KNOWLEDGE, PRACTICE, AND BARRIERS OF NURSES ABOUT EARLY TB DETECTION IN SELECTED HEALTH CENTER IVS IN A DISTRICT IN SOUTHWESTERN UGANDA

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UGANDA CHRISTIAN UNIVERSITY

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Declaration

This is a declaration stating that the work I have submitted for this dissertation is entirely my own work. All the work from previous scholars have been cited accordingly, to acknowledge their contributions.

Simon Habimana

Signature…….……

Date…2nd/10/.2024……

This dissertation has been designed under our supervision and I approve that it is ready for submission to Uganda Christian University for consideration.

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Signature…  …..

Date…8 October 2024……

Dedications

I dedicate this research to my family and siblings for their unwavering support: materially, morally, and spiritually during my academic career. To every employee in the nursing department for helping me during the course by lecturing, counseling, and directing me. To my fellow students, who throughout the study proved to be devoted and encouraging me.

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Abstract

Background/Purpose: Tuberculosis (TB) remains a significant public health issue worldwide, particularly in low- and middle-income countries. Although early detection and prompt management are key to controlling TB, nurses face numerous barriers in early detection, emphasizing the need for targeted interventions. In Southwestern Uganda, no studies have been conducted to describe the knowledge, practices, and barriers of nurses regarding early TB detection. This study aimed to describe the knowledge, barriers, and practices of nurses in early TB detection at Health Centre IVs in Southwestern Uganda.
Theoretical/Conceptual Framework: This study applied Lewin's Theory of Organizational Change, focusing on the "unfreezing" stage to assess the knowledge, practice and barriers of nurses regarding early TB detection in Health Centre IVs in Southwestern Uganda.
Methodology: A cross-sectional quantitative research design was utilized. Using consecutive sampling, 60 nurses were recruited from three Health Centre IVs in a district in Southwestern Uganda. A questionnaire was used to collect data on nurses' knowledge, practices, and barriers regarding early TB detection. Data analysis was conducted using SPSS (version 23).
Results: Only 20% of nurses had excellent knowledge of early TB detection, while 38% had poor knowledge. Most participants had poor practices (67%). About 75% of nurses faced high levels of perceived barriers to early TB detection like: lack of awareness, training, TB guidelines, lack of diagnostic equipment and poor supply of infection prevention materials, perceived stigmatization among the nurses at risk of TB, belief that TB is a high risk disease, and human resource constraints which may result in delays in getting TB laboratory results.
Conclusion: There were significant gaps in the knowledge and practices of nurses regarding early TB detection, along with high levels of perceived barriers like: inadequate training, stigma, and delays in diagnostic processes, which significantly impact the effectiveness of early TB detection.
Recommendations: The study recommends continuous professional development and comprehensive training programs for nurses to improve their knowledge, collaboration, and practices in early TB detection. Clear, standardized guidelines for early TB detection are needed, along with efforts to reduce stigma surrounding the disease, which is a significant barrier to early detection.
Key Terms: Knowledge, Practices, Barriers, Tuberculosis, Early TB detection, Nurses, Southwestern Uganda.

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List of Acronyms

AIDS: Acquired Immune Deficiency Syndrome

BCG: Bacillus Calmette-Guérin vaccine

BRICS: Brazil, Russia, China and South Africa

COVID-19: Corona Virus Disease-2019

CT scan: Computed tomography scan

CVI: Content Validity Index

EPTB: Extra pulmonary Tuberculosis

HIV: Human Immuno-deficiency Virus

HMIS: Health Management Information System

ICF: Intensified TB Case Finding

PTB: Pulmonary Tuberculosis

REC: Research Ethics Committee

SPSS: Statistical Package for the Social Sciences

TB: Tuberculosis

UCU: Uganda Christian University

WHO: World Health Organization

Chapter One: Introduction

Mycobacterium Tuberculosis is the bacterium that causes one of the earliest known human diseases, tuberculosis (TB). As of 2023, the World Health Organization (WHO) estimated 10.8 million people to have TB worldwide with an incidence of 134 per 100,000 population, including 6.0 million men, 3.6 million women and 1.3 million children (WHO, 2024). TB has returned to being one of the world's leading cause of mortality globally from a single infectious agent (WHO, 2024).

Early TB detection refers to the identification of TB infection at its initial stage, before it advances and becomes severe (Putra et al., 2019). Early detection involves identifying individuals with TB symptoms, including weight loss, fever, chills, and coughing, and providing them with prompt testing, diagnosis, and treatment (Ntow et al., 2021). Even though early detection and prompt management are the key principles for effective control of TB, in situations where resources are scarce, early detection through systematic screening for active TB at all entry points in the facility remains an area of difficulty (Krithika et al., 2018). Practices of the nurses on early TB detection remains critical in the control measures of TB since when cases are not identified or diagnosed and treated, they remain in communities spreading the TB infection to other community members (Krithika et al., 2018). This study aimed at describing knowledge, barriers, and practices of nurses about Early TB detection in selected health center IVs in a District in Southwestern Uganda.

Background to the Study

TB remains a significant issue for public health worldwide, especially in low- and middle-income nations (Romanowski et al., 2019). The *Mycobacterium tuberculosis,* which accounts for most TB, 85% of cases involve the lungs, however it can also affect other body

parts. Apart from COVID-19, TB is considered to be one of the most lethal infectious disease globally, surpassing HIV/AIDS. Tuberculosis (TB) is the primary cause of mortality for those living with HIV and plays a significant role in the development of antibiotic resistance (Baral& Koirala, 2022).

An estimated 2.5 million cases of tuberculosis were reported in Africa in 2023, making about 24% of the global case total. TB in Africa accounts for 33% of global TB related deaths in 2023 (WHO 2024). However, the epidemiologists projected that at least a million individuals suffered from tuberculosis but were not identified or treated (Ghebreyesus, 2021). Each year, an estimated 91,000 to 96,000 cases of tuberculosis (TB) are reported in Uganda, making it one of the high TB burden countries globally (WHO, 2023). The prevalence of TB in Uganda is approximately 253 cases per 100,000 population (WHO, 2023), which is higher than the previously reported estimate of 159 cases per 100,000 population from the 2015 WHO Global TB report (WHO, 2016). The high incidence rate has been made worse by the nation's high HIV/AIDS prevalence. Early detection and treatment are essential to stop the TB disease from spreading and to enhance patient outcomes (Walzl et al., 2018).

Nurses form the largest group of health workers worldwide and through infection control measures, play a critical part in the early diagnosis, treatment, and prevention of tuberculosis transmission (Chakaya et al., 2022; Russo et al., 2018). They have a critical role in the early diagnosis and treatment of instances of suspected tuberculosis and multidrug-resistant tuberculosis since they frequently see patients with TB symptoms initially (Matakanye et al., 2019). By ensuring patients receive the care they require, this practice restores health and alleviates suffering by allocating support for patients based on their specific requirements (International Council of Nurses, 2015).

In order to improve the management of TB cases, there needs to be knowledgeable and trained nurses (Alotaibi et al., 2019). Nurses with good knowledge have the capacity to raise the number of presumed tuberculosis cases, which in turn could raise the number of patients receiving TB diagnoses and treatments (Vigenschow et al., 2021).

Many studies have been conducted on nurses' knowledge, barriers, and practices in the early detection of tuberculosis. For example, in southern Mozambique, a study by Noe et al., (2017) revealed lack of knowledge among nurses, especially in early detection, treatment and a good understanding of TB disease management are less likely to practice early TB detection. Several other studies have noted that nurses had inadequate knowledge regarding Early TB detection, and control (Akande, 2020; Baral & Koirala, 2022; Vigenschow et al., 2021).

Nurses also face multiple barriers in early tuberculosis (TB) detection. These include inadequate training, limited healthcare accessibility, and constrained clinic resources affecting counseling and examination. Patient-related challenges, such as mistrust and logistical issues, further hinder timely detection. Systemic barriers involve insufficient diagnostic facilities in rural areas, inconsistent referral mechanisms, and healthcare worker-related factors like stigma and fear (Fenta et al., 2023). Additionally, issues such as poor awareness, suboptimal screening practices, and a lack of infection control measures contribute to the complex challenges nurses encounter in TB detection (Der et al., 2022; Tan et al., 2020). Furthermore, stigma, work culture, lack of risk awareness, inadequate provision and use of tuberculosis infection prevention and control measures, and low awareness and little familiarity with TB among healthcare workers have also been reported as barriers to TB detection and control (Ramos et al., 2023). These barriers highlight the complex challenges that nurses face in early TB detection and emphasize the need for targeted interventions to address these issues.

Despite the various interventions that have led to a decline in TB infection, the end TB strategy of 20% reduction has not been met as expected in Uganda (Kirenga et al., 2015). In Southwestern Uganda, reports from Health Management Information Systems (HMIS), all health center IVs in the districts were found to be below 50% of the recommended TB detection targets (*HMIS, 2022*).

Even though the nurses in these facilities are the main healthcare providers and are essential in the early detection of tuberculosis, no study has been conducted in a district in Southwestern Uganda as the few studies conducted have been done in other settings (Akande, 2020; Alene et al., 2019; Baral & Koirala, 2022; Noé et al., 2017). This lack of information regarding the practices, barriers, and knowledge of nurses in Southwestern Uganda may hinder effective TB control programs. Therefore, a descriptive study was conducted to describe nurse's knowledge, barriers, and practices about Early TB detection in selected health Center IVs in a District in Southwestern Uganda

Statement of the Problem

Despite various interventions such as onsite training, support supervision, and continuous training of focal persons, all Health Center IVs in in Southwestern Uganda have failed to meet the recommended TB detection targets set by the Ministry of Health, with detection rates remaining below 50%. Effective TB management hinges on the knowledge and practices of nurses, who are key in identifying suspected cases and facilitating timely diagnosis and treatment. However, nurses face multiple barriers that hinder their ability to effectively detect TB early. These barriers highlight the need for targeted interventions to enhance their capacity in TB detection.

While significant progress has been made in TB control globally, there remains a lack of specific studies focusing on the knowledge, practices, and barriers faced by nurses in early TB detection within the districts of Southwestern Uganda. This gap in the literature prompted the need for a descriptive study that explores the knowledge, practices, and barriers related to early TB detection among nurses in selected Health Center IVs in a district in Southwestern Uganda.

Purpose of the Study

The purpose of this study is to describe the knowledge, practices, and barriers of nurses about Early TB detection in a selected health center IVs in a district in Southwestern Uganda.

Research Question

What is the knowledge, practice and barriers of nurses about Early TB detection in a selected health center IVs in a district in Southwestern Uganda?

Research Objectives

- To identify the knowledge of nurses about early TB detection in a selected health Centre IVs in a district in Southwestern Uganda.
- To describe the practice of nurses regarding early TB detection in a selected health Centre IVs in a district in Southwestern Uganda.
- To determine the barriers faced by nurses regarding early TB detection in a selected health center IV in a district in Southwestern Uganda.

Significance of the Study

The results of this study may provide evidence to nursing as a profession regarding the current knowledge and practice of nurses regarding Early TB detection. Nurses may be reminded of their role in Early TB detection wherever they encounter patients exhibiting the key signs and

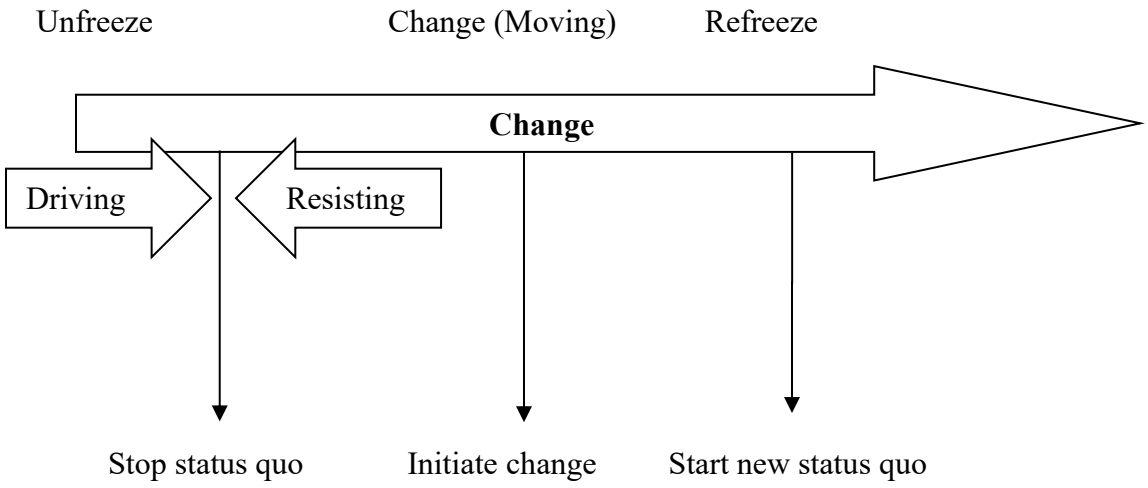
symptoms. Furthermore, the study enlightened the administrators of the barriers to early TB detection by the nurses in health center IVs in a district in Southwestern Uganda.

The study findings may help to inform educators and those who create nursing education curricula about the areas in which nursing students might not be sufficiently knowledgeable. With this knowledge, they would be able to concentrate on particular areas that require improvement and construct training modules, workshops, or programs to explicitly address the identified TB-related competency gaps.

Nursing leaders may use the results of this study as a guide at district-level in identifying areas of improvement in early TB detection. This may also serve as a reminder to them to give more trainings that nurses are expected to receive regarding early TB detection so as to improve their skills, competencies, and ultimately leading to better patient outcomes.

Theoretical Framework

Figure 1: Lewin's force field analysis



Note: Peterson, S. J., & Bredow, T. S. (2020, page 283).

This study utilized the "Lewin's Theory of Organizational Change" (Figure 1) as the theoretical framework to be used to help in understanding the concept. Lewin's main focus was

on using behavioral change to end social conflict, whether it occurred within businesses or in society at large. He listed two prerequisites for achievement:

1. To examine and comprehend the origins, drives, and upkeep of social groups. He created both Field Theory and Group Dynamics to do this.
2. To enable behavioral change within social groups. For this, he introduced Action Research and the 3-Step Model of Change (Ogochi, 2018).

