respondents who knew their HIV status and initiated TPT completed their dose. None of those who were unaware of their status completed the dose.

Statistical analysis revealed a significant association between HIV status and TPT uptake (P<0.001), but not completion (P=0.4) as shown in Table 5 and Table 6.

4.3.7 Importance of TPT

The majority (90.4%) of respondents reported finding TPT important in preventing LTBI. Out of those who considered it important, only 26% initiated TPT. Among respondents who did not think TPT was important, only 17% initiated TPT, and 33.3% of respondents who were unsure of the importance of TPT initiated TPT. Regarding completion, the majority (78%) of those who considered TPT important and initiated it completed the dose. All respondents who initiated TPT despite not considering it important completed the dose, as did all respondents who were unsure of its importance. Statistically, there was a significant association between the importance of TPT and uptake (P<0.001), but none with completion (P=0.9) as shown in Table 5 and Table 6.

The table below shows a summary of all personal factors and their significance in influencing the uptake of TPT.

Table 6: Personal Factors Influencing Uptake of Tuberculosis Prevention Therapy

	Uptake of TB Treatment			
	Yes n (%)	**No n (%)**	**Total n (%)**	**P-value**
Chronic Disease				
Yes	9 (28.1%)	23 (71.9%)	32 (14.6%)	
No	47 (25.1%)	140 (74.9%)	187 (85.4%)	0.720
Total n (%)	56(25.6%)	163 (74.4%)	219 (100%)	
Perceived Risk				**0.05****
High	35 (30.2%)	81 (69.8%)	116 (53%)	
Not sure	2 (7.4%)	25 (92.6%)	27 (12.3%)	
Low	19 (25%)	57 (75%)	76 (34.7%)	
Total n (%)	56 (25.6%)	163 (74.4%)	219 (100%)	
Years in Practice				0.3
Below 10 years	31 (23.3%)	102 (76.7%)	133 (60.7%)	
Above 10 years	25 (29.1%)	61 (70.9%)	86 (39.3%)	
Total n (%)	56 (25.6%)	163 (74.4%)	219 (100%)	
Gender				0.4
Female	35 (25%)	105 (75%)	140 (63.9%)	
Male	20 (25.6%)	58 (74.4%)	78 (35.6%)	
Others	1 (100%)	0 (0%)	1 (0.5%)	
Total n (%)	56 (25.6%)	163 (74.4%)	219 (100%)	
HIV status				**<0.001****
Yes	54 (25.5%)	158 (74.5%)	212 (96.8%)	
No	1 (20%)	4 (80%)	5 (2.2%)	
Not disclosed	1 (50%)	1 (50%)	2 (1%)	
Total n (%)	56 (25.6%)	163 (74.4%)	219 (100%)	
Importance of TPT				**<0.001****
Yes	51 (26%)	147 (74%)	198 (90.4%)	
No	3 (17%)	15 (83%)	18 (8.2%)	

Not disclosed	2 (66.7%)	1 (33.3%)	3 (1.4%)
Total n (%)	56 (265)	163 (74%)	219 (100%)

*** Significant at P <0.05*

The table below shows a summary of all personal factors and their significance in influencing the completion of TPT.

Table 7: Personal Factors Influencing Completion of Tuberculosis Prevention Therapy

	Completion of TB Treatment				
	Yes n (%)	**No n (%)**	**Not documented n (%)**	**Total n (%)**	**P value**
Experience of side effects					**0.002****
Yes	26 (78.8%)	6 (18.2%)	1 (3%)	33 (58.9%)	
No	19 (95%)	1 (5%)	0 (0%)	20 (35.7%)	
Not documented	0 (0%)	2 (66.7%)	1 (33.3%)	3 (5.4%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	56 (100%)	
Chronic Disease					0.725
Yes	8 (88.9%)	1 (11.1%)	0 (0%)	9 (16.1%)	
No	37 (78.7%)	8 (17%)	2 (4.3%)	47 (83.9%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	56 (100%)	
Perceived Risk					**0.019****
High	26 (74.3%)	9 (25.7%)	0 (0%)	35 (62.5%)	
Not sure	2 (100%)	0 (0%)	0 (0%)	2 (3.6%)	
Low	17 (89.5%)	0 (0%)	2 (10.5%)	19 (33.9%)	
Total n (%)	45(80%)	9 (16%)	2 (4%)	56 (100%)	

Years in Practice					
Below 10 years	23 (74.2%)	6 (19.4%)	2 (6.5%)	31 (55.4%)	0.5
Above 10 years	22 (88%)	3 (12%)	0 (0%)	25 (44.6%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	56 (100%)	
Gender					0.3
Female	29 (83%)	6 (17%)	0 (0%)	35 (62.5%)	
Male	16 (80%)	4 (20%)	0 (0%)	20 (35.7%)	
Others	1 (0%)	0 (0%)	0 (0%)	1 (1.8%)	
Total n (%)	45 (80%)	11 (20%)	0 (0%)	56 (100%)	
HIV status					0.4
Yes	44 (81%)	8 (15%)	2 (4%)	54 (96.4%)	
No	0 (0%)	1 (100%)	0 (0%)	1 (1.8%)	
Not disclosed	1 (100%)	0 (0%)	0 (0%)	1 (1.8%)	
Total n (%)	45 (80%0	9 (16%)	2 (4%)	56 (100%)	
Importance of TPT					>0.9
Yes	40 (78%)	9 (18%)	2 (4%)	51 (91.1%)	
No	3 (100%)	0 (0%)	0 (0%)	3 (5.4%)	
Not disclosed	2 (100%)	0 (0%)	0 (0%)	2 (3.5%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	56 (100%)	

*** Significant at P <0.05*

4.4 Health System Factors Influencing Uptake and Completion of TPT

4.4.1 Cadre

The study encompassed five distinct healthcare cadres. Uptake was below 50% across all cadres, with doctors having the lowest percentage at 15%, while pharmacists had the highest at 33% as shown below.

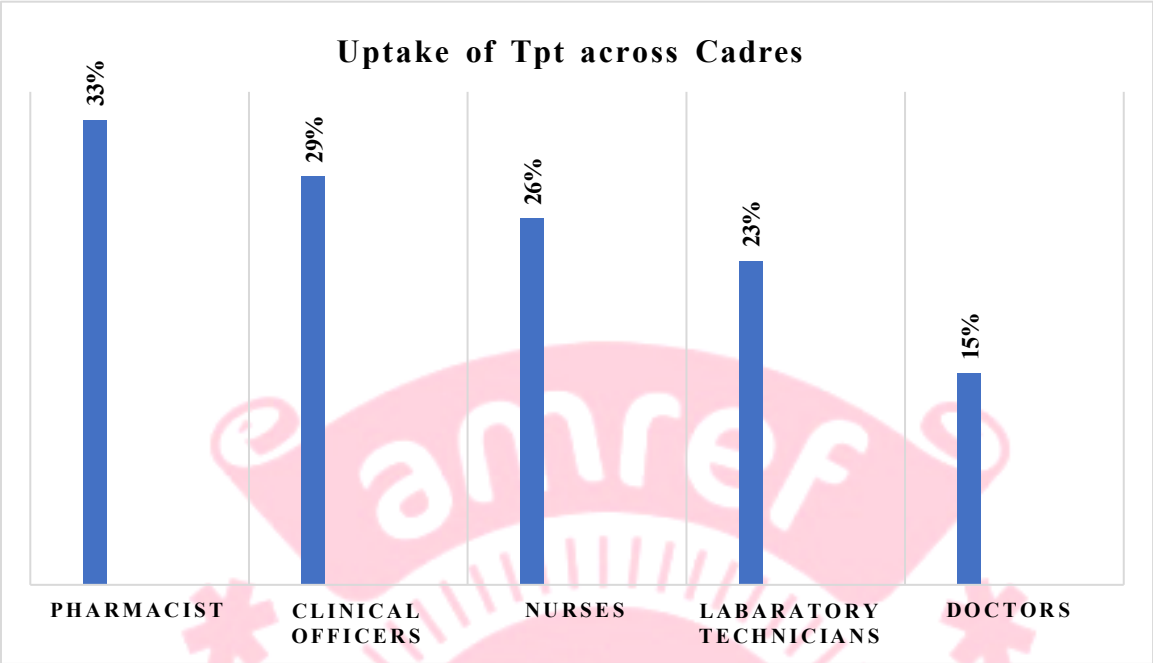


Figure 10: Uptake of TPT across Cadres

Completion was above average across the cadres. The cadres with the highest completion rate were the clinical officers and laboratory technicians with 100% completion rates with doctors having the lowest at 67%. Figure 11 shows completion rates across the cadres

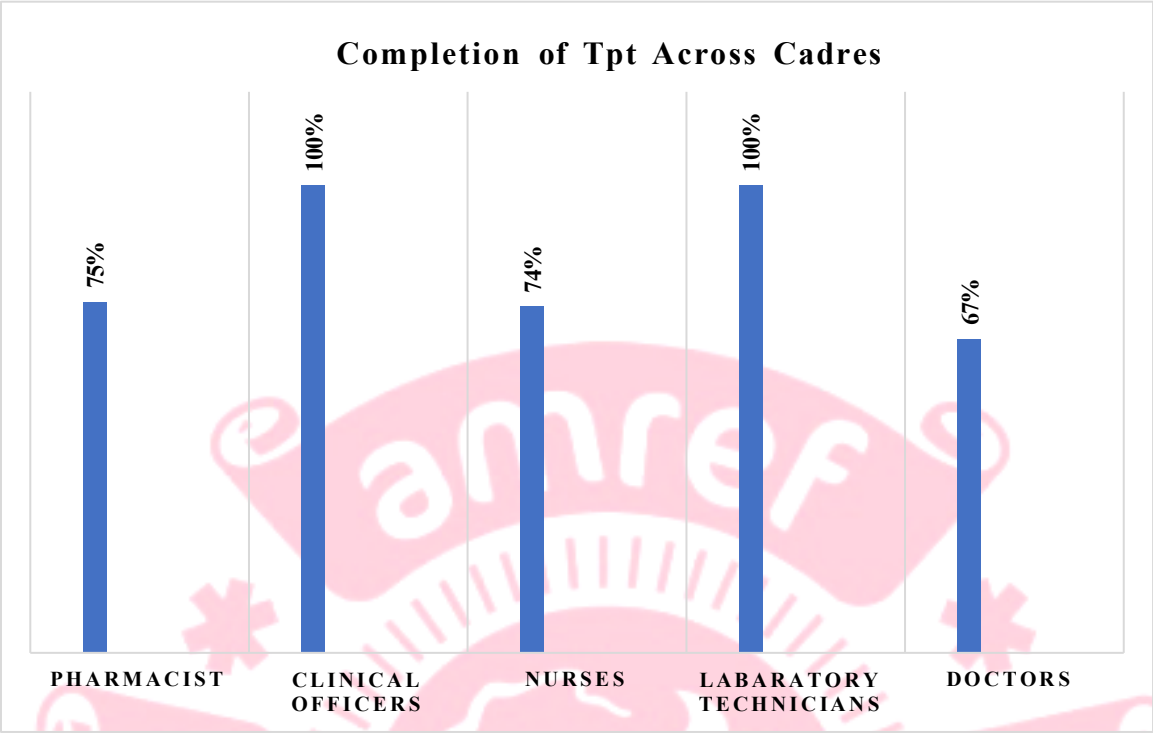


Figure 11: Completion of TPT across Cadres

Statistical analysis indicated no significant association between cadre and both TPT uptake (P=0.8) and completion (P=0.2) as shown in Table 7 and Table 8.

4.4.2 Tuberculosis Screening

A majority (60.7%) of healthcare workers (HCWs) have undergone TB screening. Statistical analysis revealed a significant association between TB screening and uptake of TPT (P=0.046) however, there was no statistical significance observed in completion rates of TPT (P=0.4) as shown in Table 7 and Table 8.

4.4.3 Facility

The majority (74%) of HCWs across the five different facilities did not take up TPT while 26% did take up TPT. There was a significant association between facility and uptake (P=0.001) as shown in Table 12 however, there was no significant association when it comes to facility and completion of TPT (P=0.826) as shown in Table 18.

4.4.4 Awareness and/or Training

Only 44.3% of HCWs had received some form of awareness or training on TPT. However, the majority (96%) of those who underwent training or a form of awareness did not initiate TPT. Among those who initiated TPT, half (50%) did not complete the regimen. Of the HCWs who did not undergo any training, only 43% initiated TPT, but the completion rate among those who initiated it was 85%. Statistical analysis demonstrated a significant association between training/awareness and both the uptake (P=0.001) and completion (P=0.0014) of TPT, as shown in Table 7 and Table 8.