Lewin's theory outlines three fundamental stages of change: Unfreeze, Change (or move), and Refreeze. During the unfreeze stage, the goal is to "stop status quo" by creating awareness of the need for change and preparing individuals or organizations to let go of their current state. In the change stage, we "initiate change" by implementing new practices or behaviors. Finally, in the refreeze stage, we "start new status quo" by stabilizing and reinforcing the changes, ensuring that the improved practices become a permanent part of the routine.

Throughout the process, organizations must identify and strengthen the driving force**s** that support change while recognizing and mitigating the restraining forces that oppose it (Deborah, 2018). By operationalizing Lewin's theory in this structured way, transformation can be more effectively managed and positive outcomes achieved (Stouten et al., 2018).

First Step: Unfreeze

In Lewin's theory of change, the first step is known as "Unfreeze." This critical stage involves creating a shift from the current state, commonly referred to as the status quo or equilibrium condition (Muldoon, 2020). The status quo represents the stable state of human behavior, which may resist change due to individual resistance and collective conformity (Jost, 2015). Unfreezing is the process of overcoming these pressures and preparing individuals or organizations to be receptive to change.

Lewin identified two essential forces that come into play during the unfreeze stage: driving forces and restraining forces. Driving forces are factors or elements that push for or support change. These forces create motivation, desire, or momentum for individuals or organizations to move toward a new state or goal. They can be internal, such as personal ambition or recognition of the benefits of change, or external, driven by environmental demands or market trends (Jost, 2015).

On the other hand, restraining forces act as barriers or obstacles that impede progress and hinder the desired change. These forces may include fear of the unknown, resistance to change, or the perceived complexity of adopting new practices. Restraining forces can also be external, arising from limited resources, lack of support from stakeholders, or conflicting priorities (Peterson & Bredow, 2020).

For the change process to begin, the driving forces must outweigh the restraining forces (Muldoon, 2020). This means that the motivation and impetus for change need to be more substantial than the resistance to change. Only when the driving forces are stronger can the equilibrium be unfrozen, allowing for the potential adoption of new behavior or practices.

Lewin's view was that a dynamic interplay of driving and restraining forces creates a quasi-stationary equilibrium, maintaining the stability of human behavior. To successfully adopt new behavior and unlearn old patterns, this equilibrium must first be disrupted or unfrozen. By addressing the driving and restraining forces effectively, the equilibrium can shift, creating a readiness for change and making individuals or organizations more receptive to embracing new practices and behaviors (Ogochi, 2018).

Second Step: Moving

The second stage of Lewin's behavior-changing process is referred to as the "Moving Stage." This step involves the actual implementation of the change. After successfully unfreezing the status quo and overcoming the restraining forces with the driving forces, the movement stage should ideally be smoother and more receptive to change (Peterson & Bredow, 2020).

During the moving stage, the target system undergoes a transformation and is brought to a new degree of equilibrium (Hassan, 2018). Employees or individuals involved in the change process are encouraged to approach the issue from a fresh perspective. They collaborate to find new and relevant information and are expected to align their views with respected and influential leaders who support the change.

In this stage, individuals acknowledge that maintaining the previous status quo is not in their best interests. They actively seek alternatives and are willing to explore different possibilities on a trial-and-error basis (Ogochi, 2018). This experimentation and exploration help in finding the most suitable approach to the desired change.

The moving stage is a critical phase where the actual shift happens, and new practices or behaviors are put into action (Adelman et al., 2023). It requires active engagement, effective communication, and cooperation among all stakeholders involved. The openness to change and the readiness to learn from successes and failures facilitate the smooth progress of the movement stage.

Third Step: Refreezing

The final phase in Lewin's three-stage transition paradigm is called "Refreezing." This critical phase ensures that the changes implemented during the movement stage become firmly integrated into the new quasi-stationary equilibrium (Peterson & Bredow, 2020). After the

intended change has been successfully implemented, the refreezing phase focuses on making the transformation sustainable (Hassan, 2018).

Refreezing aims to stabilize the group or organization at the new equilibrium and safeguard the new behaviors from regression. To achieve this, the key is to ensure that the newly adopted behaviors are aligned with the learners' other actions, personality, and environment, thereby avoiding disconfirmation. Lewin believed that for change to be effective and lasting, group norms and routines must also be modified. Otherwise, changes in individual behavior would not be sustained.

The process of refreezing often requires making alterations to company culture, norms, rules, and practices (Ogochi, 2018). This phase emphasizes the importance of creating an environment that supports and reinforces the desired changes. It involves reinforcing the new behaviors through positive reinforcement, recognition, and rewards. It may also include developing new policies and procedures that align with the changes, incorporating the new behaviors into performance evaluations, and providing ongoing training and support to maintain the momentum of the change.

By ensuring that the changes become an integral part of the new equilibrium, the refreezing phase increases the likelihood of long-term success and prevents a regression to the old behaviors. It creates a stable foundation for sustained improvement and growth within the organization.

Operationalization of Lewin's Theory of Organizational Change

Only the unfreezing step from the Lewin’s theory was applied to determine the knowledge, barriers, and practices of nurses regarding Early TB detection in a health center IV in Southwestern Uganda. The decision to focus on the unfreezing step is based on the specific

objectives and scope of my study regarding Early TB detection in a health center IV in Southwestern Uganda. By concentrating on the unfreezing step, I aimed to gain a comprehensive understanding of the current knowledge, barriers, and practices of the nurses in the health center. This step allows me to identify the driving and restraining forces that influence their behavior and attitudes towards Early TB detection. Here is how I applied Lewin's unfreezing step in my study:

Status Quo

The researcher designed survey questions to describe the existing knowledge, barriers, and practices of nurses regarding Early TB detection in the health center IV in Southwestern Uganda. This involved assessing the current level of understanding, skills, and adherence to TB detection WHO protocols.

Driving Forces

These are factors that motivate and encourage nurses to improve their knowledge, barriers, and practices related to Early TB detection. These may include factors such as existence of training programs, awareness campaigns, access to updated guidelines, supportive leadership, or recognition for excellence in TB detection from the health faculties.

Restraining Forces

These were barriers, challenges, or obstacles that hinder nurses' adoption of improved knowledge, barriers, and practices in Early TB detection in Southwestern Uganda. This included factors like lack of resources, limited training opportunities, inadequate supervision or feedback, organizational culture, or conflicting priorities.

Operational Definitions of Key Concepts

In this study on the knowledge, barriers, and practices of nurses regarding Early TB detection in health center IVs in a district in Southwestern Uganda, the following are the definition of the key concepts.

TB

An infectious disease caused by *Mycobacterium tuberculosis* that primarily affects the lungs.

Early TB Detection by Nurses in HCIV

Early TB detection refers to the identification of individuals showing TB symptoms, such as persistent cough, fever, and weight loss, within 2 weeks of symptom onset, followed by appropriate diagnostic testing (e.g., sputum smear, GeneXpert) for confirmation by nurses in Health Center IVs.

Nurses in a Health Center IV

Nurses are healthcare professionals who work in health center IV in Uganda. They check for TB, collect samples, give TB tests, and teach patients about how to prevent TB and know its symptoms. These nurses play a big role in finding and treating TB early. They also help people learn how to stay healthy and avoid getting sick.

Health Center IV

A health facility in Uganda that provides primary health care services, including TB services such as TB diagnosis, screening, and medication prescribing, among others.

Knowledge of Nurses

In this study, knowledge refers to the understanding and awareness that nurses possess regarding Early TB detection. It includes their familiarity with TB symptoms, risk factors, diagnostic procedures, treatment guidelines, and protocols for early detection.

Practices of Nurses

In this study, practice refers to the actions and behaviors demonstrated by nurses in relation to Early TB detection. It encompasses their implementation of TB screening methods, use of appropriate diagnostic tools, adherence to infection control measures, documentation of patient data, and collaboration with other healthcare professionals involved in TB detection and management.

Barriers Faced by Nurses

Barriers are defined as a spectrum of impediments hindering nurses in promptly identifying tuberculosis cases. This includes challenges like limited access to specialized training, inadequate healthcare infrastructure, communication barriers, stigma, geographical constraints, insufficient support systems, high nurse workload, and low public awareness among others.

Smear-positive PTB

Refer to individuals diagnosed with pulmonary tuberculosis whose sputum samples show the presence of *Mycobacterium tuberculosis* under a microscope using acid-fast staining.

Summary

This chapter introduces the study, providing the background that outlines the extent of TB disease and the challenge of early TB detection. It presents the research problem statement, the research purpose, research question, study objectives, and the guiding theoretical framework Chapter two described extensive analysis of the literature with regard to knowledge, practice and barriers of nurses concerning Early TB detection. In Chapter 3, the proposed research methodology for this study was discussed.

Chapter Two: Literature Review

This chapter presents reviewed literature related to knowledge, barriers, and practices of nurses about Early TB detection. It described three main topics that guided this study. The first topic describes the magnitude of TB globally and in Uganda. The second topic describes the critical role nurses play in early TB detection globally and in Uganda. Finally, nurses' knowledge and practice regarding early detection of TB globally and in Uganda is discussed.

Globally, and in Uganda, TB Remains a Major Public Health Problem

Tuberculosis is an infectious disease that mostly affects the lungs and is brought on by Mycobacterium tuberculosis. Tuberculosis is still a significant issue for public health in many parts of the world, particularly in low- and middle-income countries (Chakaya et al., 2021). *Mycobacterium tuberculosis* bacilli are typically cleared by the body's defense system, but infections are possible and can either cause the bacilli to go into a dormant condition or progress to active TB disease (Migliori et al., 2021).

There are two different forms of tuberculosis (TB): extra-pulmonary TB, which affects other regions of the body, and pulmonary TB, which affects the lungs. According to an Ethiopian study PTB has been the dominant form of TB in Ethiopia. In 2019, Ethiopia reported 212,220 new TB cases, with PTB being the most common variant. Among these, drug-susceptible TB was the majority, followed by multidrug-resistant TB (MDR-TB) (Arja et al., 2023). A meta-analysis revealed spatial variations in Extra-Pulmonary TB prevalence across regions, with higher rates observed in border areas such as Gambela and Somali regions. EPTB is often associated with HIV co-infection and poverty, and it is transmitted through the spread of *Mycobacterium tuberculosis* bacteria from an active TB infection in one part of the body to other organs or tissues (Alene et al., 2023).

The bacilli that cause TB are spread by inhaling droplet nuclei from contagious people who are coughing, speaking, whistling, or sneezing, this leads to the spread of aerosols from person to person (Temesgen et al., 2021). These are some of the TB transmission methods from infected to healthy individuals.

Globally, the WHO estimated 10.8 million people to have TB as of 2023. The incidence of 134 per 100,000 population, including 6.0 million men, 3.6 million women and 1.3 million children has been reported worldwide (WHO, 2024). Known collectively as "BRICS," Brazil, Russia, India, China, and South Africa account for 47% of all TB infections globally annually (Addo et al., 2022). As of 2023, TB has returned to being one of the world's leading cause of mortality globally from a single infectious agent, following 3 years in which it was replaced by COVID-19 (WHO, 2024). The disease accounts for about 1.2 million anticipated fatalities among HIV-negative persons living with TB and an additional 0.25 million among HIV-positive people living with TB (Bhargava & Bhargava, 2020).

In the African region, an estimated 2.5 million cases of tuberculosis were reported in in 2023, making about 24% of the global case total. TB in Africa accounts for 33% of global Tb related deaths in 2023 (WHO 2024). An estimated 91,000 to 96,000 cases of new cases of tuberculosis are reported in Uganda each year, with a prevalence of 253 cases per 100,000 people (WHO, 2023). Epidemiologists estimated that at least one million people had tuberculosis (TB) but were neither detected nor treated, despite the disease's rising prevalence (Chakaya et al., 2021). Early detection and treatment are essential to limit the TB disease from spreading and to enhance patient outcomes (Walzl et al., 2018).

TB disease develops in several stages and can vary in progression depending on individual factors such as immune system strength and bacterial strain (Ntow et al., 2021). The

first stage of TB is the latent TB infection (LTBI), whereby the bacteria continue to exist in the body in an inactive form. During this stage, individuals do not feel sick, and there are no visible symptoms (Alsayed & Gunosewoyo, 2023). But because they harbor the bacteria, if their immune system deteriorates, they run the risk of developing active tuberculosis.

Active tuberculosis disease develops when body's immune system is unable to control original infection, thus bacteria becomes active and starts multiplying within the body. This is when clinical manifestations become evident (De Martino et al., 2019). One of the primary symptoms of active TB is a persistent cough lasting more than two weeks, which may produce sputum, sometimes with blood. Fatigue and weakness are also common, alongside fever and night sweats that worsen in the evenings. Unintended weight loss is another hallmark symptom, as TB can lead to loss of appetite (Enright & Schreuder, 2013).

As the disease progresses, patients may experience chest pain or discomfort, especially during breathing or coughing (Alsayed & Gunosewoyo, 2023). In more advanced cases, hemoptysis may occur, involving the coughing up of blood or blood-streaked sputum. Additionally, TB can lead to swollen lymph nodes in the neck or other parts of the body, and in severe cases, it can affect other organs, such as the kidneys, spine, brain, or joints (De Martino et al., 2019).

In cases where TB remains untreated or the immune system is severely compromised, the disease can become life-threatening (Baral & Koirala, 2022). However, it's essential to note that treating and curing tuberculosis is possible. Significant improvements in prognosis and prevention of severe outcomes can be achieved with early diagnosis and adequate treatment (Putra et al., 2019). If someone exhibits symptoms suggestive of TB or has been in contact with

an infectious TB case, seeking medical attention promptly for evaluation and diagnosis is crucial to ensure timely treatment and containment of the disease.