4.4.5 Screening for TB

Among the respondents, 61% have ever been screened for TB. Of the 39% who have never screened, 71% did not initiate tuberculosis preventive therapy (TPT). Conversely, among HCWs who were screened, 81% did not initiate TPT. Regarding completion, among HCWs who were screened and initiated TPT, the majority (84%) did not complete their dosage. For HCWs who were not screened but initiated TPT, 73% did not complete their dosages. Statistically, a significant association was observed between screening and uptake (P=0.046), but no significance was observed for completion (P=0.4) as shown in Table 7 and Table 8.

4.4.4 Follow-up

More than half (55%) of healthcare workers (HCWs) who initiated tuberculosis preventive therapy (TPT) stated they had some form of follow-up during their dosage duration, while 41% did not have any form of follow-up. Completion was above average for both groups, with 87% of HCWs with some form of follow-up completing their dosage and 74% of HCWs without any form of follow-up completing theirs.

Statistically, a significant association was found between follow-up and both the uptake (P=0.001) and completion (P=0.052) of TPT, as shown in Table 7 and Table 8.

The table below shows a summary of all health system factors and their significance in influencing the uptake of TPT.

Table 8: Health System Factors Influencing Uptake of TPT

	Uptake of TB Treatment			
	Yes n (%)	**No n (%)**	**Total n (%)**	**P-value**
Cadre				0.8
Doctor	3 (15%)	17 (85%)	20 (9.1%)	
Clinical officer	10 (29.4%)	24 (70.6%)	34 (15.5%)	
Nurse	34 (26%)	97 (74%)	131 (59.8%)	
Pharmacist	4 (33%)	8 (67%)	12 (5.4%)	
Laboratory technician	5 (23%)	17 (77%)	22 (10.2%)	
Total n (%)	56 (26%)	163 (74%)	219 (100%)	
TB Screening				
Yes	38 (29%)	95 (71%)	133 (60.73%)	**0.046****
No	15 (19%)	66 (81%)	81 (36.00%)	
N/A	3 (60%)	2 (40%)	5 (3.27%)	
Total n (%)	56 (26%)	163 (74%)	219 (100%)	
Training and/or Awareness				**<0.001****
Yes	4 (4.1%)	93 (96%)	97 (44.29%)	
No	52 (43%)	70 (57%)	122 (55.71%)	
Total n (%)	56 (26%)	163 (74%)	219 (100%)	
Follow-up				
Yes	31 (55%)	73 (45%)	104 (47.5%)	**<0.001****
No	25 (41%)	90 (59%)	115 (52.5%)	
Total n (%)	56 (26%)	163 (74%)	219 (100%)	

** *Significant at P <0.05*

The table below shows a summary of all health system factors and their significance in influencing the completion of TPT.

Table 9: Health System Factors Influencing Completion of TPT

	Completion of TB Treatment				
	Yes n (%)	**No n (%)**	**Not documented n (%)**	**Total n (%)**	**P-value**
Cadre					0.2
Doctor	2 (67%)	0 (0%)	1 (33%)	3 (5.4%)	
Clinical officer	10 (100%)	0 (0%)	0 (0%)	10 (17.8%)	
Nurse	25 (74%)	8 (24%)	1 (3%)	34 (60.7%)	
Pharmacist	3 (75%)	1 (25%)	0 (0%)	4 (7.1%)	
Laboratory technician	5 (100%)	0 (0%)	0 (0%)	5 (8.9%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	219 (100%)	
Ever Screened for TB					0.4
Yes	6 (16%)	32 (84%)	0 (0%)	38 (67.9%0	
No	4 (27%)	11 (73%)	0 (0%)	15 (26.8%)	
N/A	1 (33%)	2 (67%)	0 (0%)	3 (5.4%)	
Total n (%)	45 (80%)	11 (20%)	0 (0%)	219 (100%)	
Awareness and training					
Yes	1 (25%)	2 (50%)	1 (25%)	4 (7.1%)	**0.014****
No	44 (85%)	7 (13%)	1 (2%)	52 (92.9%)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	219 (100%)	
Follow up					
Yes	27 (87%)	3 (10%)	1 (3%)	31 (55.36)	
No	17 (74%)	6 (26%)	0 (0%)	23 (41.07)	**0.052****
N/A	1 (50%)	0 (0%)	1 (50%)	2 (3.57)	
Total n (%)	45 (80%)	9 (16%)	2 (4%)	219 (100)	
Facility					0.826
Engineer County Hospital	5 (83%)	1 (17%)	0 (0%)	6 (10.7%)	
JM Kariuki Hospital	15 (79%)	4 (21%)	0 (0%)	19 (34%)	
Manunga Health Centre	9 (90%)	1 (10%)	0 (0%)	10 (18%)	
Ndaragwa Health Centre	8 (80%)	1 (10%)	1 (10%)	10 (18%)	
North Kinangop Catholic Hospital	8 (73%)	2 (18%)	1 (9%)	11 (20%)	
Total n (%)	8 (73%)	2 (18%)	1 (9%)	219 (100%)	

*** Significant at P <0.05*

4.5 Personal and Health System Factors Influencing Uptake and Completion of TPT

4.5.1 Personal and Health System Factors Influencing Uptake of TPT

All six significant personal and health system variables for uptake of TPT, from the chi-square test, were used to conduct a binary logistic regression analysis as shown in Table 9. The logistic regression model exhibited statistical significance $\chi 2 = 0.000$, $p < .05$. The model accounted for 67.8% of the variation in the uptake of TPT among HCWs and accurately identified 83.62% of occurrences.

Table 10: Personal and Health System Factors Influencing Uptake of TPT

Data variables	Odds Ratio(OR)	P-value	95% Confidence Interval	
			Lower	Upper
Facility				
JM Kariuki Hospital	Ref			
Engineer County Hospital	0.9	0.918	0.339	2.647
Manunga Health Centre	37.9	**0.001****	4.563	4.920
Ndaragwa Health Centre	9.5	**0.000****	2.674	3.356
North Kinangop Catholic Hospital	0.7	0.341	0.297	1.521
Awareness and training				
Yes	Ref			
No	0.1	**0.000****	0.020	0.168
Perceived risk				
I Am Not Sure	Ref			
High	5.4	**0.027***	1.213	1.3058
Low	4.2	0.068	0.901	1.926
TB screening				
Yes	Ref			

No	0.6	0.101	0.289	1.116
HIV status				
Yes	Ref			
No	0.7	0.774	0.079	6.606
Perceived importance				
Yes				
No	0.5	0.314	0.146	1.856

***Significant at P<0.05*

Three significant variables from binary logistic regression, namely facility, awareness and/or training and perceived risk were run through a multivariate analysis as shown in Table 4.11. HCWs working in Manguga Health Centre were 28.4 times more likely to initiate TPT compared to those working in JM Kariuki Hospital (OR 28.4, 95% CI 2.763-2.912). Similarly, HCWs from Ndaragwa Health Center were 5.7 times more likely to initiate TPT compared to those working in JM Kariuki Hospital (OR 5.7, 95% CI 1.425-2.316).

HCWs who did not go through any form of awareness and/or training were 0.1 times less likely to initiate TPT compared to those who went through awareness creation and training (OR 0.1, 95% CI 0.018-0.193).HCWs whose perception of TB infection was high were 7.2 times more likely to initiate TPT compared to those who were not sure about their risk (OR 7.2, 95% CI 1.143-4.508).

Table 11: Personal and Health System Factors Influencing Uptake of TPT

Data Variables	Odds Ratio(OR)	P-value	95% Confidence Interval	
			Lower	Upper
Facility				
JM Kariuki Hospital	Ref			
Engineer County Hospital	0.7	0.577	0.235	2.240
Manunga Health Centre	28.4	**0.005****	2.763	2.912
Ndaragwa Health Centre	5.7	0.014	1.425	2.316
North Kinangop Catholic Hospital	0.9	0.887	0.367	2.37
Awareness & Training				
Yes	Ref			
No	0.1	**0.000****	0.018	0.193
Perceived risk	0			
I am not sure	Ref			
High	7.2	**0.036***	1.143	4.508
Low	3	0.258	0.450	1.483

***Significant P<0.05*

4.5.2 Personal and Health System Factors Influencing Completion of TPT

All four significant personal and health system variables for completion of TPT, from the chi-square test, were used to conduct a binary logistic regression analysis as shown in Table 12. The logistic regression model exhibited statistical significance $\chi 2 = 0.0118$, $p < .05$. The model accounted for 60.42% of the variation in the completion of TPT among HCWs and accurately identified 74.57% of occurrences. Only one variable remained significant. HCWs who had a form of awareness and/or training were 16.5 times more likely to complete TPT compared to those with awareness and training (OR 16.5 95% CI 1.519-1.792).

Table 12: Personal and Health System Factors Influencing Completion of TPT

Data Variables	Odds Ratio (OR)	P-value	95% Confidence Interval (C.I)	
			Lower	Upper
Awareness training				
No	Ref			
Yes	16.5	**0.021****	1.519	1.792
Perceived risk				
I Am Not Sure	Ref			
High	2.9	0.200	0.565	1.531
Low	Omitted			
Side effects				
Presence of SE	Ref			
Absent of SE	0.2	0.142	0.022	1.725
Close Follow up				
Yes	Ref			
No	2.4	0.225	0.586	0.969

***Significant P<0.05*

4.6 Risk Factors Predisposing HCWs to LTBI

4.6.1 Co-worker with TB

A majority (72%) of the respondents had never had a co-worker diagnosed with TB as shown in Figure 12.

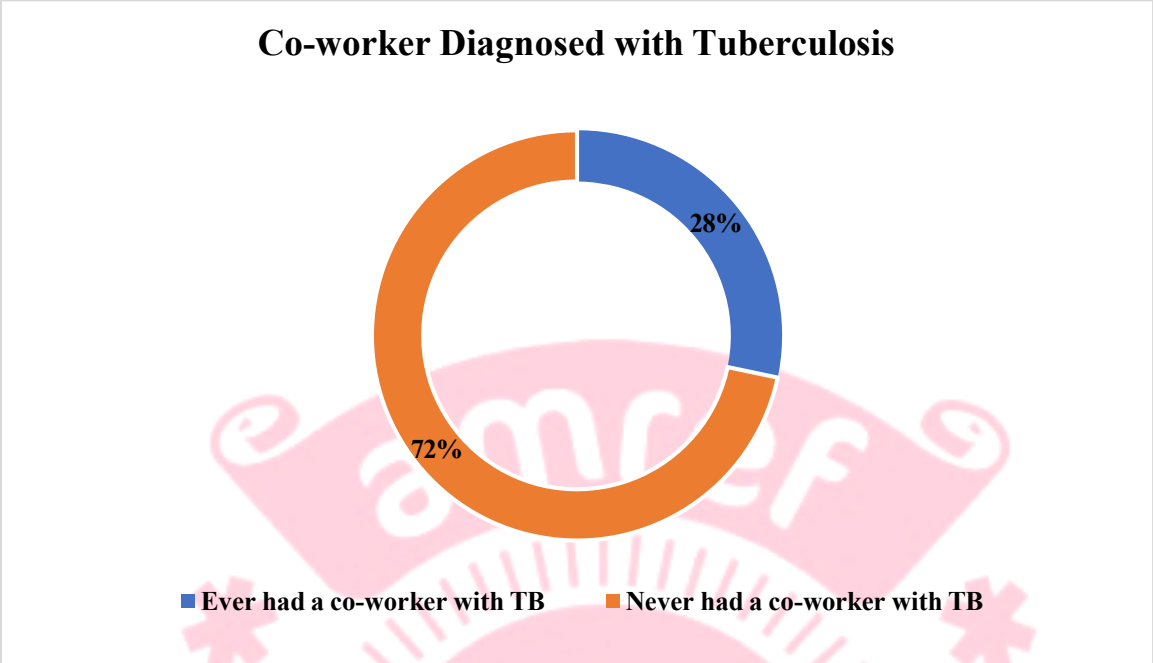


Figure 12: Co-worker Diagnosed with Tuberculosis

Uptake of TPT among the two groups was below average. However, uptake was higher (43.5%) among HCWs who had ever had a co-worker diagnosed with TB compared to those who had never (18.5%). Completion was equally below average, with only 18.6% of HCWs who have ever had a co-worker diagnosed with TB completing and 20.7% of HCWs who have never had a co-worker diagnosed with TB completing TPT. Having a co-worker with TB was statistically significant for uptake as shown in Table 4.12 however, it was not for completion of TPT as shown in Table 4.13.

4.6.2 Wearing of mask

A majority (66%) of the respondents reported wearing a mask while in the health facility and when attending to patients as shown in Figure 13.

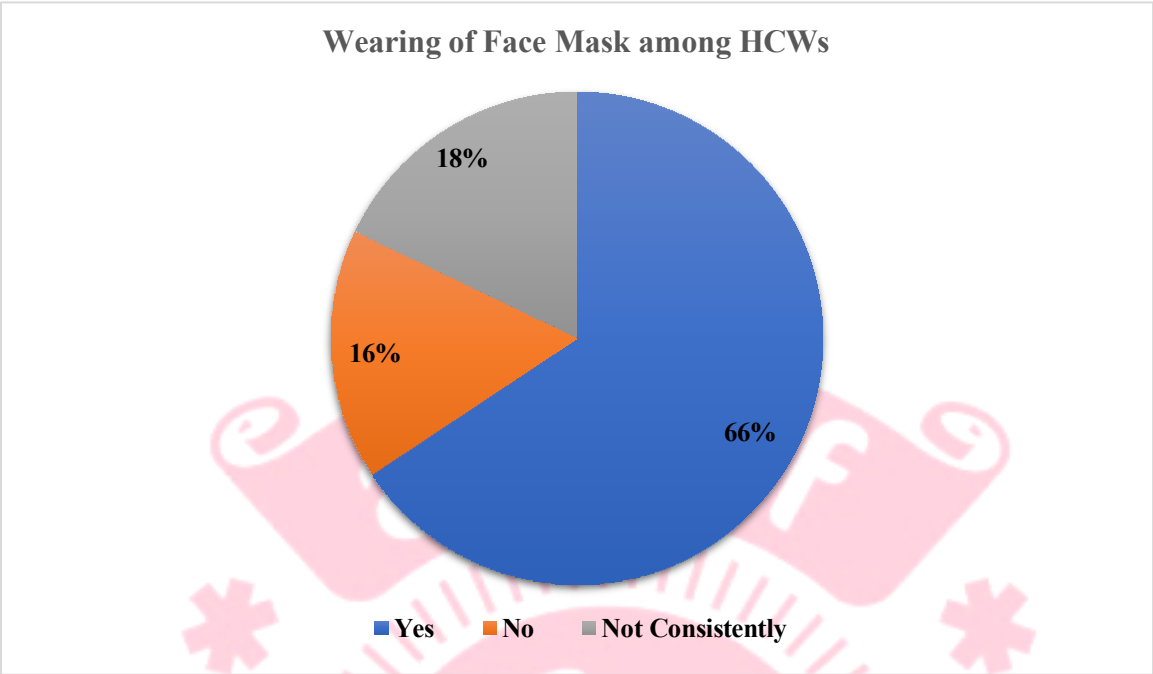


Figure 13: Wearing of Protective: Face Mask among HCWs

Uptake was sub-optimal across the three groups. Among those who wore a mask, only 22.9% initiated TPT. Of those who did not wear a mask, 25% initiated TPT and 35.9% of those who were inconsistent in wearing a mask initiated TPT. Completion rates were below average as well, across all groups, with only 21.2% of those who wore a mask, 44.4% of those who did not wear a mask, and none of those who were inconsistent in wearing a mask completing TPT. Wearing a face mask was statistically significant for completion but not for uptake as shown in Table 12 and Table 13.

4.6.3 Taken care of TB patient

Most (95.4%) of the respondents have ever attended to an active TB patient during their practice. Uptake of TPT was however noted to be low among this group, with only 26.3% initiating TPT. Uptake was even lower in HCWs who have never attended to a known active TB patient, with only 10% initiating. Completion was sub-optimal in both groups, with only 20% of respondents who have ever taken care of an active TB patient

completing it and none of the HCWs who have never attended to a known active TB patient completing TPT. Taking care of a TB patient was not statistically significant for both uptake and completion of TPT as shown in Table 12 and Table 13.

4.6.4 Smoking and drinking

Most (76.3%) of the respondents reported neither drinking alcohol nor smoking cigarettes as shown in Figure 14.

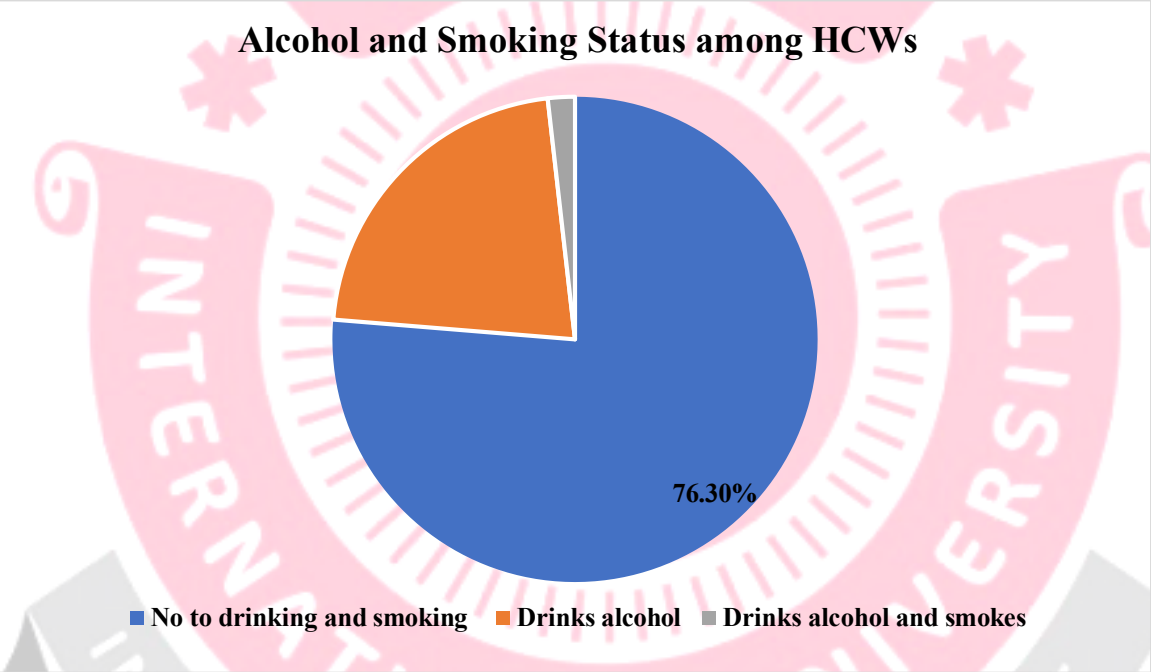


Figure 14: Alcohol and Smoking Status among HCWs

The uptake of TPT was sub-optimal across the three groups, with only 26.35% of respondents who neither drank alcohol nor smoked cigarettes initiating TPT, 25% of those who drank alcohol initiating it, and none of those who both drank alcohol and smoked cigarettes initiating TPT. Completion rates were below average as well, with only 16% of respondents who neither smoked nor drank and 50% of those who drank

alcohol completing TPT. Drinking or smoking was not statistically significant for both uptake and completion of TPT as shown in Table 12 and Table 13.

4.6.5 Department

Most (60%) of the respondents were from the wards while 40% were from the outpatient department. Uptake was sub-optimal across the groups with only 20.6% of the ward and 33% of out-patient respondents initiating TPT. Completion was sub-optimal as well, with only 17% of outpatient and 22.2% of ward respondents completing TPT. The department a healthcare worker is stationed was statistically significant for uptake but not for completion of TPT as shown in Table 12 and Table 13.

The table below is a summary of the variables of predisposing risk factors for LTBI, showing their significance in influencing the uptake of TPT

Table 13: Uptake of TPT and Predisposing Risk Factors for LTB

Data element	**Uptake**		**P-value**
	No n(%)	**Yes n(%)**	
Age categories			
Below 50 Years	149 (74.9%)	50 (25.1%)	0.634
Above 50+ Years	14 (70%)	6 (30%)	
Co-worker with TB			
No	128 (81.5%)	29 (18.5%)	**<0.001****
Yes	35 (56.5%)	27 (43.5%)	
Wearing a mask			
No	27 (75%)	9 (25%)	0.256
Sometimes	25 (15.3%)	14 (25.0%)	
Yes	111 (68.1%)	33 (58.9%)	
Taken care of TB patient			
No	9 (90%)	1 (10%)	0.248

Yes	154 (73.7%)	55 (26.3%)	
Smoking and drinking			
Drink and Smoke	4 (100%)	0 (0.0%)	0.488
Drink alcohol	36 (75%)	12 (25%)	
Didn't drink/smoke	123 (73.7%)	44 (26.3%)	
Department			
Out-patient	59 (67%)	29 (33%)	**0.04****
Wards	104 (79.4%)	27 (20.6%)	

*** Significant at P <0.05*

The health facility managers were asked to describe the HCW's understanding of their occupational exposure to TB and their awareness of the necessity and benefits of undertaking and completing TPT. Some HCWs believed their exposure risk was low and thus reluctant to initiate TPT. For instance, HCWs based in wards perceived their risk as high while those in out-patient settings perceived their risk as low. Notably, some HCWs were not sure about their risk for TB infection.

HCWs who perceived themselves at a high risk of contracting TB were more likely to accept and complete TPT.

For instance, a HCW reported:

> *"I work in the medical ward and come in contact with TB/HIV patients so my risk of contracting LTBI is high so I must take TPT"*
>
> KII, respondent.

The table below is a summary of the variables of predisposing risk factors for LTBI, showing their significance in influencing the completion of TPT.

Table 14: Completion of TPT and predisposing factors for LTBI

Variable	Completion of TB Treatment		P-Value
	No n(%)	Yes n(%)	
Co-worker with TB			
No	23 (79.3%)	6 (20.7%)	0.838
Yes	22 (81.5%)	5 (18.5%)	
Wearing a mask			
No	5 (55.6%)	4 (44.4%)	**0.03****
Sometimes	14 (100%)	0 (0.0%)	
Yes	26 (78.8%)	7 (21.2%)	
Taken care of TB patient			
No	1 (100%)	0 (0.0%)	0.618
Yes	44 (80%)	11 (20%)	
Smoking and drinking			
Yes	8 (66.7%)	4 (33.3%)	0.178
No	37 (84.1%)	7 (15.9%)	
Department			
Out-patient	24 (82.8%)	5 (17.2%)	0.639
Wards	21 (77.8%)	6 (22.2%)	

** *Significant at P <0.05*

4.6.6 Risk Factors for LTBI Influencing Uptake and Completion of TPT

4.6.6.1 Risk Factors for LTBI Influencing Uptake of TPT

The two significant variables for uptake, from chi-square, were used to conduct a binary logistic regression analysis and they both remained significant, as shown in Table 15. The logistic regression model exhibited statistical significance $\chi 2 = 0.0025$, $p < .05$. The model accounted for 66% of the variation in the uptake of TPT among HCWs and accurately identified 76% of occurrences.

Table 15: Predisposing LTBI Risk Factors and Uptake of TPT

Data variables	Odds Ratio (OR)	P-value	95%Confidence Interval (C.I)	
			Lower	Upper
Co-worker with TB				
Yes	Ref			
No	0.3	**0.000****	0.154	0.559
Department				
Wards	Ref			
Out-patient	1.9	**0.0042***	1.025	3.498

*** Significant at P <0.05*

The two variables that remained significant at the binary logistic regression level were subjected to a multivariate logistic regression as shown in Table 16. The multivariate logistic regression showed that HCWs from the outpatient department were 2.1 times more likely to initiate TPT compared to the HCWs stationed in the departments (OR 2.1 95% CI 1.105-4.007). HCWs who had never had a co-worker with TB were 0.27 times less likely to initiate TPT (OR 0.27, 95% CI 0.141-0.530).

The health facility managers were asked to describe the HCW's understanding of their occupational exposure to TB and their awareness of the necessity and benefits of undertaking and completing TPT. Some HCWs believed their exposure risk was low and thus reluctant to initiate TPT. For instance, HCWs based in wards perceived their risk as high while those in out-patient settings perceived their risk as low. Notably, some HCWs were not sure about their risk for TB infection.

HCWs who perceived themselves at a high risk of contracting TB were more likely to accept and complete TPT.

For instance, a HCW reported:

> *"I am not at risk of LTBI from my workplace because I am stationed in the pharmacy therefore my risk is low; therefore, I see no need to initiate TPT"*

KII, respondent.