The causes and contributing factors to tuberculosis infection mortality are host, illness, and health system-related (Bhargava & Bhargava, 2020). Among the identified TB risk factors are HIV infection, male gender, co-morbidities such as diabetes, a family history of TB, the absence of scarring from the Bacillus Calmette-Guérin (BCG) vaccine, smoking, alcohol consumption, single status, crowded living conditions, and low socioeconomic status (Kirenga et al., 2015). The appearance of a scar after receiving the BCG vaccine is proof that the person was protected against tuberculosis and that the vaccine was properly administered and effective (Kirenga et al., 2015). A study carried out in Iran found that not getting the BCG vaccine, smoking, poor nutrition, exposure to secondhand smoke, and diabetes are the most prevalent modifiable risk factors for tuberculosis (TB) (Sadeghi et al., 2022).

Age increases the chance of developing TB. According to Ghebreyesus and Kasaeva (2022); older adults (those 65 and older) had higher TB infection rates in 2021 than other age groups by a 10-year margin. Many other nations have also seen that the percentage of older tuberculosis patients remains high, and in certain areas, it has even gone up, disproportionately outpacing the growth in the population of older adults (Cheng et al., 2020).

Numerous clinical factors, including close contact with people who had known TB and having HIV, were found to be strongly linked to the onset of tuberculosis, including socio-demographic factors like patients' monthly income being low, their lack of educational background, and having a damaged immune system (Diriba & Awulachew, 2022; Rach, 2018).

It has also been reported that contact history and lymphadenopathy are more significant symptoms at the time of pulmonary TB onset (Farina et al., 2022).Signs such as persistent cough,

production of sputum, lack of appetite, loss of weight, elevated body temperature, night sweats, and hemoptysis are classic indications of pulmonary tuberculosis that raises TB suspicions for the person exhibiting them (Loddenkemper et al., 2018). TB has also been linked to a number of additional disease-related systemic consequences, including hypernatremia and glucose intolerance, in addition to its clinical manifestations (Luies & du Preez, 2020).

Also, disease resistance strains have emerged, posing challenges in treating TB effectively as these strains do not respond well to standard medications, leading to prolonged treatment durations and increased transmission risks (Seung et al., 2015). The difficulty in ensuring that individuals complete their entire treatment regimen is another concern, as premature cessation can foster drug resistance and hinder successful outcomes. Moreover, the cost of TB treatment can be burdensome, particularly in resource-constrained regions, limiting access to quality healthcare for many vulnerable populations. Co infection with HIV/AIDS presents a significant threat, as the compromised immune systems of HIV-positive individuals increase their vulnerability to tuberculosis infection and the disease's severity (Baral & Koirala, 2022).

In conclusion, TB remains a major public health problem globally and in Uganda. It is an infectious disease caused by *Mycobacterium tuberculosis*, primarily affecting the lungs. With millions of cases worldwide, early detection and treatment are crucial for addressing the significant burden of TB and improving patient outcomes.

Globally, and in Uganda, Nurses' Play a Critical Role in Early TB Detection

Globally, and specifically in Uganda, nurses are at the forefront of identifying potential TB cases. This is possible because nurses serve as the primary point of contact for individuals seeking healthcare services and are actively involved in various stages of TB care, as outlined by

Matakanye et al. (2019). Their work involves a thorough assessment, including inquiries about symptoms, medical history, and risk factors. Some of the few symptoms include chronic cough, elevated temperature, night sweat, and loss of weight which is unexplained, as highlighted by Ntow et al. (2021). When signs and symptoms indicative of TB are observed, nurses promptly facilitate testing, diagnosis, and treatment.

Physical examinations are also conducted by the nurse to detect signs of TB, such as abnormal breath sounds or enlarged lymph nodes, ultimately leading to early detection of infected patients (Russo et al., 2018). Their extensive awareness and knowledge regarding the physical presentation of TB contribute significantly to early detection (Baluku et al., 2023).

Nurses guide individuals through diagnostic procedures, including sputum smear microscopy and chest x-rays, as advised by Rastoder et al. (2019). These examinations play a crucial role in identifying active TB cases. Additionally, nurses play an important part in interpreting test rests, then refer patients for further assessments, such as chest x-rays or CT scans (Baluku et al., 2023). Their close collaboration with doctors and healthcare providers ensures timely and accurate TB diagnoses, further promoting early detection.

In the realm of patient education, nurses are pivotal in raising awareness about TB, as observed by Carlsson et al. (2014). They have the important task of educating both patients and the community about the disease, its transmission, and preventive measures. Furthermore, nurses provide valuable information on treatment options, potential side effects, and strategies to promote treatment adherence. Their tireless efforts in reducing TB stigma and enhancing community awareness significantly contribute to early TB detection.

Despite the critical role nurses' play in early TB detection, substantial gaps persist, particularly among high-risk groups, such as those who are HIV positive and those with in rural

settings like Western Uganda (Baluku et al., 2023). In Uganda, challenges such as inadequate staffing, limited access to laboratory testing, and TB-related stigma pose significant barriers to early detection (Cattamanchi et al., 2015). Addressing these challenges necessitates targeted research to better understand the obstacles faced by the health workers providing TB related services, facilitating the development of tailored interventions to enhance TB care.

In conclusion, nurses play a crucial and multifaceted role in the early detection globally, including in Uganda. Their involvement in TB screening, diagnosis, treatment initiation and monitoring, patient education, and community awareness significantly contributes to the overall control and prevention of TB.

Globally, and in Uganda, Nurses' Knowledge, Practice and Barriers are Important in Early Detection of TB

Nurses form the largest group of health workers worldwide and play a vital role in the early detection, treatment, and prevention of TB transmission through infection control practices (Chakaya et al., 2022; Russo et al., 2018). They are often the first to see patients with TB symptoms and are crucial to early identification and management of presumed TB and multidrug resistance TB cases (Matakanye et al., 2019). Therefore, assessing their knowledge, barriers, and practices is important.

Knowledge of Nurses towards Early TB detection

Several studies have explored nurses' knowledge regarding TB detection, offering consistent themes and insights. These studies collectively indicate that while nurses typically possess a foundational understanding of TB, specific areas of knowledge warrant attention (Demissie et al., 2015; Kuyinu et al., 2019; Mahmud et al., 2022).

Taking a global view, research has assessed the TB-related knowledge of healthcare professionals, including nurses. Findings underscore that nurses often possess a sound grasp of TB-related matters. For instance, studies conducted in the Amhara region of Northwest Ethiopia (Temesgen & Demissie, 2014) and Peru (Vigenschow et al., 2021) revealed substantial levels of TB knowledge among healthcare workers, including nurses.

Nevertheless, these global studies consistently pinpoint specific knowledge gaps. Further examination reveals recurring patterns in the depth of nurses' TB knowledge. For example, a study conducted during the Hajj pilgrimage demonstrated that nurses exhibited a foundational comprehension of TB, though with discernible limitations in specific areas (Alotaibi et al., 2019). Similarly, a Vietnamese study reported elevated knowledge scores among participants but identified disparities in their grasp of specific facets, including TB symptoms and the judicious utilization of protective equipment (Ngo et al., 2019).

A recurring theme across multiple studies emphasizes the crucial role of training in enhancing nurses' knowledge. For instance, within the South African context, nurses who received in-service training demonstrated notably improved understanding of TB detection (Heunis et al., 2013). This exploratory study set out to evaluate health workers' attitudes, knowledge, and training in relation to TB or HIV. For the TB or HIV knowledge items that were evaluated, the vast majority of respondents were knowledgeable, and just a small percentage had only key information on TB or HIV. Most health workers were not in agreement with stigmatizing messages regarding people living with tuberculosis or HIV.

The above pattern extended to studies from Uganda, South Africa, and Nigeria, where training interventions had a positive impact on nurses' knowledge of TB detection and control (Akande, 2020; Buregyeya et al., 2016; Kigozi et al., 2019). The studies collectively underscore

that nurses commonly possess a foundational understanding of TB detection. However, persistent knowledge gaps exist, particularly in specialized domains and context-specific practices.

Practices of Nurses towards Early TB detection

Numerous studies consistently reveal a pattern in the practices of nurses regarding TB detection, emphasizing the need for targeted interventions (Naseer et al., 2013; Nguyen et al., 2019; Rusakova et al., 2021; Temesgen & Demissie, 2014). Across different regions, studies find that nurses frequently possess a basic understanding of TB and its symptoms, yet their practices in Early TB detection are often suboptimal. For instance, in Nigeria, a significant proportion of nurses exhibited a basic knowledge of TB symptoms, but their practices in routine screening and referrals were lacking (Akande, 2020). Similar findings were observed in studies from Ethiopia, South Africa, Vietnam, Indonesia, and Pakistan (Abera et al., 2022; Naseer et al., 2013; Nguyen et al., 2019).

Interestingly, while the studies consistently identify shortcomings in practices, the correlation between knowledge and practice emerges as a notable theme. Studies from Ethiopia and Indonesia suggest that nurses with better TB infection control knowledge are more likely to implement appropriate practices (Rusakova et al., 2021; Temesgen & Demissie, 2014). This underscores the importance of knowledge in driving positive practices and reinforces the value of comprehensive training.

Furthermore, studies often recommend continuous education and training for nurses to bridge the knowledge-practice gap (Fekadu et al., 2020; Jiao et al., 2019). This is a significant recommendation as it underlines the necessity for ensuring that ongoing trainings enable nurses' practices to align with recommended guidelines so as to enhance overall TB detection efforts.

Similarly, a common thread emerges, in that despite the gaps in knowledge, barriers, and practices, there is a recognition of the pivotal role nurses play in Early TB detection. Nurses are often at the forefront of healthcare delivery, making them key actors in identifying potential TB cases. As such, the studies collectively highlight the need for targeted training and education initiatives to equip nurses with required knowledge and skills for effective detection and control of tuberculosis.

Barriers Faced by Nurses towards Early TB detection

The identification of tuberculosis (TB) poses significant challenges for healthcare professionals, with several barriers impeding nurses' early detection efforts. A comprehensive study conducted by Fenta et al. (2023) sheds light on various obstacles encountered by nurses in the Early TB detection. The study reported that human-related challenges such as poor capacity-building for medical staff, patients' limited ability to access healthcare facilities, time and space constraints for counseling, mistrust between index patients and contacts, and logistical and infrastructure challenges significantly impede prompt tuberculosis case identification. Moreover, human resource constraints, charges for laboratory use, high workloads, and geographical distances to TB facilities exacerbate the overall difficulty in efficient and early detection of tuberculosis cases within healthcare settings.

In addition, health system-related barriers identified by Tan et al. (2020) and Der et al. (2022) further highlight the complexity of the problem. The absence of TB diagnostic laboratories in rural health facilities, inconsistent referral mechanisms, deficiencies in implementation, training, and quality control, suboptimal screening practices, and healthcare workers' fear contribute to the impediments in early TB detection. Fenta et al. (2023) also

reported that health facility-related obstacles, such as waiting time, institutional readiness issues, and feedback mechanisms also hinder the early detection of tuberculosis cases.

Beyond systemic barriers, social and cultural factors also play a pivotal role in hindering TB detection. Ramos et al. (2023) and Tan et al. (2020) point to factors such as stigma, work culture, lack of perception of risk, poor supply and use of TB infection prevention and control measures, and low awareness and familiarity with TB among healthcare workers. These sociocultural barriers highlight the nuanced aspects of Early TB detection, emphasizing the need for interventions that go beyond the healthcare system to address deeply rooted societal attitudes and practices.

In conclusion, these studies provide consistent insights into the knowledge-practice dynamics of nurses in Early TB detection. While nurses may exhibit satisfactory knowledge levels in some areas, there are consistent gaps in their practices. In Uganda, little is known about the knowledge, barriers, and practices of nurses regarding early TB detection. Specifically, in Southwestern Uganda, little is known about the knowledge and practice of nurses about Early TB detection. Therefore, a descriptive study was conducted to describe nurses' knowledge, barriers, and practices about Early TB detection in selected health center IVs in a district in Southwestern Uganda.

Summary

In this chapter, the literature review has been presented. It depicts the magnitude of TB disease burden, the importance of early TB detection, and the role of nurses towards early TB detection. The chapter also describes the nurses' knowledge and practice regarding early detection of TB globally and in Uganda. Furthermore, the chapter describes the barriers to early TB detection among nurses. The next chapter described the method to be used to conduct this

proposed study including ethical considerations to be undertaken during data collection and analyses.

Chapter Three: Methodology

Introduction

Chapter three addresses the methodology which was used in this study. It includes: the method and design, the study population and sample selection for the study, the study site, and how data collection was carried out. Also, the chapter contains a description of the tool that was used, how the analysis was done, and ethical procedures observed during data collection.

Method and Design

A cross-sectional quantitative research design was chosen for this study because it allows for the systematic collection and analysis of data at a single point in time, which is ideal for assessing current knowledge, barriers, and practices without manipulating the study environment (Spector, 2019). This design was particularly appropriate given the study's objective to obtain a snapshot of nurses' experiences and behaviors related to Early TB detection across several Health Center IVs in Southwestern Uganda. Furthermore, the cross-sectional approach was cost-effective and time-efficient, making it practical within the resource and time constraints of this study. A representative sample of nurses was selected, and data were collected on their knowledge, barriers, and practices regarding Early TB detection at a single point in time, ensuring consistency in measurement.

Setting

The research setting for this study was selected health center IVs in a district in Southwestern Uganda. In Uganda, health centers like health center IVs are essential in the early detection of TB cases (Kakame et al., 2021). Health center IVs are district-level referral health facilities that offer a range of services which includes the diagnosis and treatment of tuberculosis. For effective service provision, the District Health teams in collaboration with

Ministry of Health have tried interventions such as onsite training, support supervision, and continuous training of focal persons. The health center IVs in a district in Southwestern Uganda was selected due to their representative nature among other health center IVs in Uganda. These facilities were deemed suitable for the study because they serve as primary healthcare facilities to a diverse patient demographics and offer a range of healthcare services including TB detection, and have common operational challenges. This ensured that the findings were reflective of broader trends in similar healthcare settings across Uganda.