Table 16: Predisposing LTBI Risk Factors and Uptake of TPT

Data variables	Odds Ratio (OR)	P-value	95% Confidence Interval(C.I)	
			Lower	Upper
Department				
Wards	Ref			
Out-patient	2.104	**0.002***	1.105	4.007
Co-worker with TB				
Yes	Ref			
No	0.274	**0.000****	0.141	0.530

***Significant at P<0.05*

Respondents appreciated the need to establish robust and effective monitoring systems to track uptake, adherence to therapy and completion of treatment. They also suggested the use of feedback mechanisms to identify and address challenges promptly. Additionally, there should be support systems for those undergoing TPT. This can be done by encouraging the formation of peer support groups among HCWs to share success stories and experiences thus fostering a sense of community and mutual encouragement for TPT adherence. Share success stories and experiences. These peer

support groups were also noted to have a downside where some HCWs could influence others not to take TPT.

> *"One of the challenges faced was some HCWs were not willing to initiate TPT due to their misconceptions and fears and could negatively influence their peers not to initiate TPT as well thus leading to poor uptake"*
>
> KII, respondent.

> *"Majority of HCWs took TPT during working hours thus supporting each other and therefore good adherence"*
>
> IDI, respondent.

> *"Staff took TPT during working hours and thus were able to monitor side effects and motivate others"*
>
> KII, respondent.

Measures were reported to be in place to monitor the uptake and completion of TPT among HCWs. The existence of a register that records HCWs who have been on TPT and those who have completed their dosages was highlighted as one of the monitoring measures. Further, it was noted that HCWs who formed support groups or took TPT together as a group reported higher completion rates. Celebrating those who completed TPT also served as a motivational factor.

The weekly dosage was identified as a positive factor, motivating HCWs to complete their TPT. This approach seemed to work well. In all interviews, the positive impact of HCWs taking TPT during working hours and supporting each other was highlighted.

Support groups were mentioned as effective in monitoring side effects and motivating others.

4.6.6.2 Risk Factors for LTBI Influencing Completion of TPT

One significant variable for completion of TPT, from the Chi-square test, was used to conduct a binary logistic regression analysis as shown in Table 17. The logistic regression model did exhibit statistical significance $\chi 2 = 0.004$, $p < .05$. HCWs who did not wear a mask were 0.45 times less likely to complete TPT compared to those who wore a mask (OR 0.45 95% CI 0.979-0.988).

Table 17: Predisposing LTBI Risk Factors and Completion of TPT

Data Variable	Odds Ratio (OR)	P-value	95% Confidence Interval (C.I)	
			Lower	Upper
Wearing a Mask				
Yes	Ref			
No	0.45	**0.05***	0.979	0.988

***Significant at P<0.05*

4.7 Uptake and Completion Across the Health Facilities

4.7.1 Uptake of TPT Across Facilities

Most respondents (74%) did not initiate TPT as seen in Figure 15 below.

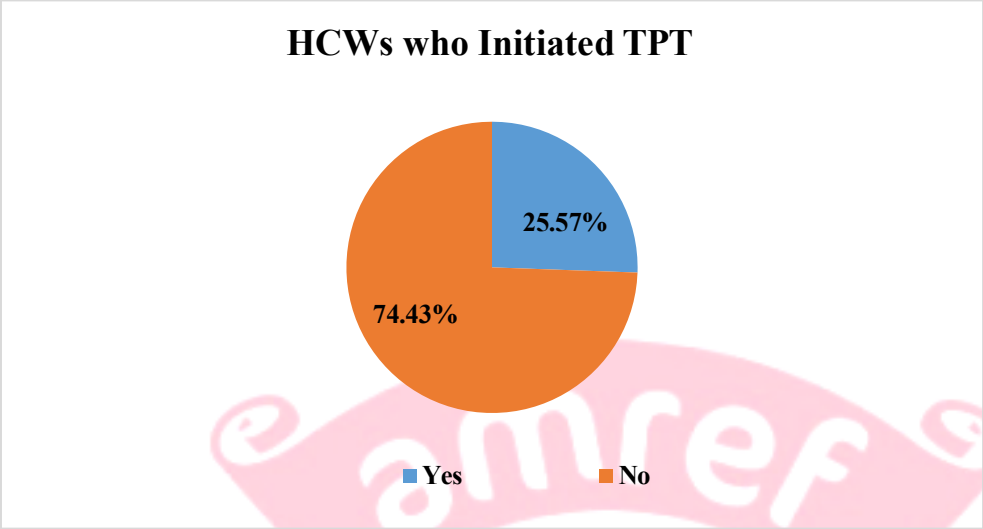


Figure 15: Percentage of HCWs who Initiated TPT

The facility with the highest TPT initiation rate was Manunga Hospital (91%), a level 3 facility, while the facility with the lowest rate was North Kinangop Catholic Hospital, a level 5, with only 15% of respondents initiating TPT. Health facility level was significant for uptake of TPT (P<0.001) as shown in Table 18 below.

Table 18: Uptake of TPT Across Healthcare Facilities

	Uptake		
Facility	**Yes n (%)**	**No n (%)**	**P-value**
Engineer County Hospital	6 (20%)	24 (80%)	
JM Kariuki Hospital	19 (21%)	72 (79%)	
Manunga Health Centre	10 (91%)	1 (9%)	
Ndaragwa Health Centre	10 (71%)	4 (29%)	**<0.001****
North Kinangop Catholic Hospital	11 (15%)	62 (85%)	
Total	56 (26%)	163 (74%)	

*** Significant at P <0.05*

4.7.2 Completion of TPT Across Facilities

The total percentage of HCWs who completed TPT was above average with 80% completing TPT as seen in Figure 16 below.

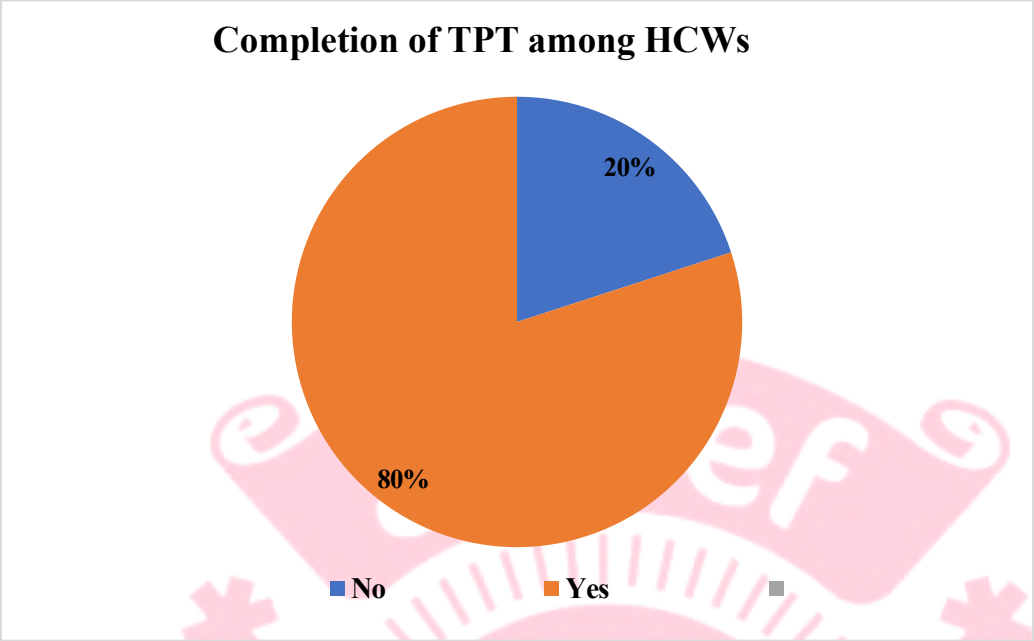


Figure 16: Percentage Completion of TPT among HCWs

The average completion rate was better at the level 2 and level 3 facilities, which had completion rates above 80% as compared to level 1 as shown in Table 19.

Statistically, there was no significant association between facility and completion of TPT (P=0.826) as seen in Table 19 below.

Table 19: Completion of TPT Across Healthcare Facilities

	Completion of TPT			
Facility	Yes n (%)	No n (%)	ND	p-value
Engineer County Hospital (level2)	5 (83%)	1 (17%)	0 (0%)	
JM Kariuki Hospital (level 5)	15 (79%)	4 (21%)	0 (0%)	
Manunga Health Centre (level 3)	9 (90%)	1 (10%)	0 (0%)	
Ndaragwa Health Centre (level 3)	8 (80%)	1 (10%)	1 (10%)	0.826
North Kinangop Catholic Hospital (level 5)	8 (73%)	2 (18%)	1 (9%)	
Total	45 (80%)	9 (16%)	2 (4%)	

*** Significant at P <0.05*

4.7.3 Awareness and/or Training Across Health Facilities

Most (55.7%) of HCWs had a form of awareness and/or training on TPT as shown in Figure 17.

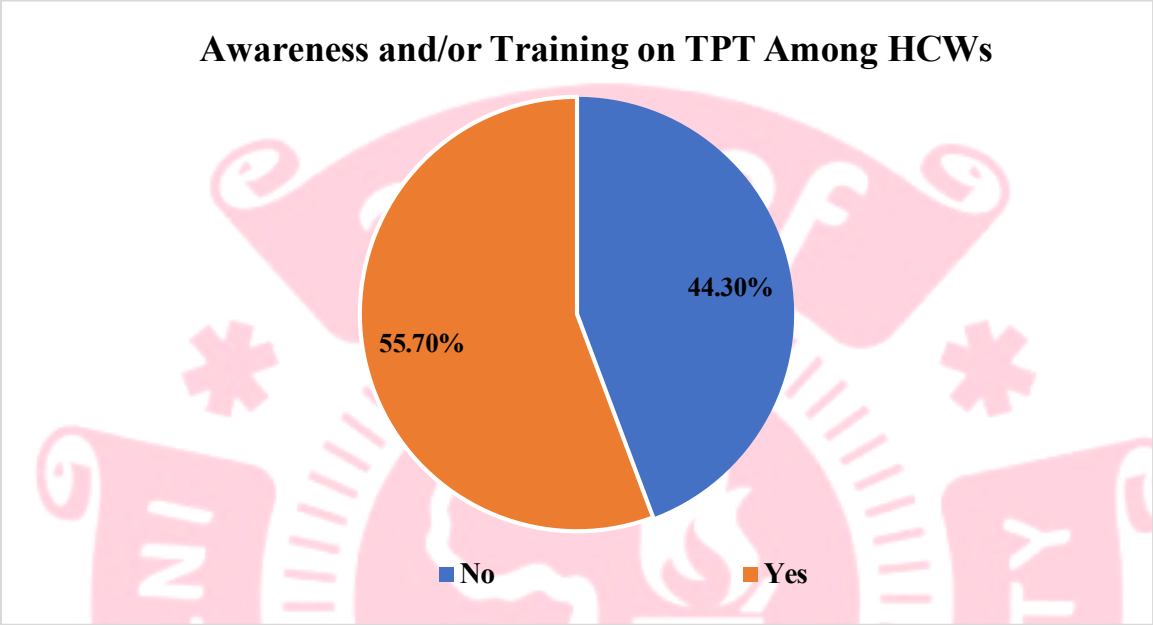


Figure 17: Percentage of awareness and/or Training on TPT Among HCWs

Ndaragwa Health Center had the highest level of training/awareness among respondents, followed by Manunga Health Center, both of which are level 3 facilities. However, the facilities with the most respondents who had not undergone any training/awareness of the TPT program were J.M. Kariuki Referral Hospital and North Kinangop Catholic Hospital both level 5 facilities as seen in Table 20. Awareness and/or training on TPT was significant for uptake across health facilities (P value <0.001) as shown in the table below.

Participants in the IDI and KII appreciated the need to establish continuous training and sensitization campaigns to reinforce knowledge of LTBI and TPT and address stigma and negative attitudes towards LTBI and TPT among HCWs. Most of the respondents who had not been screened for TB reported that they did not see a need to be screened.

For instance, a HCW reported:

"I have no clinical symptoms of active TB, so I don't see a need to be screened for LTBI"

Training sessions conducted before the initiation and rollout of TPT were mentioned as a supportive health system factor. These training sessions aimed to educate healthcare workers on the importance of TPT, by providing evidence-based information thus contributing to better understanding and acceptance.

"We received great support from the TB program partners who ensured continuous training/sensitization to HCWs".

KII, respondent.

"Healthcare workers were taken for training before initiation of treatment although not all of them were trained. They were also encouraged to form support groups for taking the drugs as a group"

IDI, respondent.

"Some HCWs feared becoming resistant to TPT if they failed to complete the dose thus, they did not want to initiate TPT"

IDI, respondent.