According to a study published in 2021, the southwestern region of Uganda, which includes Kabale and Mbarara, has continuously reported high prevalence rate of both TB and HIV, and wide diversity of the TB strain causing pulmonary tuberculosis (Micheni et al., 2021). A more recent study published in 2022 found that 6.4% of pulmonary diagnosed TB patients in Southwestern Uganda, including Mbarara and Kabale, had various strains of *Mycobacterium tuberculosis* infection (Micheni et al., 2022). These patients often seek for screening and medical treatment at the HCIVs. As a result, nurses in HCIVs in Southwestern Uganda are responsible for early TB detection. This made it more likely to obtain an adequate and representative population of nurses working in health center IVs in Uganda. The study randomly sampled three HCIVs in Rubanda. This involved generating a comprehensive list of eligible health centers, assigning each a unique random number, and then randomly selecting three HCIVs from the list. Since each facility had about 20 nurses, the study sample size was easily achieved.

Population

The population for this study comprised all nurses working at Health Center IVs in Uganda. However, the accessible population was nurses from selected Health Center IVs in a district in Southwestern Uganda.

Sample

The study included nurses working in three health center IVs in a district in Southwestern Uganda. This was because nurses are involved in screening and triaging patients with signs and symptoms suggestive of TB and able to provide the necessary data which answered research question of this study.

Sampling frame

Based on the staffing levels at the health center IVs in Uganda, the maximum sample size was 60 nurses. This was obtained from 3 HCIVs in a district in Southwestern Uganda where each health center IV had about 20 nurses. Consecutive sampling was used in this research study. Consecutive sampling entails selecting every member of the accessible population who satisfies eligibility requirements over a predetermined period of time (Polit & Beck, 2017, p. 254). The possibility of bias is significantly decreased when every member of an accessible population is requested to participate in a study over a predetermined length of time in order to achieve a given sample size (Polit & Beck, 2017, p. 254). Due to its ability to incorporate all potential respondents, consecutive sampling was regarded as the most effective nonprobability sampling technique for reducing sample bias (Thewes et al., 2018). In this study, I ensured that all the necessary data was collected from the participants in one-week period. This involved selecting participants in a sequential manner, without skipping any potential participant within my sampling frame. The sampling frame, in this case, constituted the entire population who were nurses from whom the study findings could be generalized.

Sample Size determination

To get the sample size that represented all nurses working in health center IVs in Southern Uganda, the formula developed by Krejcie and Morgan (1970) was used. Krejcie and Morgan formula which helped me determine this study's sample size has been shown below.

$s = X^2NP\,(1-P) \div d^2\,(N-1) + X^2P\,(1-P)$.

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size. For this study, the expected population size were 60 nurses from the three HCIVs that was considered.

P = the population proportion (assumed to be 0.50 since this would provide the maximum Sample size).

d = the degree of accuracy expressed as a proportion (0.05).

Thus, $s = [3.841^2 \text{x} 60 \text{x} 0.5\,(1\text{-}0.5) \div [0.05^2(60\text{-}1) + (3.841^2 \text{x} 0.5\,(1\text{-}0.5)]$

$s = 221.299 \div (0.1475 + 3.688)$

$s = 221.299 / 3.8355$

$s = 57.698$

Therefore, 58 participants were the minimum desired number for this study however, all available and willing nurses were invited to participate in the study. Including all eligible nurses limited biases and allowed for some generalization among the nurses in selected health center IVs in a district in Southwestern Uganda. The study results were directly influenced by the sample size. Extremely smaller samples undermine study's external and internal consistence whereas extremely larger samples present practical challenges (Faber, & Fonseca, 2014).

Inclusion Criteria

Nurses who were willing to voluntarily participate in the study were invited. This was demonstrated through obtaining a written consent (Appendix A). Nurses, regardless of their employment status (full-time or part-time), participated in the study. This criterion ensured inclusivity and did not discriminate based on employment status. There were no exclusion criteria for this study.

Data Collection

Once permission was granted, data collection was conducted in all the three health centers between July 2024 and Sep 2024. Each of three health centers were given two full days for data collection. Daily scheduling involved hosting two meetings, one in the morning and another in the afternoon. This strategic arrangement accommodated participants from both day and evening shifts, enabling me collect data from all the participants who were willing to participate in the study.

Employing a consecutive sampling method, data collection spun a one-week duration, covering various work shifts of the nursing staff from all three health centers. To ensure privacy and a quiet environment for data collection, a private room in the health center IVs was used, away from patients and other staff. The administrators of the health centers were asked to arrange for group meetings where the nurses were met and told them about my study. During these sessions, detailed explanations were provided, and nurses were invited to voluntarily sign consent forms (Appendix A) to participate in the study.

After they had signed the consent forms, they were put in an envelope and sealed. Then proceeded to give them questionnaires to complete. Once the participants finished filling out the

questionnaires (Appendix B), they were placed in an envelope and kept under lock and key where I was the only one who accessed them when entering data into a codebook.

Description of the Tool

A self-administered structured questionnaire was used as the primary data collection instrument to assess knowledge, practices, and barriers related to Early TB detection among nurses working at selected Health Center IVs in a district in Southwestern Uganda. This questionnaire was developed by the researcher and was not translated into another language, as the targeted participants—registered nurses and enrolled nurses—were literate and proficient in English.

The tool was conceptually grounded in Lewin's Theory of Organizational Change, specifically the "unfreezing" stage, which emphasizes the need to understand and disrupt existing behavioral patterns to initiate change. The questionnaire items were theoretically aligned to capture the current status quo (knowledge and practices), as well as potential driving and restraining forces (barriers and motivators) affecting Early TB detection in the health setting.

Furthermore, the development of the questionnaire was guided by established global and national protocols for TB screening, diagnosis, and management, including the Intensified TB Case Finding (ICF) guidelines, and Ministry of Health TB diagnostic algorithms for adults and children (Ministry of Health, 2019, 2021). These sources provided evidence-based content to ensure that the items were contextually relevant, up-to-date, and reflective of national policy standards.

Item analysis

Demographic characteristics of participants

The first section had eight questions (questions 1-8), which were included in the questionnaire to gather key socio-demographic information from participating nurses, covering aspects such as age, gender, education level, years of nursing experience, employment status, and any prior training in TB detection. This concise set of questions aimed to establish a comprehensive understanding of the demographic profile of the nursing participants. This information played a crucial role in contextualizing the study's findings.

Knowledge about Early TB detection

The second section had 21 multiple choice questions (questions 9-29), covering the knowledge related to TB in general and those specific to Early TB detection. Each question carried one point and the total points achieved were calculated against the total number of questions and expressed as a percentage to get a final knowledge score. For example, a participant who answered 10 questions correctly, was calculated as 10/21*100% = 47.6%.

The grading of the overall score of the participant was based on the set categories (Mohammed et al., 2024). Individuals who scored< 50% were classified as having poor knowledge, those who scored 50% to < 75% were classified as having good knowledge whereas those who scored ≥75% were classified as having excellent knowledge (Mohammed et al., 2024).

Practice about Early TB detection

The third section had 16 Likert scaled questions (questions 30-45) about the practice related to Early TB detection. Participants were asked to rate the frequency of their practices, ranging from 0 (“Never") to 4("Always"). The questions covered a spectrum of practices,

including patient education about TB, referral patterns for specific symptoms, preferences for diagnostic tests, and the consideration of various testing methods.

The participant's responses for all the items in section C of the questionnaire were entered in IBM SPSS Statistics (Version 23) statistical software, and an overall practice score for each participant was determined. The overall practice score was calculated by taking the mean practice score of the participating nurses who completed the questionnaire. For example, if a participant's total responses became 48, his or her mean score was 48/16=3.

The practice scores were classified into four categories i.e. very poor practice, poor practice, good practice and excellent practice. Individuals who scored (0-1.99) were classified as having very poor practice, those who scored (2-2.99) were classified as having poor practice, and those who scored (3-3.49) were classified as having good practice whereas those who scored (≥3.5) were classified as having excellent practice.

Barriers about Early TB detection

The last section had 15 Likert scaled questions (questions 46-60) that focused on identifying barriers to the early detection of tuberculosis (TB) by nurses. Participants were asked to assess each statement and indicate their level of agreement on a scale ranging from 1 ("Strongly disagree") to 4 ("Strongly agree"). The questions aimed to uncover various factors that were perceived as influencing the effectiveness of early TB detection efforts. The mean score for each individual statement was obtained by summing up the participants' responses and dividing by the total number of statements. This mean score served as the basis for categorizing statements into distinct levels of barriers related to early TB detection. Mean scores ranging from 0.00-0.99 were interpreted as providing a low barrier to practicing early TB detection, 1.00-2.99 were interpreted as moderate barriers, and 3.00-4.00 were interpreted as high barriers.

A codebook was created that contained information about the variables in the data, their labels, and their properties. This helped to ensure that the data was properly coded and could be analyzed accurately. The SPSS (Version 23) software was checked to identify any potential data analysis problems.

Data Quality and Quality Control

Pilot Plan

A pilot study involving a small sample of approximately ten nurses was conducted. These participants shared similar characteristics with the targeted sample and worked at other health centers within the same region. Questionnaire was pretested to see how much time participants take to complete it, to identify the parts of the questionnaire that were hard for participants to read or understand, and to identify questions which participants found objectionable or offensive (Polit & Beck, 2017, p.268-269). Analysis of the pilot study was done by examining the responses of the participants to the questions. This helped to determine if the questions were clear and easy to understand, and if the participants were able to complete the questionnaire within the expected time frame. In addition, I asked nurses participating in the pilot study areas where more clarifications or adjustment were needed in the questionnaire. The questionnaire was completed within 20 minutes and all questions were clear to the participants. The results of the pilot study were entered into SPSS to formulate my codebook and test the performance of the questionnaire in SPSS. The results of the pilot study were shared with the supervisors for approval.

Validity

Validity in the context of measurement is the extent to which an instrument measures the concept that it is intended to measure (Polit & Beck, 2017, p. 309). The content of this study's

questionnaire had been designed after a detailed analysis of current literature. This questionnaire was developed with guidance from two faculty team members who guided me through the whole research process. The content validity of the questionnaire was enhanced by seeking feedback from two recognized experts in the field of TB, specifically from the National Tuberculosis Reference Laboratory, Uganda. Their insights and expertise contributed significantly in ensuring that the questionnaire was relevant and comprehensive enough to effectively capture the nuanced dimensions of Early TB detection, including knowledge, practices and barriers to Early TB detection.

Reliability

Reliability refers to the consistency and dependability of the research findings. It ensures that the study instruments, such as questionnaires, yield consistent results when used repeatedly (Tarrant et al., 2014). In this study, reliability was established by using ten nurses to calculate Cronbach's alpha. The Cronbach's Alpha analysis of reliability was done using SPSS (version 23). The overall Cronbach's alpha was found to be 0.817. A score of 0.817 indicated adequate internal consistency for this questionnaire. Internal consistency of questionnaire refers to the extent to which the items or questions within the questionnaire measure the same construct or concept consistently (Polit & Beck, 2017, p.308).

Data Analysis

A pre-tested codebook that had been created during the pilot study was used to receive and manage the data. The codebook contained information about the variables in the data, their labels, and their properties. This pre-testing ensured clarity, consistency, and relevance of variable definitions, improving the reliability of the data entry process. Data was entered in the codebook on a daily basis as soon as it was collected from the study participants for analysis. All

analyses were conducted using SPSS Version 26, which was chosen for its reliability, user-friendliness, and suitability for descriptive statistical analysis.

Demographics

Descriptive univariate analysis of demographics characteristics was performed. Results were reported as frequencies and percentages and also in form of tables. This approach was chosen to provide a clear summary of the study population's characteristics, which are important for contextualizing findings related to knowledge, practice, and perceived barriers.

Knowledge

For knowledge scores, each individual participant's answer was entered into SPSS according to the created codebook. Each individual participant's overall score was calculated by percentage and by category. Overall group score was analyzed by looking at mean percentage and also by looking at distribution in categories and the mean for the group categories.

Every question in the questionnaire was evaluated for its performance, which assisted in determining its strength and weakness. In order to determine this, each question's percentage score was examined. Questions that were passed by 75% or higher of the participants were deemed to be in their areas of strength. Questions that were passed by less than fifty percent of the participants were categorized as their areas of weakness. For analysis, descriptive statistics were generated for responses and presented as frequencies and percentages (Mohammed et al., 2024). The decision to use descriptive statistics was based on the study's objective to identify knowledge levels and identify the areas of strengths and weaknesses.

Practice

For practice scores, each individual participant's selected option was entered into SPSS and the individual mean was calculated. The overall group scores were then analyzed by looking

at the overall mean for the group and the distribution in the categories and the mean for the categories. The mean and percentages of each practice question was calculated. This assisted me in identifying practice-related strengths and weaknesses for each participant. Questions that 75% or higher of the participants answered correctly were deemed to be in their areas of strength. Questions that were not answered correctly by less than fifty percent of the participants were categorized as their areas of weakness. Descriptive statistics were generated for responses and presented as frequencies and percentages. Practice scores were presented in the form of tables (Polit & Beck, 2017, p.360). Descriptive analysis was deemed appropriate as the aim was to map out existing practices to determine areas of strengths and weaknesses rather than infer causal links.

Barriers

For perceived barrier scores, each individual participant's selected option was entered into SPSS and the individual mean was calculated. The overall group scores were analyzed by looking at the overall mean, the distribution in the categories and the mean for the categories. The mode of each perceived barrier was calculated. The percentages of participants who perceived a certain barrier as a barrier was described as low, moderate or high barrier and this was based on mode.

For analysis, descriptive statistics was generated for responses and presented as frequencies and percentage. Perceived barrier scores were presented in form of tables of frequency against scores (Polit & Beck, 2017, p.359). Tables were used to enhance clarity and facilitate a visual comparison of common barriers. The use of descriptive analysis was appropriate given the descriptive nature of the study's objectives.

Ethical Considerations

This section described the process of ethical approval, informed consent, privacy, confidentiality, benefits and risks, and use of incentives. It also described the social cultural issues and conflict of interest.

Ethical Approval

Administrative approval (Appendix C) was obtained by the researcher from a district in Southwestern Uganda. This research proposal was submitted to Uganda Christian University Research Ethical Committee for approval and it was approved, REC approval number: UCU REC 2024-847(Appendix D). Following UCU REC approval of this research proposal, the head of nursing department UCU was approached for an introductory letter (Appendix E). This is the one used when approaching the district health officer and the health center IV's administrator where data collection took place.