Awareness creation should also promote preventive measures as an essential component of the health system approach. Educational channels such as workshops, posters and online resources were proposed to create awareness among the HCWs.

> *"WhatsApp notifications about the availability of TPT in the facility were sent to individual departmental groups to create awareness within the facility"*
>
> KII, respondent.

The HCWs noted that training and awareness creation should address myths surrounding TPT such as the misconception that it could cause infertility which negatively influenced decision-making to initiate or complete TPT. Addressing and demystifying these myths emerged as an essential component of TPT acceptance.

> *"Some HCWs thought that TPT would cause infertility therefore they were reluctant to initiate TPT.*
>
> IDI, respondent.

Further, emphasizing the benefits of TPT such as reducing the risk of developing active TB disease, during training programs would increase its uptake and completion rate

among HCWs. Training sessions should highlight the effectiveness and safety of preventive therapy.

> *"Some HCWs felt that there was no need to take TPT, yet they were not sick"*
>
> IDI, respondent.

Regarding the uptake and completion of TPT across health facilities, there was a need to strengthen the collaboration between healthcare facilities and county TB coordinators. This would leverage their support for continuous training, supervision, and the provision of necessary resources.

> *"Training and sensitizations done before TPT rollout by the national and county government helped to improve uptake and completion. All facilities in charge were trained on the importance of TPT uptake and completion"*
>
> IDI, respondent.

KII, respondent.

Table 20: Awareness and/or Training across Healthcare Facilities

	Awareness and/or Training			
	Yes n (%)	**No n (%)**	**Total n (%)**	**P-value**
Health Facility				**<0.001****
Engineer County Hospital	21 (17.2%)	9 (9.3%)	30 (13.70%)	
JM Kariuki Hospital	45 (36.9%)	46 (47.4%)	91 (41.55%)	
Manunga Health Centre	10 (8.2%)	1 (1.%)	11 (5.02%)	
Ndaragwa Health Centre	14 (11.5%)	0 (0%)	14 (6.4%)	
North Kinangop Catholic Hospital	32 (26.2%)	41 (42.3%)	73 (33.33%)	
Total	122 (55.70%)	97 (44.3%)	219 (100%)	

*** Significant at P <0.05*

4.7.4 TB Screening Across Health Facilities

Most (61%) of the HCWs had been screened for TPT as shown in Figure 18.

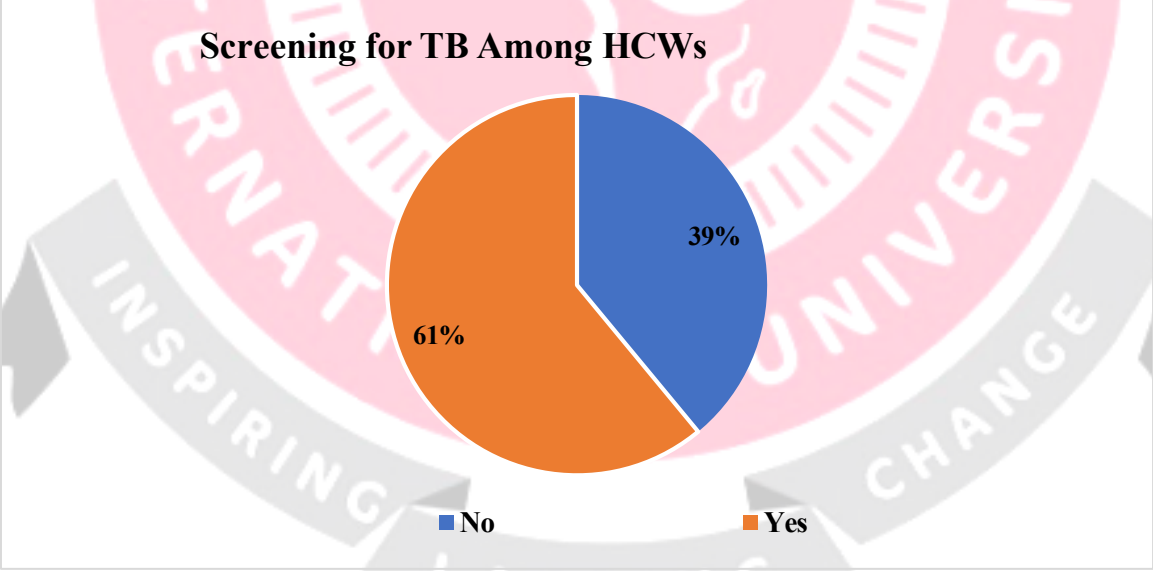


Figure 18: Percentage Screening for TB Among HCWs

Comparison at the health facility level showed that HCWs from level 3 facilities followed by level 2 facilities had the highest number of respondents who have ever been screened for TB. The majority (80%) of respondents from Ndaragwa Health

Center and Manunga Health Center (73%) have ever been screened for TB. The facility with the least number of respondents who had ever been screened for TB was Engineer County Hospital, a level 2 facility as seen in Table 21. Screening for TB was significant for the uptake and completion of TPT across health facilities (P value <0.001) as shown below.

Table 21: Table 4.20 TB Screening Across Healthcare Facilities

	Ever Screened for TB			
	Yes n(%)	**No n(%)**	**Total n (%)**	**P Value**
Health Facility				**<0.001****
Engineer County Hospital	16 (53%)	14 (47%)	30 (13.70%)	
JM Kariuki Hospital	55 (60%)	36 (38%)	91 (41.55%)	
Manunga Health Centre	8 (73%)	3 (27%)	11 (5.02%)	
Ndaragwa Health Centre	12 (86%)	2 (14%)	14 (6.45%)	
North Kinangop Catholic Hospital	46 (63%)	27 (37%)	73 (33.33%)	
Total	133 (61%)	81 (39%)	219 (100%)	

*** Significant at P <0.05*

The availability of resources and infrastructure to support TB prevention therapy was highly regarded by the HCWs. The respondents noted that the availability of adequate facilities for screening, diagnosis and therapy administration would improve the uptake and completion of TPT.

"Some HCWs insisted on being screened for LTBI before initiating TPT"

KII, respondent.

It was noted that strengthening the healthcare system through stabilizing and funding the TB program, ensuring continuous supply of drugs, enhancing sensitization campaigns, and involving all HCWs in TB prevention activities would improve uptakes and completion of TPT among HCWs. Continuous availability of TPT drugs was emphasized as a crucial factor in ensuring good uptake and completion. The presence of drugs at all times helps prevent interruptions in the treatment process and supports healthcare workers in completing their TPT.

> *"We no longer received medications for TPT as the resources were diverted by the national government to other vulnerable groups, who were considered a priority compared to healthcare workers. Therefore, we did not have a continuous supply of drugs available to initiate more healthcare workers on TPT"*
>
> IDI, respondent.

> *"There was good uptake from healthcare workers initially before the issue of commodities arose"*
>
> IDI, respondent.

Respondents noted that immunocompromised HCWs may not be reassigned to lower-risk environments due to inadequate staffing, potentially exposing them to higher TB risk. It was recommended that guidelines and protocols for the reassignment of immunocompromised HCWs to lower-risk environments should be developed. Further,

it was noted that the healthcare system should ensure confidentiality and respect for individual health statuses.

> *"We cannot reassign HIV positive HCWs to lower risk department because we don't want them to feel stigmatized"*
>
> KII, respondent.

Support from the health system, particularly from the County government TB co-coordinators, was reported. This support included facility sensitization, mentorship, and on-the-job training (OJT). Adequate supply of TPT drugs at the facility level was also highlighted as a form of support.

> *"The CCC/TB in charge would hold departmental sensitization to bring awareness of the TPT program"*
>
> KII, respondent.

Challenges in the infrastructure, such as the lack of isolation space for TB patients in specific wards, could expose HCWs to a higher risk in certain situations. The unavailability of screening tools, like TST and IGRA, hindered routine screening for TB infection status among HCWs, limiting the ability to identify and manage potential risks. Strengthening laboratory capacities to facilitate testing and improvement of infrastructure to include adequate isolation spaces for TB patients helps prevent the

spread of TB within healthcare facilities and protects HCWs from unnecessary exposure.

> *"HCWs will come in contact with a patient in the outpatient setting, attend to them without a mask only to discover later on that the patient was positive for active TB. This lack of timely diagnosis at the initial encounter increases the risk of LBTI among HCWs"*
>
> KII, respondent.

Inadequate funding for TB prevention activities at the facility level was mentioned as a challenge, potentially limiting resources and measures to protect HCWs. The respondents noted that advocating for increased funding for TB prevention activities, including LTBI screening and TPT implementation.

> *"In our facility, we require health and safety officers or TB infection prevention and control managers, who have a specific and dedicated role in infection prevention and control within the facility. This will enable easy implementation of TB infection prevention thus protecting HCWs"*
>
> KII, respondent.

Resources should be allocated for continuous education, infrastructure improvements such as isolation spaces for TB patients, and support programs. Further, they suggested

that LTBI screening and TPT should be integrated into routine healthcare protocols. This includes incorporating LTBI screening into regular health check-ups for HCWs.

> *"We need protocols that mandate regular health check-ups for healthcare workers (HCWs), allowing for frequent TB screening"*
>
> KII, respondent.

4.7.5 Themes and Sub-themes of the Research

Thematic findings of the research were analyzed into five themes and sub-themes documented in detail as presented in Table 22 below.

Table 22:Themes and Sub-themes

Theme	Sub-Themes
Risk perception and awareness	Perceived low risk, awareness of benefits and necessity of TPT
Training and sensitization	Continuous education, addressing stigma and negative attitudes, and promotion of TPT benefits
Resources and infrastructure	Infrastructure improvement, support for immunocompromised HCWs, Workplace safety, availability of preventive measures, availability of healthcare services for HCWs
Follow-up and monitoring	Tracking systems for adherence to therapy, support to HCWs undergoing therapy

Side effects and tolerability	Risk of drug resistance, fear of adverse drug reaction

CHAPTER 5: DISCUSSIONS

5.1 Introduction

The discussion section provides an in-depth analysis of the study findings, interpreting the data in the context of the study's objectives and existing literature. This section also addresses the implications of the results for TB prevention among healthcare workers (HCWs) in Nyandarua County and beyond and suggests directions for future research.

5.2. Personal Factors Influencing Uptake and Completion of TPT

The study revealed that personal factors play a crucial role in the uptake and completion of Tuberculosis Preventive Therapy (TPT) among healthcare workers (HCWs). Specifically, those who perceived their risk of contracting TB from their workplace as high and viewed TPT to be important in preventing this were more likely to initiate and complete TPT. This aligns with previous research indicating that HCWs aware of their TB risk are more likely to adhere to preventive measures, including TPT (Nguyen et al., 2018). This study also found that contrary to expectations, HCWs in high-risk departments and those with chronic diseases, compared to those from low-risk departments and without a chronic disease were less likely to initiate TPT, despite a high-risk perception. These findings both mirror and contradict other studies' findings. It contradicts a study in the USA that highlighted higher adherence to preventive therapies among HCWs with chronic conditions due to their perceived higher risk (Swift et al., 2020). It mirrors a study in Korea that indicated HCWs with chronic diseases or those on hepatotoxic drugs were less likely to initiate LTBI treatment due to fear of drug interactions (Lee et al., 2019). Another study in the USA also showed low initiation rates among HCWs who work in high-risk departments and identified

inadequate knowledge about latent tuberculosis infection (LTBI), continuous exposure to TB at work, and concerns about treatment side effects and duration as barriers to TPT (Swift et al., 2020). The variability in our findings compared to those in other studies can be explained by several factors, including differences in healthcare settings, cultural contexts, levels of awareness, and access to resources. More research is needed to identify specific barriers among these two groups of vulnerable HCWs. This will enable tailor-made interventions to address these barriers, thus enabling the translation of policy knowledge to implementation and action. This will ensure that vulnerable HCWs in Nyandarua County and other counties as a whole and the entire community at large are adequately protected against TB.

Qualitative findings highlighted concerns about side effects, stigma and myths as barriers to the uptake and completion of TPT. These findings correspond with a study in the USA which also identified fear of side effects as a significant deterrent to TPT adherence (Swift et al.,2020). In this study, HCWs who had a negative attitude towards TPT fueled by the fear of potential side effects and those with misconceptions were less likely to initiate TPT. In particular female HCWs on contraception and male HCWs, who feared that TPT would cause infertility, were less likely to initiate TPT due to the misconception of the potential drug side effects. Several studies have highlighted how the reproductive needs of HCWs can play a role in the decision-making of infection prevention measures. For example, a study in the USA showed that contemplation of pregnancy among female HCWs and the fear of side effects were noted as a barrier to TPT uptake (Swift et al., 2020). These findings highlight the necessity of incorporating reproductive health needs into training, sensitization, and awareness activities of TPT, intending to address stigma, myths, and concerns related to the reproductive health of

both genders and TPT. Addressing these barriers will reassure the confidence that HCWs in Nyandarua County have in TPT thereby increasing uptake and completion.