Informed Consent

Informed consent (Appendix A) involved explanation of the study and its purpose, the type of data needed and its use. Participants in the study were notified that they could leave the study at any time, and participation was entirely voluntary. The research title, the researcher's contact details, and my supervisor's contacts were all included in the informed consent. The consent included an overview of the study, its goals, inclusion criteria, and a summary of the investigation. It also included information on possible benefits, possible risks, and how confidentiality was protected when gathering and analyzing data. The signed authorization statement at the conclusion of the form indicated the participant's willingness to participate in the study (Polit & Beck, 2017, p. 143).

Privacy

To ensure privacy, participants were not asked to put their names or phone contacts on the questionnaire. The collected data was assigned a code which made it hard to trace it back to the participants. This coding system was known only to me, further safeguarding the privacy of the participants.

Confidentiality

To ensure confidentiality, I had to give consent forms to participants to have them signed. These were then kept by me and they were destroyed after data analysis was complete. The questionnaires were locked in a cabinet, with the key being kept by me. Electronic data was password-protected. Only the researcher, statistician, and, my supervisor had access to the participant data. When publishing, information was presented in aggregate form. The collected data was destroyed after the analysis so as to prevent the possibility of tracing it back to the individuals.

Benefit

There were no individual benefits for the study participants in this study.

Risks

There were no risks related to this study.

Use of Incentives

There was no incentive for participation in this study. The study participants were given each ten thousand Uganda shillings (10,000/=) after data collection to compensate the time that was given to participate in the study.

Social or Cultural Issues

I was aware that the majority of the nurses participating in this study were graduates, certificate holders, and other lower-level nurses. To mitigate any possible challenges stemming from varying educational backgrounds, I clarified to the participants that the study was open to all nurses, regardless of level of education and cadre. I also thoroughly explained the consent form so that participants signed it only after they had a clear understanding of its contents. The questionnaire was in English, a language that all nurses commonly use in their communication. I encouraged all participants to seek clarification where they didn't understand. I also used minimal technical terms in the questionnaire to allow easy understanding of the content by the participants.

Conflict of Interest

There was no conflict of interest to this study. This study was self-sponsored being done as a requirement for the award of master's degree in nursing science of Uganda Christian University.

Summary

The research methodology outlined in chapter three includes key sections such as study design, population, study setting, sampling, selection criteria, and data collection steps. Furthermore, the chapter contains information about the questionnaire, validity and reliability measures, data analysis, and ethical implications. Chapter 4 covered the findings of the data collected.

Chapter Four: Presentation of Results

This chapter discusses the findings of the data collected about participants' demographics characteristics, knowledge, practice and barriers regarding early TB detection. As soon as data was collected, it was entered into SPSS (version 23) for analysis. Each section in the questionnaire was analyzed separately looking at the performance of the participants on each question.

Demographic Data

The participants of this study comprised of sixty nurses from three Health Center IVs in Southwestern Uganda. Twenty nurses were recruited from each of the selected Health Center IVs. Majority of the participants belonged to the age group 30-39 (57%). About 62% of the participants were females. The majority of the participants (83%) were from the Outpatient Department. Most participants had Certificate level of education (60%), with Bachelor Degree holders comprising only 5%. For their experiences, 40% of participants had 16 or more years of working experiences. All participants had received training on tuberculosis (100%), with the majority (57%) never receiving any training after the training schools.

Table 1:

Demographics Distribution of Study Participants (N=60)

Demographic Characteristics	Frequency(f)	Percentage (%)
Age (years)		
20-29	17	28
30-39	34	57
40-49	7	12
50-59	2	3
Gender		
Female	37	62
Male	23	38
Department		
Maternal Child Health	10	17
Outpatient Department	50	83
Education Level		
Bachelor's Degree	3	5
Certificate	36	60
Diploma	21	35
Years of practice (years)		
≤5	11	18
6 – 10	8	13
11- 15	17	28
16 or more	24	40
Training on Tuberculosis		
Yes	60	100
Training Source		
At Training School	34	57
No Training After School	26	43

Knowledge of Nurses about Early TB detection

This section describes the knowledge of nurses about Early TB detection. The data collection tool had two knowledge sections: knowledge about TB in general and knowledge specific to Early TB detection. Consequently, the following section begins by describing the combined knowledge before breaking down into two sections: general knowledge about tuberculosis and specific knowledge about early TB detection. Lastly this section looks at how each question performed related to the two specific knowledge areas.

Findings of Combined Knowledge in Early TB detection

This section describes participants' individual raw scores and categories. The mean combined knowledge of the participants about Early TB detection was 63% as reflected in Appendix F. The combined knowledge of the nurses about Early TB detection is shown in Table 2. About 20% (95% C.I = 9.7-29.0) of the participants scored above or equal to 75% in their responses thus were categorized as having excellent knowledge. About 42% (95% C.I = 29.0-53.2) of the participants scored between 50 to 74% and thus were categorized as having good knowledge, while 38% (95% C.I = 24.2-50.0) of the participants scored below 50% in their responses and were categorized as having poor knowledge.

Table 2:

Comparison of Combined Knowledge of Nurses about Early TB detection

Combined Knowledge Level	Frequency (f)	Percentage (%)	95% C.I
Excellent Knowledge (≥75%)	12	20	9.7-29.0
Good knowledge (50% to 74%)	25	42	29.0-53.2
Poor Knowledge (<50%)	23	38	24.2-50.0

General Knowledge about TB

The following section about general knowledge about TB describes raw scores, categories for general knowledge of TB questions and also describes the performance of the participants on each question. The mean raw score for general knowledge of TB questions was 65%. The distribution by categories of knowledge of the Nurses about TB in General is shown in Table 3. About 25% (95% C.I = 14.5-35.5) of the participants scored above or equal to 75% in their responses thus were categorized as having excellent knowledge. Fifty percent scored between 50 to 74% thus were categorized as having good knowledge, while 25% (95% C.I = 14.5-35.5) of the participants scored below 50% in their responses and thus were categorized as having poor knowledge.

Table 3:

Comparison by Category of General Knowledge about TB

Category	Frequency (f)	Percentage (%)	95% C.I
Excellent Knowledge (≥75%)	15	25	14.5-35.5
Good knowledge (50% to 74%)	30	50	35.5-59.7
Poor Knowledge (<50%)	15	25	14.5-35.5

Performance of General TB Questions

This section describes the performance of the participants on each question about TB in general as reflected in Appendix G. All participants were able to identify pathogens that cause TB. Participants' strengths were also noted in areas regarding; vaccination age, acquisition, general symptoms and treatment. Participants' weaknesses were noted in areas regarding;

investigations, duration of treatment and what makes identification of TB patients hard as reflected in Appendix G.

Specific Knowledge about Early TB detection

This section describes raw scores and categories for knowledge questions specific to Early TB detection. It also describes the analysis of performance of the participants on each question. The mean knowledge of the participants about Early TB detection was 60%, thus the participants were categorized as having good knowledge.

The distribution by categories of knowledge of the Nurses about Early TB detection is shown in Table 4. About 23% (95% C.I = 12.9-33.9) of the participants scored above or equal to 75% in their responses thus were categorized as having excellent knowledge about Early TB detection. About 48% (95% C.I = 33.9-58.1) of the participants scored between 50% and 74% thus were categorized as having good knowledge about Early TB detection, while 28% (95% C.I = 16.1-38.7) of the participants scored below 50% in their responses and thus were categorized as having poor knowledge about Early TB detection.

Table 4:

Comparison by Category of Specific Knowledge about Early TB detection

Category	Frequency (f)	Percentage (%)	95% C.I
Excellent Knowledge (≥75%)	14	23	12.9-33.9
Good knowledge (50% to 74 %)	29	48	33.9-58.1
Poor Knowledge (<50%)	17	28	16.1-38.7

Performance on Specific Questions of Early TB detection

The performance on specific questions of Early TB detection section describes how each participant performed in questions specific to Early TB detection, as reflected in Appendix G. Participants' areas of strengths were noted in questions related to: Location for screening, Appropriate screening questions, and typical early symptoms of TB. Eighty-seven percent of the participants answered correctly a question regarding accurate TB symptoms whereas 73% of the participants failed a question regarding action to take for patients with persistent cough. This was noted as one of their areas of weakness. Other areas of weakness were noted in questions related to: relationship between TB and HIV, and quickest investigation for early detection of TB in HIV infected persons. Those were areas where the majority of the participants could not give correct answers

Practices of Nurses towards Early TB detection

The practices section describes raw scores and categories for practice questions about Early TB detection. The section also describes an analysis of the performance of the participants against each question. The practice scores of the participants about Early TB detection by category are presented in Table 5.

Each individual practice raw scores are presented in Appendix H. The overall mean score of the total responses for practice was noted to be 2.17. The distribution by categories of practice of nurses about Early TB detection is shown in Table 4. The overall practice of Early TB detection was categorized as poor. About 32% (95% C.I = 19.0-39.7) of the participants scored between 0 to1.99 in their responses and thus were categorized as having very poor practices about Early TB detection. Sixty-seven percent of the participants scored between 2 to 2.99 in their responses and were categorized as having poor practices about Early TB detection, while

only two percent of the participants scored between 3 and 3.49 and were categorized as having good practice. No participant had an excellent practice.

Table 5:

Comparison of Means of Nurses' Practice by Categories (N=60)

Category	Frequency (f)	Percentage (%)	95% C.I
Excellent Practice (≥3.5)	0	0	0-0
Good practice (3-3.49)	1	2	0.0-4.8
Poor Practice (2-2.99)	40	67	52.4-74.6
Very Poor Practice (0-1.99)	19	32	19.0-39.7

Performance of Practice Questions

The performance of practice questions section describes analysis of each practice statement. When analyzing the performance of the participants on each practice statement, (Appendix I), participants reported excellent practice in *I educate patients about TB, I send patients coughing bloody sputum to the laboratory for further TB diagnosis, and I collect sputum sample for all patients with signs and symptoms of TB and take them to the laboratory.* The participants reported good practice in *I use GeneXpert for early TB detection.* Participants reported poor and very poor practice in the rest of practice statements.

Perceived Barriers to the Early Detection of TB

The perceived barriers' section describes raw scores and categories for perceived barriers by nurses about Early TB detection. The section also describes analysis of performance of the participants against each question. The perceived barrier score categories are presented in Table 5. This section also summarizes perceived barriers which were reported by most of the participants as high barriers to Early TB detection (Table 6).

The individual raw scores on each perceived barrier question is reflected in Appendix J. The overall mean score of total responses for perceived barriers was noted to be 3.11. This was categorized as a high level of barriers to Early TB detection. The distribution by categories of

perceived barriers about Early TB detection is shown in Table 5. As presented in Table 5, 25% of the participants scored between 1 and 2.99 in their responses thus were categorized as experiencing moderate barriers towards Early TB detection. Seventy-five percent of the participants scored between 3 and 4.00 in their responses thus were categorized as experiencing high barriers towards Early TB detection.

Table 6:

Comparison of Nurses Perceived Barriers by Categories (N=60)

Category	Frequency(f)	Percentage (%)	95% C.I
High Barrier (3-4.00)	45	75	61.3-83.9
Moderate Barrier (1-2.99)	15	25	14.5-35.5
Low Barrier (0-0.99)	0	0	0-0

Performance on Perceived Barrier Questions

The performance on perceived barrier questions' section describes the analysis of each statement about perceived barriers towards Early TB detection, (Appendix K). The section also summarizes the main barriers to Early TB detection, (Table 6). Seventy-two percent of the participants expressed strong agreement on the statement *few trainings to boost the knowledge related to TB detection is a major barrier to my effectiveness in early TB detection*. Sixty-eight percent of the participants strongly agreed with the statement *Irregular trainings is major barriers to effective early TB detection.* Sixty-seven percent of the participants agreed with the statement *stigma surrounding TB is a major barrier to effective early TB detection. S*ixty percent of respondents agreed with statement *the delays in receiving TB results from TB laboratory affects my early TB detection practices* (Appendix K).

Table 7:
Performance of Topical Areas Perceived as High Barriers to Early Detection of TB

Barrier	Mean	SD
Lack of trainings, awareness and TB guidelines	3.45	0.657
Lack of diagnostic equipment and poor supply of infection prevention materials	3.425	0.716
Stigma and belief that TB is a high risk disease	3.142	0.768
Human resource constraints that may result in delays to receive TB lab results	3.383	0.865

Table 7 summarizes perceived high barriers shown in appendix L. The study found that, early TB detection was hindered by: lack of awareness, training, TB guidelines, lack of diagnostic equipment and poor supply of infection prevention materials. In addition, it was noted perceived stigmatization among the nurses at risk of TB and belief that TB is a high risk disease was also noted as one of the high barriers to early TB detection. Furthermore, human resource constraints which may result in delays in getting TB laboratory results was also noted as high barrier to early TB detection. The study also found that early detection is also hindered by lack of access to laboratory services, effect of charges for laboratory use, effectiveness of referral processes, and impact of workload. These barriers were categorized as moderate barriers, (Appendix K).

Summary

Chapter four has described the findings from this study's three objectives of knowledge, practice and barriers of nurses about Early TB detection. Though the general knowledge of nurses in Early TB detection was noted to be good, some participants showed a knowledge gap about the early detection of TB. Overall practice of nurses regarding Early TB detection was also

noted to be poor. Finally, nurses agreed there were high levels of perceived barriers which hinder Early TB detection. Chapter five was a discussion of findings, recommendations, and conclusion.

Chapter Five: Discussion, Recommendations and Conclusion

Chapter five provides a comprehensive discussion of the demographic characteristics of the participants and the findings from the study conducted at a health center IV in Southwestern Uganda. The guiding objectives were to: identify the knowledge of nurses about early TB detection, describe the practice of nurses regarding early TB detection, and determine the barriers faced by nurses regarding early TB detection. The chapter is organized into several sections: demographics, discussion of each research objective, application of the theoretical framework, recommendations, limitations of the study, areas for further study, and conclusions.