5.3 Health System Factors Impacting the Uptake and Completion of TPT

HCWs who underwent awareness, training or sensitization activities on TPT and had a form of follow-up mechanism during the dosage period of TPT, were more likely to initiate and complete TPT. This finding supports existing literature on the positive impact of training on healthcare worker adherence to TB infection prevention and control policies (Tan et al., 2020) and the effectiveness of structured follow-up in improving treatment completion (Shukla et al., 2002; Abad et al., 2013). Qualitative findings highlighted inadequate resources as a barrier to upscaling of TPT in Nyandarua County. Inadequate finances were a hindrance to training, sensitization and TB screening activities among HCWs. It also led to interruptions in drug supply. There was a redirection of drug supply to another population who were deemed to be more vulnerable to TB than HCWs due to interruptions in funding. This led to a low uptake of TPT across the County. While support from the county through the TB coordinators was there, inadequate funding was a significant barrier that needed to be addressed Several studies have highlighted funding and resource shortages as barriers to TB infection prevention and control measures in LMICs. A systematic review study highlighted shortages of funding and resources as significant challenges which often led to prioritizing patient care over the protection of healthcare workers. (Tan et al., 2020). Health facilities, such as level 3 facilities, that leveraged technology to create awareness and sensitization of TPT, for example, through departmental WhatsApp groups and who formed support groups among themselves had higher initiation and completion rates of TPT. These support groups acted as follow-up mechanisms which

promoted adherence by enabling early detection and treatment of side effects. However, qualitative findings also revealed that while these groups can be beneficial, they can also be a barrier to TPT efforts, as some HCWs discouraged others in the group from initiating TPT due to misconceptions about TPT. This study is limited in its ability to establish a causal relationship and longitudinal studies are needed to establish the effects of technology and support groups on TB infection prevention measures. This will provide more insight as to how health facilities in LMICs such as Nyandarua County and other Counties facing resource constraints in a high TB prevalence health setting, can leverage existing health facility technology and strengthen impactful HCW groups to increase awareness sensitization and adherence to TB-IPC measures.

5.4 Risk Factors for LTBI Affecting Uptake and Completion

Awareness of the risk factors for LTBI in the workplace promoted preventive measures behaviours among HCWs. Those who understood their increased vulnerability to TB were more likely to take precautionary measures, such as wearing protective face masks while in the hospital and while attending to patients. This heightened awareness and proactive approach significantly contributed to better uptake and completion rates of TPT. Conversely, while consistent use of PPE, such as face masks, was associated with better completion rates qualitative data suggested varying adherence to PPE protocols due to discomfort and perceived barriers to consistent use, such as inadequate supplies and discomfort. While direct studies on PPE's impact on TPT uptake are limited, our findings support the broader evidence on PPE's role in reducing TB transmission risks (Tan et al., 2020). HCWs who had ever had a colleague diagnosed with TB and thus were aware of their risk of TB were more likely to initiate TPT compared to those who had never.

5.5 Health Facility Level and Uptake and Completion of TPT

The study found significant variations in TPT (tuberculosis preventive therapy) uptake and completion across different health facility levels. Healthcare workers (HCWs) in lower-tier facilities (e.g., level 3 hospitals) demonstrated better uptake and completion rates compared to those in higher-tier facilities (e.g., level 5 hospitals). This disparity may be attributed to differences in training, awareness or sensitization opportunities, and administrative support for screening HCWs seen in the lower-tier facilities. Lower-tier facilities offer relatively fewer services than higher-tier facilities and thus have fewer HCWs in comparison. This could account for the higher number of HCWs who underwent TB screening, TPT sensitization, and follow-up in comparison to higher-tier facilities. Qualitative findings highlighted that lower-tier facilities not only leveraged technology, such as departmental WhatsApp groups, to create awareness and sensitization of TPT among HCWs, but also established groups among themselves to facilitate easy follow-up during the dosage duration. This strategy improved the uptake and completion of TPT.

HCWs in higher-tier facilities encounter more patients compared to those in lower-tier facilities and thus their risk for TB is higher. Therefore, it is crucial to protect HCWs in higher-tier facilities by ensuring TB screening for at-risk HCWs and adopting similar inexpensive and efficient methods of creating awareness, sensitization, and follow-up, especially in settings with inadequate funding and large numbers of HCWs. These efforts are essential for reducing TB transmission among HCWs and the general public who come in contact with HCWs.

CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter summarizes the key findings of the study, presents conclusions drawn from these findings based on the study objectives, and provides recommendations for improving the uptake and completion of Tuberculosis Preventive Therapy (TPT) among healthcare workers (HCWs) in Nyandarua County.

6.2 Conclusions

6.2.1 Personal Factors Influencing Uptake and Completion of TPT.

The study concluded that:

1. A high perception of TB risk at the workplace and knowledge of the importance of TPT promoted the uptake and completion of TPT among HCWs. However, HCWs in high-risk departments and those with chronic diseases were less likely to start TPT despite acknowledging their heightened vulnerability to TB in their workplace showing a gap between knowledge of policy and action.
2. Fear of side effects, stigma, myths and misconceptions about TPT, particularly regarding reproductive health was a barrier to uptake of TPT.

6.2.1 Health System Factors Impacting Uptake and Completion of TPT

According to the findings of the study:

1. Health system factors such as training, awareness, sensitization and follow-up mechanisms positively influenced the uptake and completion of TPT among HCWs.

2. Inadequate resources, including funding and drug supply interruptions, were significant barriers.

3. Leveraging technology for awareness and sensitization of TPT and support groups among HCWs is less resource-intensive and effective in promoting the upscaling of TPT, although misinformation within these groups could also pose challenges.

6.2.3 Risk Factors for LTBI Affecting Uptake and Completion of TPT

The study demonstrated that:

1. Healthcare workers who practised TB reduction measures, such as consistently wearing PPE like face masks, were more likely to initiate TPT. This increased likelihood can be attributed to their heightened awareness and understanding of the TB risks present in their workplace. However, inconsistent adherence to PPE protocols due to discomfort and supply issues was noted.

2. HCWs with a direct experience of a colleague diagnosed with TB within their professional environment were more likely to initiate TPT. This firsthand exposure increases their awareness of the real and immediate risk of TB transmission.

6.2.4 Uptake and Completion Rates of TPT Among Different Health Facility Levels

The study highlighted that:

1. Lower-tier facilities had higher rates of TPT uptake and completion, attributed to their leverage of technology to promote awareness and sensitization of TPT,

administrative support seen through screening HCWs for TB and establishment of support groups.

2. Higher-tier facilities had poor uptake of TPT due to a lack of the above support structures. This increases their vulnerability to TB due to the volume of patients attending to compared to lower-tier facilities.

6.3 Recommendations

To ensure the successful implementation of Tuberculosis Preventive Therapy for the management of Latent TB infection among HCWs in Nyandarua, the following is recommended:

1. The national and the county governments in collaboration with county health officials, national programs, and technical partners need to ensure there is consistent funding to sustain TPT and Tuberculosis infection prevention measures efforts. This will ensure an uninterrupted drug supply, TB screening among at-risk HCWs, and training, sensitization and awareness activities aimed at improving the uptake and completion of TPT among HCWs.

2. Nyandarua County through the County and sub-county TB coordinators in collaboration with the different health facilities should expand, standardize and implement regular, comprehensive training and sensitization programs for HCWs across all facility levels. The training should also aim to raise awareness of the risk of TB at the workplace, address concerns about potential side effects, providing clear, evidence-based information to alleviate fears and misconceptions. It should incorporate reproductive health education to address specific concerns of both male and female HCWs.

3. The health facilities should leverage technology for awareness and monitoring. Digital platforms can be used to enhance awareness in larger institutions with many HCWs, where traditional methods may be time and resource-consuming. For example, hospital WhatsApp groups and other digital communication tools can be utilized to disseminate information quickly and efficiently, ensuring all staff members are informed and engaged.

4. Nyandarua County with coordinated efforts from ministries of health, finance, justice, and labor should establish or strengthen dedicated occupational health departments within hospital facilities. These departments will focus exclusively on HCWs' safety, ensuring their needs are addressed. Key functions will include collaborating with hospital TB clinics for regular screening of at-risk HCWs for example from the ward departments and those with chronic conditions, to determine those who are eligible for TPT, support training and sensitization efforts and work closely with the management to ensure regular supply and proper use of personal protective equipment (PPE) such as masks. This targeted approach will enhance HCWs' health and safety, improve TPT uptake and completion rates, and reduce TB transmission risks among HCWs and in Nyandarua County as a whole.

5. More research needs to be done on the prevalence of TB among healthcare workers in Nyandarua County and the entire country as well. This will raise awareness of the risk by providing concrete evidence. The research can inform existing policies on latent TB infection (LTBI) and additionally, when HCWs understand the scope of the problem, it will heighten their awareness and

understanding of the TB risks in their workplace, thereby promoting individual preventive measures.

6. Further research is also needed to identify specific barriers faced by HCWs in high-risk departments and those with chronic diseases, and evaluate the long-term impact of implemented interventions. Findings from ongoing research can be used to continuously refine and improve strategies for TB prevention among healthcare workers, ensuring they remain relevant and effective.

7. To replicate this study in other countries, a similar mixed-methods approach combining quantitative and qualitative research can be employed. Begin by identifying healthcare workers (HCWs) in various healthcare settings and assessing their perceptions of TB risk and the importance of Tuberculosis Preventive Therapy (TPT). Quantitative data can be collected through structured surveys to measure factors such as perceived risk, TPT initiation, and completion rates. Concurrently, qualitative methods like focus group discussions and in-depth interviews can explore personal, health system, and facility-level barriers to TPT uptake and completion. Factors such as side effects, stigma, myths, training, resources, and technology use should be examined in the local context. Additionally, differences in TPT uptake across healthcare facility levels should be analyzed to understand contextual influences. Replicating the study in other countries involves tailoring the research tools to the specific healthcare environment and sociocultural factors of the target region while maintaining the core methodology for comparability.

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APPENDICES

Appendix I: Informed Consent Form for Healthcare Workers

TITLE: Assessing Uptake and Completion of Tuberculosis Prevention Therapy Among Healthcare Workers in Nyandarua County, Kenya.

Introduction

I am Sylvia Vosevwa, a graduate student in Public Health at Amref International University. I am working on a study titled "Assessing Uptake and Completion of Tuberculosis Prevention Therapy among Healthcare Workers in Nyandarua County, Kenya". This consent form provides you with the details you will need to make an informed decision about whether to participate in the research or not. Feel free to ask any questions whenever you need clarification. Once we have addressed all your questions, you can decide whether to take part in the study or not. Upon understanding the study, you will be requested to sign this form or make a mark in the presence of a witness. We will give you a copy of this form for your record keeping.

Purpose of the Research

We are requesting you to participate in the study to help us assess the uptake and completion of tuberculosis preventive therapy among healthcare workers in Nyandarua County. We would like to get information on the factors that influence healthcare workers to take up and complete the dosage of tuberculosis preventive therapy. We would also like to know the overall uptake and completion rate in the county as a whole.

New Findings and Benefits

The study results will be shared with relevant stakeholders in the health facilities, sub-county level, County level and Ministry of health under the National TB program to provide information for ensuring optimal uptake and completion of tuberculosis preventive therapy among healthcare workers in the country thus protecting them, their patients and community at large.

Study Participants

The study participants will comprise of health care workers in Nyandarua County serving in Ol Kalou hospital, Engineer level 4, Manunga hospital and North-Kinangop hospital. It will also target facility managers in the respective hospitals, county and sub-county tuberculosis coordinators.

Participating in the study is voluntary

Your participation in this study is entirely voluntary. After we have answered all your questions and you have understood the study, you can decide if you want to participate in the study or not.

Procedures

If you agree to participate in this study by signing at the end of this form, you will be asked questions related to your personal life such as your years in employment, job position, department you work in and medical history. Additionally, you will be questioned about tuberculosis preventive therapy and the factors that influenced your uptake and its completion.

Possible Risks/Discomfort

There are no risks associated with the study as no harmful procedures will be carried out on you. You may feel a little uncomfortable during the interview process due to the sensitive nature of some questions, but precautions will be taken to minimize the discomfort by reassuring you of the confidentiality of any information collected. You are allowed to skip questions that you do not want to answer, and you may stop the interview at any time without any consequences. You will be free to withdraw from the study at any time and your withdrawal will not affect any services delivered to people with disabilities.