Demographics

The majority of the participants were within the age group of 30-39 years, indicating that most nurses in this study were in their early to mid-career stages. This aligns with demographic trends in the Ugandan healthcare workforce, where younger professionals are increasingly prevalent (Ekong et al., 2015). Most of the participants were female, reflecting the gender distribution commonly seen in nursing, both regionally and globally. This finding is in agreement with a report that nursing is a female-dominated profession in Uganda, with women tending to report higher job satisfaction and stronger attachment to their facilities and communities than the men (Ekong et al., 2015).

A significant proportion of the participants were from the Outpatient Department, highlighting the critical role this department plays in TB detection and management. The higher representation of nurses from the Outpatient Department is expected, as this is where most patients, including those with potential TB, are first encountered (Abayneh et al., 2020).

The educational background of the participants showed that the majority held a Certificate in nursing, with very few having a Bachelor’s degree. This finding is in agreement

with Okuonzi et al., (2023), who found that majority of the nurses were certificate holders or diploma holders. Very few nurses in this study were found to have bachelor's degree. This finding suggests that while most nurses have foundational training, there may be gaps in advanced education that could impact Early TB detection practices. The low percentage of bachelor's degree holders may also reflect limited opportunities for higher education in nursing in Southwestern Uganda due to admission barriers, financial constraints, a scarcity of educational institutions, and workforce priorities (Anyango 2022; Okuonzi et al., 2023).

In terms of experience, more than a third of the participants had 16 or more years of working experience. This substantial level of experience suggests that many of the nurses are seasoned professionals, potentially bringing a wealth of practical knowledge to their roles. This finding was also in agreement with Amsalu et al., (2021), who reported that majority of the nurses had experience of more than 10 years.

All participants had received training on tuberculosis, which is encouraging. However, a concerning finding is that more than half of the participants had not received any additional training after their initial education at training schools. This agrees with findings from South Africa that reported that receipt of training on TB transmission was low among the health workers (Malotle et al., 2017). This lack of ongoing professional development could hinder the ability of nurses to stay updated with the latest guidelines and practices in Early TB detection, potentially impacting the effectiveness of TB control programs.

Knowledge of Nurses about Early TB Detection

The study aimed to assess the knowledge levels of nurses regarding early TB detection in Health Center IVs in Southwestern Uganda. The combined knowledge of nurses in this study regarding early TB detection was moderate. The combined knowledge is composed of general

knowledge of the nurses regarding TB and early TB detection. Notably, only 20% of the participants demonstrated excellent knowledge, while the majority fell into the good knowledge category, and 38% exhibited poor knowledge. These results indicate that while many nurses have a basic understanding of TB and its early detection, significant knowledge gaps persist.

Most nurses were able to correctly identify the pathogen causing TB and recognize common symptoms of active TB. However, there were noticeable gaps in their knowledge of risk groups, challenges in early detection, diagnostic methods, and treatment protocols. These discrepancies likely stem from insufficient training or exposure to specific aspects of TB management, which is an area that demands urgent attention (Andom et al., 2022). The gaps are concerning, as effective early TB detection is crucial for timely intervention and reducing transmission in healthcare settings.

The findings align with global studies that report similar patterns in nurse knowledge of TB. Studies have reported that healthcare professionals often have a foundational understanding of TB but lack depth in critical areas, such as symptom recognition, early detection strategies, and specialized areas of TB management (Buregyeya et al., 2016; Kigozi et al., 2019; Temesgen & Demissie, 2014). However, these studies also emphasize the importance of continuous professional development in ensuring that healthcare workers maintain up-to-date knowledge on evolving TB management protocols.

Despite a reasonable level of knowledge about TB treatment protocols and drug combinations, some nurses provided incorrect responses, particularly concerning the duration of TB treatment. This is a critical area requiring immediate trainings, as adherence to accurate treatment guidelines is essential for preventing drug resistance and ensuring successful patient

outcomes (Tola et al., 2015). Further, the failure to provide correct treatment information could lead to treatment failure, which is a major public health concern.

Encouragingly, the majority of nurses correctly identified the appropriate age for TB vaccination, indicating a good understanding of preventive measures-an important aspect of TB control in high-burden settings like Uganda (Mangtani et al., 2013). These findings suggest that while nurses have a solid foundation in TB knowledge, targeted training programs are needed to address the specific gaps in early detection and management. Such programs should be designed with input from both the healthcare providers and experts in the field to ensure their relevance and effectiveness.

In conclusion, it was found that while nurses in Health Center IVs in Southwestern Uganda possess a moderate knowledge regarding TB and its early detection, significant knowledge gaps remain. These gaps, particularly in specific aspects of early TB detection, could hinder effective TB management and control efforts.

Practices of Nurses towards Early TB detection

This study found that the overall practices of nurses regarding early TB detection were categorized as poor. Specifically, many nurses did not consistently follow early detection protocols, including routine screening, use of diagnostic tools, and timely referral of suspected TB cases. These findings suggest a gap between knowledge and the practical application of early TB detection strategies, despite the nurses having a basic understanding of TB. For example, while some nurses were aware of the importance of screening, only a small proportion performed routine TB screenings for all patients presenting with respiratory symptoms. Additionally, inconsistencies were observed in the use of diagnostic tools, which are critical for confirming TB

cases. These gaps in practice indicate potential barriers such as lack of training, time constraints, or inadequate resources in the healthcare facilities in Southwestern Uganda.

The findings of this study are consistent with global research on nurses' practices in early TB detection. Studies from Nigeria, Ethiopia, and South Africa have highlighted that, despite adequate knowledge, nurses often fail to effectively implement early TB detection practices (Akande, 2020; Naseer et al., 2013; Temesgen & Demissie, 2014). Studies in various regions have recommended targeted training initiatives to ensure that nurses' practices align with the recommended guidelines, thereby enhancing early TB detection efforts (Fekadu et al., 2020; Jiao et al., 2019). These findings highlight the importance of ensuring that nurses are adequately trained and supported to perform their role in TB detection effectively.

Perceived Barriers to the Early Detection of TB

This study revealed a significant perception of barriers to early TB detection among nurses at Health Centre IVs in Southwestern Uganda. Most of the participants reported encountering numerous challenges in performing early TB detection, with none indicating that barriers were minimal. These findings emphasize the widespread and deeply rooted nature of the obstacles nurses face in early TB detection.

The most commonly reported barriers included inadequate training and irregular training sessions, with a majority of participants acknowledging that these factors hinder their ability to carry out effective TB detection. This suggests that while nurses are generally aware of TB detection protocols, their ability to apply them in practice is hampered by a lack of regular capacity-building opportunities. The irregularity of training sessions further limits the reinforcement of key knowledge and skills, which may affect their confidence in applying early detection protocols consistently. Additionally, many nurses highlighted stigma as a significant

barrier, reflecting broader social and cultural factors that limit open TB discussion and early diagnosis. Delays in receiving TB test results from laboratories were also frequently mentioned, pointing to logistical challenges that impede timely detection and diagnosis.

These findings align with global research highlighting similar barriers. For example, Fenta et al. (2023) identified comparable human-related challenges, such as insufficient training and logistical constraints, which mirror the barriers found in this study. The widespread nature of these barriers suggests that healthcare systems in resource-limited settings, like Uganda, face shared challenges in scaling up early TB detection efforts.

Additionally, systemic issues such as the absence of TB diagnostic laboratories and inconsistent referral mechanisms, as reported by Tan et al. (2020) and Der et al. (2022), resonate with the delays in lab results identified by nurses in this study. These systemic challenges underscore the need for infrastructure improvements to enhance TB detection capabilities. The lack of proper referral mechanisms may also contribute to delays in diagnosis, as patients are often transferred to other facilities with insufficient follow-up. Moreover, the issue of stigma, frequently mentioned by participants, aligns with sociocultural barriers identified in other research, emphasizing the need for targeted interventions to reduce the stigma surrounding TB and promote early detection (Ramos et al., 2023).

In conclusion, the findings suggest that nurses are constrained by several barriers. Addressing these barriers through targeted interventions, improved training, better laboratory support, and stigma reduction initiatives will be essential in enabling nurses to play a more effective role in early TB detection and improving overall TB control efforts. Furthermore, addressing the systemic and cultural barriers alongside enhancing healthcare infrastructure will create a more supportive environment for TB detection and management.

Application of the Theoretical Framework

This study applied Lewin's Theory of Organizational Change, focusing on the unfreezing step to assess the knowledge, practices, and barriers faced by nurses regarding early TB detection at Health Center IVs in Southwestern Uganda. The unfreezing stage was specifically chosen due to its relevance to identifying the current state of nurses' behavior, attitudes, and practices towards early TB detection, as well as the factors that either drive or restrain improvements in this area.

In the context of this study, the unfreezing step was operationalized by designing a comprehensive questionnaire aimed at evaluating the existing knowledge, practices, and barriers that nurses encounter. The process of unfreezing involved encouraging participants to critically assess their current understanding and behaviors related to early TB detection, laying the groundwork for future changes or interventions. This aligns with Lewin's concept of disrupting the status quo, prompting individuals to reconsider and evaluate their existing practices.

The findings of the study suggest that while nurses are aware of TB detection protocols, their practices and application are constrained by several barriers, including inadequate training and logistical challenges. These restraining forces, such as limited access to regular training and delays in laboratory results, hinder the unfreezing process and hinder early TB detection practices.

Recommendations

Based on the findings of this study, several key recommendations can be made to improve the early detection of tuberculosis (TB) by nurses:

Nurses should advocate for their continuous professional development, particularly in TB detection. By actively seeking training opportunities and staying informed about the latest

developments in TB management, nurses can enhance their knowledge and improve their practices. This would directly contribute to better TB detection and control outcomes. Continuous learning can also help nurses stay up-to-date with evolving diagnostic protocols, ensuring they provide the highest level of care.

Nurses should work towards improving collaboration and communication within healthcare teams and with patients so as to help in TB screening and ensure that suspected cases are followed up promptly. An integrated approach within healthcare teams would ensure that all aspects of TB detection are covered, from initial screening to diagnosis.

Nurses should take an active role in educating patients about TB symptoms and the importance of early detection. Empowering patients with knowledge can help them recognize symptoms early and seek medical attention promptly, improving the chances of early diagnosis and effective treatment.

For healthcare institutions, there is need to prioritize continuous and comprehensive training programs for nurses, focusing on Early TB detection. Regular and updated training sessions are essential to ensure that nurses are equipped with the latest knowledge and skills required for effective TB detection. These training programs should address the gaps identified in this study, particularly in areas where poor practices were observed. Government of Uganda ought to invest in the necessary infrastructure and ensure that all facilities, especially those in rural areas, have access to essential diagnostic tools. This would greatly enhance nurses' ability to detect TB cases early.

To nursing management, there is a need for the development and dissemination of clear and standardized guidelines for Early TB detection. These guidelines should be integrated into the daily practices of nurses and supported by regular monitoring and evaluation to ensure

adherence. Policy makers should also focus on addressing systemic barriers that hinder early TB detection, such as human resource constraints, high workloads, and geographical challenges. Health center policies that promote better staffing, reduce workloads, and facilitate easier access to TB diagnostic services are crucial in improving early detection rates.

Public health organizations should intensify efforts to reduce the stigma surrounding TB, which has been identified as a significant barrier to early detection. Awareness campaigns, community engagement, and education initiatives should be launched to combat misconceptions and fears associated with TB. There is also need to strengthen the referral systems to ensure that suspected TB cases are promptly referred and diagnosed. This includes streamlining processes within healthcare facilities and ensuring that referrals are timely and effective.

Study Limitations

While this study provides valuable insights into the knowledge, practices, and barriers faced by nurses in early TB detection, a few areas could be improved in future research. One potential limitation is the reliance on self-reported questionnaire responses. Self-reporting can introduce response bias, where participants may provide socially desirable answers rather than reflecting their true knowledge or practices. Although precautions were taken during data collection to mitigate this, the possibility of response bias remains and could influence the accuracy of the findings. Also another limitation was that, I developed the data collection tool myself and its validity did not include the use of Content Validity Index (CVI)

Although this study was conducted across three Health Center IVs in Southwestern Uganda, future studies could benefit from including a broader range of healthcare facilities and regions across Uganda to ensure a more comprehensive understanding of early TB detection

practices in diverse settings. Including nurses from other healthcare levels, such as Health Center IIIs or referral hospitals, may offer a more holistic view.

Areas for Further Study

Future research should focus on expanding the geographical scope of similar studies to include different regions and healthcare settings across Uganda to assess the generalizability of the findings. Additionally, longitudinal studies could be conducted to track changes in nurses' knowledge, practices, and barriers related to TB detection over time, providing deeper insights into the long-term effects of training and policy interventions. Exploring the impact of innovative training methods, such as e-learning and simulation-based education, on improving nurses' competencies in TB detection could also offer valuable insights.

Dissemination of Study Findings

Copies of the completed dissertation will be given to the university library and the Faculty of Public health and Department of Nursing Uganda Christian University. The results will be published in nursing and medical journals and presented at conferences. A copy of the study's report will be kept by me for personal use, while the other copy will be distributed to Southwestern District stakeholders.

Study Conclusion

The study found that the combined knowledge of nurses regarding early TB detection was moderate, indicating that while they have a fundamental understanding of TB, there are notable gaps in more specialized aspects of early detection and management. The overall practices of nurses towards early TB detection were categorized as poor, reflecting a lack of effective application of their knowledge in clinical settings. Additionally, the study identified a high level of perceived barriers, including inadequate training, stigma, and delays in diagnostic

processes. These barriers significantly impact the overall effectiveness of early TB detection. Therefore, it is crucial to implement targeted interventions that enhance both knowledge and practical skills while addressing the identified barriers. By doing so, early TB detection can be improved, contributing to more effective TB control and management.

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Appendix A: Informed Consent

Title of research study: Knowledge, practices and barriers of nurses about Early TB detection in health center IVs in Southwestern Uganda.

Principle investigator contact information and affiliation: I am Simon Habimana, a student at Uganda Christian University, and I am conducting this study in partial fulfillment for the requirements for award of Master's Degree of Science in Nursing of Uganda Christian University, Mukono. Tel: +256774579209/+256705489640, email: habimanasimon2017@gmail.com

Supervisors: My supervisors are: Dr Karen Drake Tel: +1(763)242-5695 email address: drakar@bethel.edu, and Dr Ketty Holt email: ketty.m.holt@gmail.com

Introduction and purpose of study: Globally, an estimated 10 million people were diagnosed with TB in 2020. Early detection and treatment of TB are crucial to limit the spread of the disease and improve patient outcomes. In the districts of Southwestern Uganda, no study has been conducted. The purpose of this descriptive study is to find out what nurses know, how they practice and what they see as barriers to their practice about detecting TB early.

Description of the research: This is a descriptive study.

Subject participation: You are being asked to participate in this study in your capacity as a nurse who works in HCIV, and therefore possesses knowledge and experience related to Early TB detection.

Potential Risks and Discomforts: There is no anticipated risk by participating in this study.

Potential benefits: There is no direct benefit to you from taking part in this study. However, the findings of this study may provide evidence to nursing as a profession regarding the current knowledge, practice and barriers of nurses regarding Early TB detection.

Reimbursement: The researcher will provide you a compensation of about 10,000/= Ugx after data collection for your time and commitment.

Confidentiality: No personal information like address, contacts or real names was gathered. The collected data was assigned a code which will make it hard to trace it back to you. Only the researcher, statistician, and, if necessary, my supervisor, will have access to the participant data.

Contact information for ethical concerns or to withdraw consent: This study has been approved Uganda Christian University Research Ethics Committee (UCU REC). For any concern you may contact; Dr Grace Nakate Tel; +256-772439526; email address: gracentale@gmail.com

Authorization statement:

I have read this consent form and I agree to be a participant in this study. I have been given the opportunity to ask questions regarding the study, and I have received answers to my questions. I

acknowledge that I am aware of what this study involves, that I am at least 18 years old, and that I have received a copy of this Informed Consent form.

Signature lines and dates for:

Participant ……

Researcher…….....

Appendix B: Questionnaire

Instructions

This questionnaire is designed for assessing the knowledge, practices and barriers of nurses about Early TB detection. Please read each question carefully and select the best answer that reflects your knowledge, practices and barriers about Early TB detection. Your responses was kept confidential and anonymous. Thank you for your time and participation.

Section A: Demographic information

1. What is your age? ..... (Years)

2. What is your gender?

    A. Male

    B. Female

3. Which department do you work in?

    A. Outpatient

    B. Maternal Child Health (MCH)

    C. ART

    D. Inpatient

    E. Other (please specify) …….

4. What is your highest level of education?

    A. Certificate

    B. Diploma

    C. Bachelor's degree

5. How many years of experience do you have in healthcare? ……

6. Have you ever obtained training or certification in tuberculosis diagnosis and management?

A. No

B. Yes

If yes:

7. How long ago did you obtain the training in no. 6 above?

…….

8. Where did you attend the training from?

A) Training school

B) Workshop

C) Health Unit CMEs

D) On-site training (Mentorship) by health workers from the District or outside district

Section B: Knowledge regarding Early TB detection

Questions about TB in general

9. Which group of pathogens that cause tuberculosis?

a) Bacteria

b) Viruses

c) Fungi

d) Parasites

10. How can one acquire Tuberculosis?

    a. Through the air when a person with active Tb coughs, sneezes or sings or laughs

    b. Through sexual contact with a person infected with Tuberculosis

    c. Through contaminated food or water

    d. Through blood or other body fluids

    e. A and C

11. Which group of people is at risk of developing tuberculosis in this country?

    a. People taking any type of medicines for any other illness

    b. People from outside this country

    c. People who are already infected with HIV

    d. All the above

12. What are the symptoms of active TB?

    a. Weight loss

    b. Night sweats

    c. Loss of appetite

    d. All the above

13. What makes Early TB detection hard?

    a. Signs and symptoms are not always obvious

    b. Signs and symptoms are on and off

    c. Tuberculosis may take long to show typical signs and symptoms

    d. A and B

14. What methods are used in Tuberculosis diagnosis?

    a. By chest x-ray

b. By sputum sample microscopy and GeneXpert

c. Culture

d. All the above

15. Which of the following is most correct about TB investigations?

a. The GeneXpert testing is a fast-molecular test for TB detection

b. The Heaf test is the most commonly used test

c. Miliary TB is easily detected by upper lobe shadowing in chest x-ray

d. Mycobacterium tuberculosis bacilli are non-acid-fast and grow rapid

16. How is Tuberculosis treated?

a. By use of antiviral drugs

b. By use of antibiotics

c. By surgical means

d. By chemotherapy

17. Which drug combination is used in the treatment of a newly diagnosed adult patient withTB?

a. 2RHZE/8RH

b. 2RHZ/7RH

c. 2RHZE/4RH

d. 2RHZE/6RH

18. Which of the following is correct about duration of TB treatment of a newly diagnosed patient with pulmonary TB?

    a. 2months on initial phase and 8months on continuation phase

    b. 2months on initial phase and 4months on continuation phase

    c. 2months on initial phase and 6months on continuation phase

    d. Patients on TB treatment are given Pyridoxine for the first one week of TB treatment to limit liver complications

19. Which of the following is correct about age of vaccination against TB in Ugandan setting?

    a. Vaccination is done at one month after birth

    b. Vaccination is done immediately after birth or at first contact with healthcare provider

    c. Between 18 and 45 years of age

    d. Above 65years of age.

Questions about TB detection

20. What is the best way of identifying patients with TB

    a. Encouraging patients to seek medical assistance in case they feel unwell

    b. Using microscope only to detect patients with TB

    c. Screening all patients for signs and symptoms of TB

    d. Using only x-ray and sputum samples to detect TB

21. Where should TB screening be done in the health center

    a. Only in outpatient department

    b. At all entry points in the health center

    c. Only in laboratory

    d. At HIV clinic only

22. What should be done when a patient present with one or two symptoms of TB

    a. Give the patient some antibiotics and pain medications as you wait for all signs and symptoms suggestive of TB to occur.

    b. Screened thoroughly and send the patient to laboratory or x-ray department for further testing and possible Early TB detection

    c. Given starting dose of anti-TB drugs as wait laboratory or x-ray results and stop treatment when the microscopy or X-ray results for TB turn negative.

    d. Send the patient home ask him/her to come back to check on the TB testing results.

23. Which one of the following questions is not appropriate when screening patients or clients for TB?

    a. Are there people at your home with cough?

    b. Have you ever been in contact with someone diagnosed of TB

    c. Do you have any of the following problems: cough, chest pain, loss of weight or night sweats

    d. What do you do during your free time

24. What can you do for the patient who presents with a persistent productive cough which is blood stained, has chest pain and weight loss for longer than 2 weeks and there is no power to test sputum with a microscope?

    a. Collect sputum sample and ask the patient to come for results after some days

    b. Diagnose this patient clinically for TB and send this patient's sputum sample to facilities where it can be examined.

    c. Tell the patient to go back home and come back when the electric power has come

    d. Admit the patient on the ward and give other treatment as we wait for lab results

25. Which of the following series of symptoms of TB is most correct?

    a. Productive cough for 2weeks or more, chest pain, backache, nausea and vomiting

    b. Chest pain, productive cough for 2 weeks or more, night sweats, loss of appetite and loss of weight

    c. Mild cough, fever, weight loss, diarrhea, some headache, and loss of appetite.

    d. Weight loss, fever, loss of appetite, general body weakness and frequent thirsty

26. Which category of patients should you screen for TB

    a. Only patients with TB signs

    b. Only patients who are HIV positive

    c. Only patients who have had contact with TB

    d. All patents or clients and their caregivers who enter the health center

27. What is the relationship between TB and HIV

    a. TB causes HIV infection

    b. TB can predispose one to HIV

    c. HIV lowers ones immune system and increases the chances of one developing TB

    d. Both TB and HIV are diseases which affect only poor people

28. Who is eligible for TB screening in your HIV clinic

    a. All clients who are HIV positive should be screened for TB

    b. Only those clients who have had contact with TB patients

    c. Only those clients who have signs and symptoms suggestive of TB

    d. Only children whose parents were diagnosed of TB

29. Which quickest investigation can one do to HIV infected person with signs and symptoms of TB?

a. Chest X-ray

b. Sputum sample microscopy

c. TB LAM

d. Skin or blood test

Section C: Practices Related to Early TB detection

For the following questions, read each statement carefully and tick the score that closely corresponds with your Practices Related to Early TB detection as measured on the scale.

S/N	**Question**	**Response**				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
30.	I educate patients about TB					
31.	I don't send patients with cough that lasts for weeks to the laboratory for further TB diagnosis					
32.	I send patients coughing bloody					

S/N	Question	Response				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
	sputum to the laboratory for further TB diagnosis					
33.	I don't consider patients with chest pain to be likely to have TB					
34.	I send patients who have been vomiting to the laboratory for further TB diagnosis					
35.	I send patients who have been having night sweats to the laboratory for					

S/N	Question	Response				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
	further TB diagnosis					
36.	I collect sputum sample for all patients with signs and symptoms of TB and take them to the laboratory					
37.	I refer patients with signs and symptoms of TB but with negative TB lab results for chest x-ray					
38.	I only collect sputum samples for microscopy for early TB					

S/N	Question	Response				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
	detection, but not for other testing methods like culture.					
39.	I use GeneXpert for early TB detection					
40.	I refer patients chest X-ray as the gold standard for early TB detection					
41.	I refer patientsfor Tuberculin Skin Test (TST) for early TB detection					

S/N	Question	Response				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
42.	I refer patients for Interferon-Gamma Release Assays (IGRAs) for early TB detection					
43.	I do not use or refer samples for Molecular tests for early TB detection					
44.	I refer all patients with HIV to the laboratory for TB diagnosis regardless of having signs and symptoms of TB.					

S/N	Question	Response				
		0	**1**	**2**	**3**	**4**
		Never	Rarely	Sometimes	Frequently	Always
45.	I consider TB culture results as the gold standard for TB diagnosis					

Section D: Barriers to Early TB detection

For the following questions, read each statement carefully and tick the score that closely corresponds with your barriers to Early TB detection as measured on the scale below.

S/N	Question	Response			
		1	**2**	**3**	**4**
		Strongly disagree	Disagree	Agree	Strongly agree
46.	Few trainings to boost the knowledge related to TB detection is a major barrier to my effectiveness in early TB detection.				

S/N	Question	Response			
		1	**2**	**3**	**4**
		Strongly disagree	Disagree	Agree	Strongly agree
47.	I find it easy to access the laboratory to take patient samples for TB detection activities.				
48.	I have sufficient time and space for assessing patients during TB detection.				
49.	Referral processes operate smoothly in facilitating early detection of TB cases.				
50.	The delays in receiving TB results from TB laboratory affects my early TB detection practices.				
51.	Human resource constraints impact my				

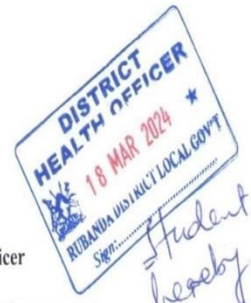
S/N	Question	Response			
		1	2	3	4
		Strongly disagree	Disagree	Agree	Strongly agree
	ability to detect TB cases early.				
52.	Charges for laboratory use do not affect the frequency of TB testing for early detection.				
53.	My workload allows sufficient time and attention for early TB detection.				
54.	The absence of diagnostic equipment like x-ray and GeneXpert machines affects my ability to detect cases early.				
55.	Irregular trainings is major barriers to				

S/N	Question	Response			
		1	**2**	**3**	**4**
		Strongly disagree	Disagree	Agree	Strongly agree
	effective early TB detection.				
56.	The absence of TB screening guidelines affects my Early TB detection practices at my health facility				
57.	Stigma surrounding TB is a major barrier to effective early TB detection.				
58.	The belief that TB is a high risks disease influences my early detection practices.				
59.	Poor supply and use of infection prevention measures impact my				

S/N	Question	Response			
		1	**2**	**3**	**4**
		Strongly disagree	Disagree	Agree	Strongly agree
	ability to detect TB cases early.				
60.	My lack of awareness and familiarity with updated TB information influence my early detection efforts.				

THE END

Appendix C: Administrative Clearance



Uganda Christian University

P.O.BOX 4,

Mukono-Uganda

18th March 2024

Student is hereby cleared to undertake his research studies in Rubanda DLG HC IVs.

The District Health Officer

Rubanda District Local Government

Dear Sir,

Re: **Administative clearance for data Collection**

I here by request for administrative clearance for research data collection in health center IVs in your district. I am persuing an online Master's Dgree in Nursing Science at Uganda Christian University, Reg. No.RJ21M11/014. My research topic is: **Knowledge, Practice, and Barriers of Nurses about TB Early Detection in Health Center IVs in Southwestern Uganda**

Thiis one of the requirements of the university for their students to get administrative clearance from sites where they hope to collect research data from before final approval by University research Ethics Committee (REC). Once my research proposal is approved by the University REC, I will come back to seek furhther permission to go to different sites in your district to collect data.

Thank you for your positive consideration of my request.

Yours faithfully,

.....

Simon Habimana

Tel: +256774579209/+256705489640

Email: habimanasimon2017@gmail.com

Appendix D: REC Approval

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

UG-REC-026 Approval Version 4.0 07th May, 2024

07th May, 2024

Habimana Simon
Uganda Christian University
+256774579209
Email: habimanasimon2017@gmail.com

UG-REC-026 APPROVAL NOTICE

To: Habimana Simon, Principal Investigator

Re: UCU-REC Application titled: **Knowledge, Practice, and Barriers of Nurses about TB Early Detection in Health Center IVs in Southwestern Uganda**

Application Number: UCUREC-2023-847

Version: 4.0

UGANDA CHRISTIAN UNIVERSITY APPROVED 07 MAY 2025 RESEARCH ETHICS COMMITTEE

Type: [ ] Initial Review
[ ] Protocol Amendment
[ ] Letter of Amendment (LOA)
[ ] Continuing Review
[ ] Material Transfer Agreement
[ ] Other, Specify:

I am pleased to inform you that the **UG-REC-026**; UCUREC approved the above referenced application.