If decide to withdraw part way through the study/interview process, your data will not be used during data analysis and report writing.

Data Security and Confidentiality

All data acquired in the study will be kept private and used exclusively for this research. None of the data collection tools will record your name or contact information and you will receive a copy of this consent form. No one will have access to the data except the researchers and the supervisors

Contact Person

If you have questions or worries about the research you should contact Sylvia Vosevwa, principal investigator, mobile number 0703155371.

Your rights as a participant

This research has been reviewed and approved by the Amref Ethics and Scientific Research Committee. If you have any questions about your rights as a research

participant, you may contact the secretary of the Amref ESRC (a team that examines the research to protect your rights as a participant) at **Telephone number +254 20 6994000** or mobile number **0795746777**or the principal investigator on **0703155371**

Compensation

You will not receive any direct benefits, nor will you be paid anything to take part in the study. However, any personal expenses made for the purpose of this study will be reimbursed.

You're Statement of Consent and Signature

I, the undersigned, have read, listened, and comprehended the study's purpose. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. By signing here, I voluntarily consent to participate study.

Signature of participant …….

Date (DD/MM/YYY) …….

Statement by the researcher/person seeking consent

I attest that the study subject was given the chance to ask questions concerning the study, and that I have answered all their questions truthfully and to the best of my abilities. I thus confirm that the permission was freely and voluntarily given and was not obtained through coercion.

The study subject has been given a copy of this informed consent form.

Name of researcher/person seeking consent……..

Signature of researcher/person seeking consent…….

Date (DD/MM/YYY) ……

Appendix II: Informed Consent Form for Key Informant Interview

TITLE: Assessing Uptake and Completion of Tuberculosis Prevention Therapy Among Healthcare Workers in Nyandarua County, Kenya.

Introduction

I am Sylvia Vosevwa, a graduate student in Public Health at Amref International University. I am working on a study titled "Assessing Uptake and Completion of Tuberculosis Prevention Therapy among Healthcare Workers in Nyandarua County, Kenya". This consent form provides you with the details you will need to make an informed decision about whether to participate in the research or not. Feel free to ask any questions whenever you need clarifications. Once we have addressed all your questions, you can decide whether to take part in the study or not. Upon understanding the study, you will be requested to sign this form or make a mark in the presence of a witness. We will give you a copy of this form for your record keeping.

Purpose of the Research

We are requesting you to participate in the study to help us assess uptake and completion of tuberculosis preventive therapy among healthcare workers in Nyandarua County. We would like to get information on the factors that influence healthcare workers to take up and complete the dosage of tuberculosis preventive therapy. We would also like to know the overall uptake and completion rate in the county as a whole.

New Findings and Benefits

The study results will be shared with relevant stakeholders in the health facilities, sub-county level, County level and Ministry of health under the National TB program to

provide information for ensuring optimal uptake and completion of tuberculosis preventive therapy among healthcare workers in the country thus protecting them, their patients and community at large.

Study Participants

The study participants will comprise of health care workers in Nyandarua County serving in Ol Kalou hospital, Engineer level 4, Manunga hospital and North-Kinangop hospital. It will also target facility managers in the respective hospitals, county and sub-county tuberculosis coordinators.

Participating in the study is voluntary

Your participation in this study is entirely voluntary. After we have answered all your questions and you have understood the study, you can decide if you want to participate in the study or not.

Procedures

If you agree to participate in this study by signing at the end of this form, you will be asked questions related to your personal life such as your years in employment, job position and experience with tuberculosis preventive therapy among HCWs in Nyandarua County. Additionally, you will be questioned about tuberculosis preventive therapy and the factors that influenced uptake and completion of HCWs in Nyandarua County from various health facilities.

Possible Risks/Discomfort

There are no risks associated with the study as no harmful procedures will be carried out on you. You may feel a little uncomfortable during the interview process due to the sensitive nature of some questions, but precautions will be taken to minimize the

discomfort by reassuring you of the confidentiality of any information collected. You are allowed to skip questions that you do not want to answer, and you may stop the interview at any time without any consequences. You will be free to withdraw from the study at any time and your withdrawal will not affect any services delivered to people with disabilities.

If decide to withdraw part way through the study/interview process, your data will not be used during data analysis and report writing.

Data Security and Confidentiality

If you agree to participate, some data will be taken in form of audio and it will be recorded for analysis later on. Data acquired in the study will be kept private and used exclusively for this research. None of the data collection tools will record your name or contact information and you will receive a copy of this consent form. No one will have access to the data except the researchers and the supervisors

Contact Person

If you have questions or worries about the research you should contact Sylvia Vosevwa, principal investigator, mobile number 0703155371.

Your rights as a participant

This research has been reviewed and approved by the Amref Ethics and Scientific Research Committee. If you have any questions about your rights as a research participant, you may contact the secretary of the Amref ESRC (a team that examines the research to protect your rights as a participant) at **Telephone number +254 20 6994000** or mobile number **0795746777**or the principal investigator on **0703155371**

Compensation

You will not receive any direct benefits, nor will you be paid anything to take part in the study. However, any personal expenses made for the purpose of this study will be reimbursed.

You're Statement of Consent and Signature

I, the undersigned, have read, listened, and comprehended the study's purpose. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. By signing here, I voluntarily consent to participate study.

Signature of participant …….

Date (DD/MM/YYY) …….

Statement by the researcher/person seeking consent

I attest that the study subject was given the chance to ask questions concerning the study, and that I have answered all their questions truthfully and to the best of my abilities. I thus confirm that the permission was freely and voluntarily given and was not obtained through coercion.

The study subject has been given a copy of this informed consent form.

Name of researcher/person seeking consent……..

Signature of researcher/person seeking consent…….

Date (DD/MM/YYY) ……

Appendix III: Informed Consent Form for In-Depth Interviews

TITLE: Assessing Uptake and Completion of Tuberculosis Prevention Therapy Among Healthcare Workers in Nyandarua County, Kenya.

Introduction

I am Sylvia Vosevwa, a graduate student in Public Health at Amref International University. I am working on a study titled "Assessing Uptake and Completion of Tuberculosis Prevention Therapy among Healthcare Workers in Nyandarua County, Kenya". This consent form provides you with the details you will need to make an informed decision about whether to participate in the research or not. Feel free to ask any questions whenever you need clarifications. Once we have addressed all your questions, you can decide whether to take part in the study or not. Upon understanding the study, you will be requested to sign this form or make a mark in the presence of a witness. We will give you a copy of this form for your record keeping.

Purpose of the Research

We are requesting you to participate in the study to help us assess uptake and completion of tuberculosis preventive therapy among healthcare workers in Nyandarua County. We would like to get information on the factors that influence healthcare workers to take up and complete the dosage of tuberculosis preventive therapy. We would also like to know the overall uptake and completion rate in the county as a whole.

New Findings and Benefits

The study results will be shared with relevant stakeholders in the health facilities, sub-county level, County level and Ministry of health under the National TB program to provide information for ensuring optimal uptake and completion of tuberculosis

preventive therapy among healthcare workers in the country thus protecting them, their patients and community at large.

Study Participants

The study participants will comprise of health care workers in Nyandarua County serving in Ol Kalou hospital, Engineer level 4, Manunga hospital and North-Kinangop hospital. It will also target facility managers in the respective hospitals, county and sub-county tuberculosis coordinators.

Participating in the study is voluntary

Your participation in this study is entirely voluntary. After we have answered all your questions and you have understood the study, you can decide if you want to participate in the study or not.

Procedures

If you agree to participate in this study by signing at the end of this form, you will be asked questions related to your personal life such as your years in employment, job position and experience with tuberculosis preventive therapy among HCWs in Nyandarua County. Additionally, you will be questioned about tuberculosis preventive therapy and the factors that influenced uptake and completion of HCWs in Nyandarua County from various health facilities.

Possible Risks/Discomfort

There are no risks associated with the study as no harmful procedures will be carried out on you. You may feel a little uncomfortable during the interview process due to the sensitive nature of some questions, but precautions will be taken to minimize the discomfort by reassuring you of the confidentiality of any information collected. You

are allowed to skip questions that you do not want to answer, and you may stop the interview at any time without any consequences. You will be free to withdraw from the study at any time and your withdrawal will not affect any services delivered to people with disabilities.

If decide to withdraw part way through the study/interview process, your data will not be used during data analysis and report writing.

Data Security and Confidentiality

If you agree to participate, some data will be taken in form of audio and it will be recorded for analysis later on. All data acquired in the study will be kept private and used exclusively for this research. None of the data collection tools will record your name or contact information and you will receive a copy of this consent form. No one will have access to the data except the researchers and the supervisors

Contact Person

If you have questions or worries about the research you should contact Sylvia Vosevwa, principal investigator, mobile number 0703155371.

Your rights as a participant

This research has been reviewed and approved by the Amref Ethics and Scientific Research Committee. If you have any questions about your rights as a research participant, you may contact the secretary of the Amref ESRC (a team that examines the research to protect your rights as a participant) at **Telephone number +254 20 6994000** or mobile number **0795746777**or the principal investigator on **0703155371**

Compensation

You will not receive any direct benefits, nor will you be paid anything to take part in the study. However, any personal expenses made for the purpose of this study will be reimbursed.

You're Statement of Consent and Signature

I, the undersigned, have read, listened, and comprehended the study's purpose. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. By signing here, I voluntarily consent to participate study.

Signature of participant …….

Date (DD/MM/YYY) …….

Statement by the researcher/person seeking consent

I attest that the study subject was given the chance to ask questions concerning the study, and that I have answered all their questions truthfully and to the best of my abilities. I thus confirm that the permission was freely and voluntarily given and was not obtained through coercion.

The study subject has been given a copy of this informed consent form.

Name of researcher/person seeking consent……..

Signature of researcher/person seeking consent…….

Date (DD/MM/YYY) ……

Appendix IV: Amref ESRC Approval Letter

amref health afrtca

Amref Health Africa in Kenya

REP: A5fREF'—ESRC P1427/20Z3 **J•¥y Id, 2023**

Sylvia Mugamangi
Amref Internetioaal University
P.O Box 27691-00506

Tel: *354703 ISS37t
Email: jail.cnm

Dear Sylvis Mugamangi,

RESEARCH PROTOC'OL: ASSESSING UPTAKE AND COMPLETION OF TUBERCULOSIS PREVk1 fTJON T14ERAPY AMONG HEALTHCARE WORKERS M NYANDARUA COUHTY, KENYA

Thank you for submitting your prou›co1 to the Amref Fthics and Scientific Rwiew Committee (ESRC).

This is to infom ypu that the ESRC kas reviewed and approved your protocol. Your application approval number is KRC Pt427/2023. The approval p«riod is l?om **July** 14, 2023, to July l3, 2024, arid is sutiject to compliance with the following requirements:

a) Only approved documents (including informed consents, siudy instrumenis, advertising manrials, material transfer agreements, eic.) will be used
b) all changes including (amendments, deviations, violations, em) as submitted for rgview and approval by Amref ESRC b«fore intplanentation.
c) Death and life-threatening **problems** and **serious diverse evcms tSAEs) or unexpected advofsc events** whmher related or unfcTet€d tp **the study** must be reported to the Atnro£ **ESRC** within 72 ours o not caootL
d) Any changes, anticipated or otherwise tha may increase 1e risks or afFem safety or welfare of study participants and othcn or aff¥ct th¢ integrity of the zusearch must be reported to Amref ESRC within 72 hours.
*) Clearanee for expori of biological specimen must br obtained from the rtlwant government
f) Submission aha requea for msewai of approval at least 60 days prior to expiry oftbe appmval period. Aaach a comprehmsive progress report to support the mn¢wal.
g) In cess of late renewal, tier Amref ESRC shall not be held respxisibI• for any serious «Iversc evmts tSAEs) that may eccur as a resutt of research activities that wm carried eat after the expiry of approval.
h) Submission of ari executive summary repon within 80 days upon completion of the study to the Arrtrcf ESRC.
i) All govemmcm regulations for prevmtion and contrctl of the spread of COVfD-l9 including social distancing, provision of personal protective equipment for pBrtieipantS and r¢sc8zclt assistants should be adhcmt Io during daia collection. AU research assistams should be monitomj for COV1D 19 symptoms and referred for lasting in case they prcs¢m with S}/T gTO¢FIS.

amref
heakh afr\ca

Amref Health Africa in Kenya

Prior to commencing your srudy, you will be expected to obuiin a research licence from Naiional Commission for Science, Technology arid Innovation (NACOSTI) btg›s://feseafch-pqrial.nmnstt.gc.ke and also obtain orl+cr clearances ncod¢d.

Please do n‹x hesitate tp contact the FJRC SocrCtariat (csrc_kmya@amref.gig) for any clarification or query.

Yours Sincerely,

AMREF - ESRC
P.O. Box 30125-00100, NAIROBI
18 JUL 2023

Prof. Mohamed Karama,
Chair. Amref ESRC

CC: Samuel Muhula, Senior lvianager. Learning rind lmpaci Ammf Hearth Africa.

Appendix V: Nacosti Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 924112

Date of Issue: 21/August/2023

RESEARCH LICENSE

This is to Certify that Dr.. Sylvia Vosevwa Vosevwa of Amref International University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nyandarua on the topic: ASSESSING UPTAKE AND COMPLETION OF TUBERCULOSIS PREVENTION THERAPY AMONG HEALTHCARE WORKERS IN NYANDARUA COUNTY, KENYA for the period ending : 21/August/2024.

License No: NACOSTI/P/23/28568

924112

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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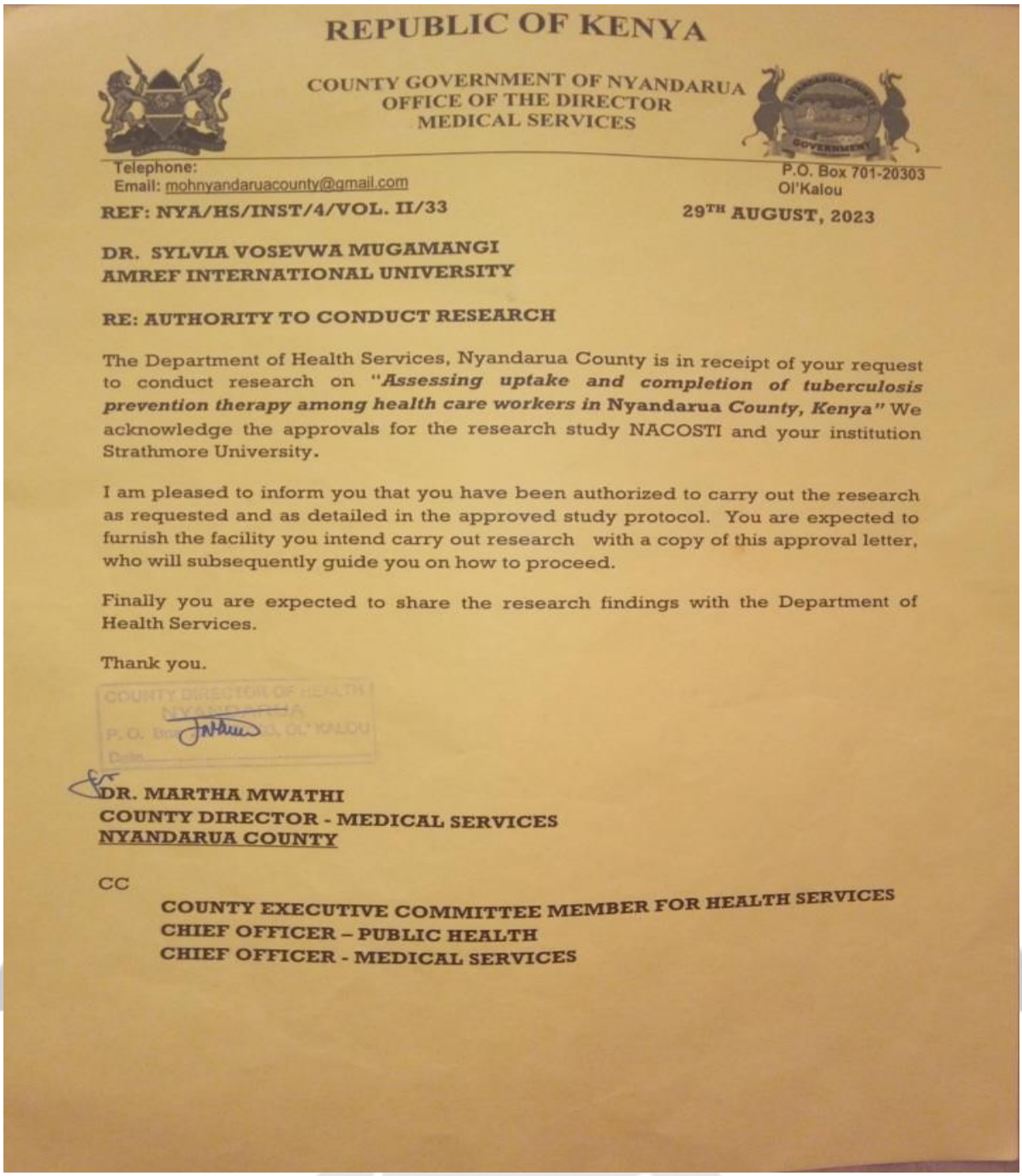
See overleaf for conditions

Appendix VI: Nyandarua County Research Approval



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NYANDARUA
OFFICE OF THE DIRECTOR
MEDICAL SERVICES

Telephone:
Email: mohnyandaruacounty@gmail.com

P.O. Box 701-20303
Ol'Kalou

REF: NYA/HS/INST/4/VOL. II/33

29TH AUGUST, 2023

DR. SYLVIA VOSEVWA MUGAMANGI
AMREF INTERNATIONAL UNIVERSITY

RE: AUTHORITY TO CONDUCT RESEARCH

The Department of Health Services, Nyandarua County is in receipt of your request to conduct research on *"Assessing uptake and completion of tuberculosis prevention therapy among health care workers in* **Nyandarua** *County, Kenya"* We acknowledge the approvals for the research study NACOSTI and your institution Strathmore University.

I am pleased to inform you that you have been authorized to carry out the research as requested and as detailed in the approved study protocol. You are expected to furnish the facility you intend carry out research with a copy of this approval letter, who will subsequently guide you on how to proceed.

Finally you are expected to share the research findings with the Department of Health Services.

Thank you.

COUNTY DIRECTOR OF HEALTH
NYANDARUA
P. O. Box ... OL' KALOU
Date

DR. MARTHA MWATHI
COUNTY DIRECTOR - MEDICAL SERVICES
NYANDARUA COUNTY

CC

COUNTY EXECUTIVE COMMITTEE MEMBER FOR HEALTH SERVICES
CHIEF OFFICER – PUBLIC HEALTH
CHIEF OFFICER - MEDICAL SERVICES

Appendix VII: Structured Questionnaire for HCWs

TITLE: Assessing Uptake and Completion of Tuberculosis Prevention Therapy Among Healthcare Workers in Nyandarua County, Kenya

SECTION A

(State the answer in the spaces provided)

Age…….. Gender……..

Carder…….. Department ……

Number of years in practice 10years and below 20years and above

BCG vaccination Yes No

SECTION B

1. Have you taken anti-tuberculosis medication for prevention of latent tuberculosis infection? (**Please tick one)**

   Yes No

   IF YES move to question 3. **IF NO** move to question 2 then proceed to Q.6

2. Why didn't you take the anti-tuberculosis medication for prevention of TB?**(Please tick one)**

Unaware of the program Fear of side effects medical condition

Pregnant am not at risk of TB

Other

(explain)……

……..

3. Did you experience any drug side effects of the anti-tuberculosis medication?(**Please tick one**) yes ☐ No ☐

   IF YES, which side effect did you experience? **(You can tick more than one)**

   Loss of appetite ☐ Abdominal discomfort ☐

   Nausea and vomiting ☐ Persistent fatigue or weakness ☐

   Yellow eyes ☐ Limb numbness or tingling sensation ☐

   Rashes ☐

   Other

   (list)……

   ……

   ……

   …….

   IF YES TO EXPERIENCING SIDE EFFECTS did that stop you from completing the dose?

   Yes ☐ No ☐

4. Which regimen were you on? **(Please tick one)**

   6-month isoniazid daily (6H)

   3-month rifapentine plus isoniazid weekly (3HP)

   3-month isoniazid plus rifampicin daily (3RH)

5. Did you have any close follow up during the duration you were taking the anti-TB medication?

Yes ☐ No ☐

6. Do you know you HIV/AIDS status?

Yes ☐ No ☐

7. Do you have any chronic medical condition?

Yes ☐ No ☐

IF YES which one? (**Can tick more than one)**

Diabetes ☐ Cancer ☐ Liver Disease ☐ Kidney disease ☐

Other (list)…….

8. Do you drink alcohol or smoke?

Drink alcohol ☐ Smoke ☐ Both drinking &Smoking ☐

SECTION C

1. Have you ever attended to or cared for a TB patient or come across a patient's TB specimen?

Yes ☐ No ☐

IF YES, did you wear a mask or any other personal protection equipment at that time? ☐ ☐

Yes No

IF NO, why didn't you wear any personal protection at that time? (can answer more than one)

☐

Lack of PPEs ☐ d not see the need to

Other(name)……

……

2. How can you grade your risk of contracting TB from your work place?(please tick one)

   High ☐ Low ☐

3. Have you ever had a co-worker diagnosed with TB?

   Yes ☐ No ☐

4. Have you ever had a household member diagnosed with TB?

   Yes ☐ No ☐

5. Did you undergo any training/department meeting/CME that made you aware of the anti-TB medication for protection of healthcare workers and its importance?

   Yes ☐ No ☐

6. Do you think tuberculosis preventive therapy is importance for reducing risk of TB among healthcare workers?

   Yes ☐ No ☐

Appendix VIII: In-Depth Interview Guide for County & Sub-County Tb Coordinators.

TITLE: Assessing Uptake and Completion of Tuberculosis Prevention Therapy among Healthcare Workers in Nyandarua County, Kenya.

Name of TB coordinator……

Sub-county……

1. How would you describe the uptake and completion rate of tuberculosis preventive therapy (TPT) among health-care workers in Nyandarua County and in the sub-county you represent?
2. Was there any support given to health facilities to ensure good uptake and completion? If so which ones?

3. What are some of the challenges encountered in implementation of TPT among healthcare workers in the health facilities?
4. According to you, what factors played a role in improving uptake and completion of TPT among HCWs?
5. According to you, what factors played a role in negatively influencing uptake and completion of TPT?
6. How can uptake and completion of TPT among HCWs be improved in the county and county wide as well?

Thank you for your participation.

Appendix IX: Key Informant Interview for Facility Medical In Charge

Title: Assessing Uptake and Completion of Tuberculosis Prevention Therapy among Healthcare Workers in Nyandarua County, Kenya.

Name of Facility…….

Name of medical superintendent……

SECTION A: HEALTH SYSTEM FACTORS

1. Do you know about tuberculosis preventive therapy for healthcare workers?
2. How did you hear about it?
3. Did you and HCWs receive any training on tuberculosis preventive therapy for healthcare workers and its importance?
4. What are some of the challenges you faced as a facility in implementation of TPT among HCWs?
5. Did you receive any support from the County government TB co-coordinators' towards ensuring uptake and completion of TPT in HCWs? If so what kind of support did you receive?
6. Are there measures set aside to monitor uptake and completion of TPT among HCWs in your facility?
7. According to you, what factors contributed to some HCWs accepting to take TPT and others not accepting to take TPT in your facility?
8. According to you, what factors contributed to some HCWs completing TPT and others not completing TPT in your facility?
9. How do you think uptake and completion can be improved in your facility and others in the future?

SECTION B: RISK FACTORS

1. Does the facility routinely screen for TB infection status among the healthcare workers? i.e using TST and/or IGRA, and what are the challenges faced that may hinder this
2. Is there a system for reporting TB among healthcare workers?
3. Are immunocompromised healthcare workers reassigned to lower risk environments and can this be done without the risk of exposing their state eg HIV status?
4. Is there a health and safety officer or a TB infection prevention and control manager in-charge of infection prevention of TB among HCWs within the facility?
5. Is the infrastructure laid down by the health facility sufficient to adequately protect healthcare workers from TB? For example- Isolation space for TB patients in the wards, direction of windows opening
6. Is there adequate funding for activities towards TB prevention among HCWs?
7. Does the facility face any challenges towards protecting workers against TB?

Appendix X: Plagiarism Checker Certificate

COMPLETE THESIS

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8	Nicholas I. Paton, Laurence Borand, Jubert Benedicto, Mar Mar Kyi et al. "Diagnosis and management of latent tuberculosis infection in Asia: Review of current status and	<1%

Appendix XI: Nyandarua County Map