Approval of the research is for the period from 07th May, 2024, to 07th May, 2025
This research is considered minimal risk category.
As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and additions to the protocol or the consent form must be submitted to the REC for re-review and approval prior to the activation of the changes. The REC application number assigned to the research should be cited in any correspondence.
3. Reports of unanticipated problems involving risks to participants or other must be submitted to the REC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for REC review.

1 of 2

4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Regulations require review of an approved study not less than once per 12-month period. **Therefore, a continuing review application must be submitted to the REC eight weeks prior to the above expiration date of 07th May, 2025 in order to continue the study beyond the approved period.** Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. Your research details have been shared with the Executive secretary of Uganda National Council for Science and Technology (UNCST) and you are not required to get clearance since you are a Masters Degree research. Refer to UNCST Research registration and clearance Policy and guidelines (July 2016) in Uganda section 6(e).

The following is the list of all documents approved in this application by UG-REC _026:

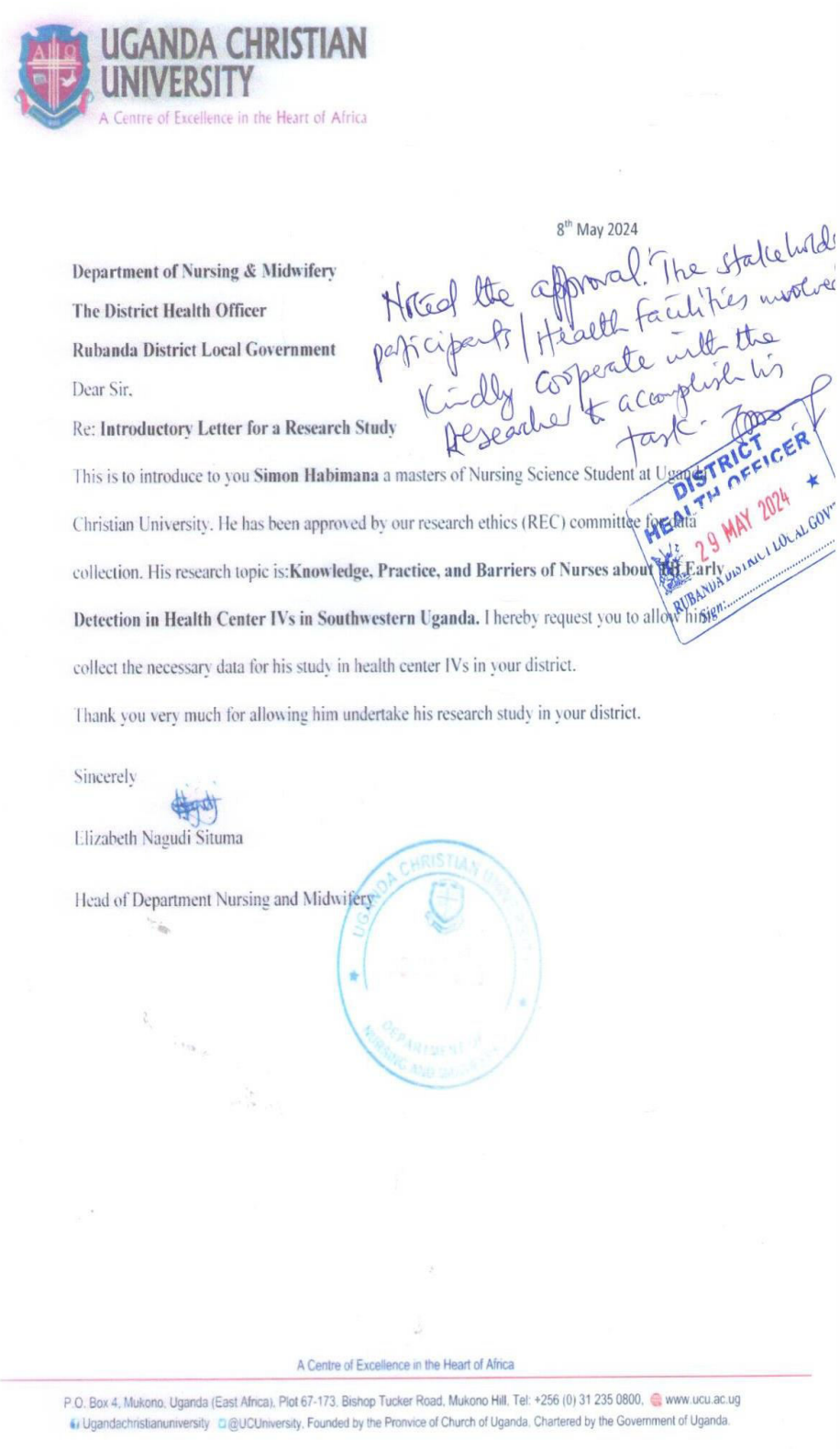
	Document Title	Language	Version	Version Date
1.	Protocol	English	1.0	2024-04-03
2.	Questionnaire	English	1.0	2024-04-03
3	Informed Consent Form	English	1.0	2024-04-03

Signed and Stamped

Prof. Peter Waiswa.
UCUREC Chairperson,
pwaiswa@musph.ac.ug

UGANDA CHRISTIAN UNIVERSITY
APPROVED
07 MAY 2025
RESEARCH ETHICS COMMITTEE

Appendix E: Introductory letter from Head of Nursing Department



UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

8th May 2024

Department of Nursing & Midwifery

The District Health Officer

Rubanda District Local Government

Noted the approval. The stakeholders participants / Health facilities involved Kindly cooperate with the Researcher to accomplish his task.

DISTRICT HEALTH OFFICER
29 MAY 2024
RUBANDA DISTRICT LOCAL GOVT
Sign:.....

Dear Sir,

Re: **Introductory Letter for a Research Study**

This is to introduce to you **Simon Habimana** a masters of Nursing Science Student at Uganda Christian University. He has been approved by our research ethics (REC) committee for data collection. His research topic is:**Knowledge, Practice, and Barriers of Nurses about IMCI Early Detection in Health Center IVs in Southwestern Uganda.** I hereby request you to allow him to collect the necessary data for his study in health center IVs in your district.

Thank you very much for allowing him undertake his research study in your district.

Sincerely

Elizabeth Nagudi Situma

Head of Department Nursing and Midwifery

UGANDA CHRISTIAN UNIVERSITY DEPARTMENT OF NURSING AND MIDWIFERY

A Centre of Excellence in the Heart of Africa

P.O. Box 4, Mukono, Uganda (East Africa), Plot 67-173, Bishop Tucker Road, Mukono Hill, Tel: +256 (0) 31 235 0800, www.ucu.ac.ug
Ugandachristianuniversity @UCUniversity. Founded by the Province of Church of Uganda. Chartered by the Government of Uganda.

Appendix F: Nurses' Individual Scores in Knowledge towards Early TB detection

S/N	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Raw scores	% Scores	Category
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21	100%	Excellent Knowledge
2	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	18	86%	Excellent Knowledge
3	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	15	71%	God Knowledge
4	1	1	0	1	0	0	0	1	0	0	1	0	1	1	1	0	1	0	0	1	0	10	48%	Poor Knowledge
5	1	1	1	0	0	1	1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	15	71%	God Knowledge

6	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	17	81%	Excellent Knowledge
7	1	1	1	0	1	0	1	1	1	1	0	1	1	0	0	0	1	1	1	1	1	15	71%	Good Knowledge
8	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	0	1	1	17	81%	Excellent Knowledge
9	1	1	0	1	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	15	71%	Good Knowledge
10	1	1	0	1	0	0	0	1	1	1	1	0	1	0	0	0	1	1	0	0	0	10	48%	Poor Knowledge
11	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	14	67%	Good Knowledge
12	1	1	0	1	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	10	48%	Poor Knowledge

13	1	1	0	1	0	0	0	1	0	0	1	0	1	0	1	0	1	0	0	1	0	9	43%	Poor Knowledge
14	1	1	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	1	0	1	1	10	48%	Poor Knowledge
15	1	1	0	1	0	0	0	1	0	0	1	1	1	0	1	0	1	1	0	0	0	10	48%	Poor Knowledge
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	20	95%	Excellent Knowledge
17	1	1	0	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	1	9	43%	Poor Knowledge
18	1	1	0	1	0	1	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	10	48%	Poor Knowledge
19	1	1	1	0	0	1	1	0	1	0	0	1	1	1	0	1	1	0	1	1	1	14	67%	Good Knowledge

20	1	0	0	1	0	0	0	1	0	0	1	1	1	0	1	0	0	1	1	0	1	10	48%	Poor Knowledge
21	1	1	0	1	0	0	0	0	1	0	0	1	1	1	0	0	0	1	1	1	0	10	48%	Poor Knowledge
22	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	1	1	0	1	1	1	11	52%	God Knowledge
23	1	1	1	1	0	1	1	0	1	0	1	1	0	0	1	1	1	1	0	1	0	14	67%	God Knowledge
24	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	17	81%	Excellent Knowledge
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	20	95%	Excellent Knowledge
26	1	1	1	0	0	1	0	0	1	1	1	0	1	0	1	0	1	0	0	0	0	10	48%	Poor Knowledge

27	1	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0	1	10	48%	Poor Knowledge
28	1	1	0	1	0	0	0	1	0	0	1	1	1	0	1	0	1	0	0	1	0	10	48%	Poor Knowledge
29	1	1	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	18	86%	Excellent Knowledge
30	1	0	1	0	1	0	1	0	1	0	1	0	0	0	1	0	0	1	0	1	0	9	43%	Poor Knowledge
31	1	1	0	1	0	0	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	9	43%	Poor Knowledge
32	1	1	0	0	0	1	0	1	0	0	1	0	0	0	1	0	1	1	0	0	1	9	43%	Poor Knowledge
33	1	1	0	1	0	1	0	1	0	0	0	1	1	0	1	0	1	0	0	0	1	10	48%	Poor Knowledge

34	1	0	0	1	0	0	0	1	0	0	1	1	1	0	1	0	1	1	0	1	0	10	48%	Poor Knowledge
35	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	0	0	1	16	76%	Excellent Knowledge
36	1	1	0	1	0	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0	1	9	43%	Poor Knowledge
37	1	0	0	1	0	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	10	48%	Poor Knowledge
38	1	1	0	1	0	0	0	1	0	0	1	0	1	0	1	0	1	1	1	0	0	10	48%	Poor Knowledge
39	1	1	0	1	0	1	0	1	0	0	1	0	1	0	1	0	1	1	0	0	0	10	48%	Poor Knowledge
40	1	1	0	0	1	1	0	1	1	1	1	0	1	0	1	1	1	1	0	1	1	15	71%	Good Knowledge

41	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	18	86%	Excellent Knowledge
42	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	18	86%	Excellent Knowledge
43	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	1	0	15	71%	God Knowledge
44	1	1	0	1	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	10	48%	Poor Knowledge
45	1	1	0	1	1	1	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	17	81%	Excellent Knowledge
46	1	1	1	1	0	1	0	1	1	1	1	1	1	0	1	0	1	1	0	1	0	15	71%	God Knowledge
47	1	1	1	1	1	1	0	1	0	0	1	0	1	1	1	0	1	1	0	1	1	15	71%	God Know

																							ledge
48	1	1	1	1	1	1	0	1	0	0	1	0	1	0	0	0	1	1	0	1	0	12	57%	Good Knowledge
49	1	1	1	1	0	1	0	1	0	0	1	1	1	0	1	0	1	1	0	1	1	14	67%	Good Knowledge
50	1	1	1	1	0	1	1	1	1	1	1	0	1	0	0	0	1	1	0	1	1	15	71%	Good Knowledge
51	1	1	1	1	0	1	0	1	0	1	1	0	1	1	1	0	1	1	0	1	0	14	67%	Good Knowledge
52	1	0	0	1	1	1	0	1	1	1	1	0	1	0	1	0	1	1	0	1	0	13	62%	Good Knowledge
53	1	1	1	1	1	1	0	1	0	0	1	1	1	0	1	0	1	1	0	0	0	13	62%	Good Knowledge
54	1	1	1	1	0	1	1	1	0	0	1	0	1	0	1	0	1	1	0	1	1	14	67%	Good Knowledge

55	1	1	1	1	1	1	0	1	0	0	1	1	1	0	1	1	1	1	0	1	0	15	71%	God Knowledge
56	1	1	1	1	0	1	0	1	0	0	1	0	1	0	1	0	1	1	0	1	0	12	57%	God Knowledge
57	1	1	1	1	0	1	0	1	1	1	1	0	1	0	1	0	1	1	0	1	0	14	67%	God Knowledge
58	1	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	0	1	1	13	62%	God Knowledge
59	1	0	1	1	1	1	0	1	0	0	1	1	1	1	1	0	1	1	0	0	0	13	62%	God Knowledge
60	1	1	1	1	0	1	0	1	1	1	1	0	1	0	1	0	1	1	0	0	0	13	62%	God Knowledge
Total	60	53	30	48	19	41	19	48	33	24	54	32	51	26	49	16	52	44	19	42	29	789		
Mean	100%	88%	50%	80%	32%	68%	32%	80%	55%	40%	90%	53%	85%	43%	82%	27%	87%	73%	32%	70%	48%	**13.15**	**63%**	

Appendix G: Nurses' Performance per Question Assessing Knowledge towards Early TB detection

Variable	Response Status	Frequency	Percentage (%)	Knowledge Level
Knowledge Questions Specific to TB in General				
Q9 (Pathogens causing TB)	Correct	60	100	Excellent Knowledge
Q10 (Acquisition of TB)	Correct	53	88	Excellent Knowledge
	Incorrect	7	12	
Q11 (TB risk groups)	Correct	30	50	Good knowledge
	Incorrect	30	50	
Q12 (Symptoms of active TB)	Correct	48	80	Excellent Knowledge
	Incorrect	12	20	
Q13 (Challenges in Early TB detection)	Correct	19	32	Poor Knowledge
	Incorrect	41	68	
Q14 (TB diagnosis methods)	Correct	41	68	Good knowledge
	Incorrect	19	32	
Q15 (TB investigations)	Correct	19	32	Poor Knowledge
	Incorrect	41	68	
Q16 (TB treatment)	Correct	48	80	Excellent Knowledge
	Incorrect	12	20	
Q17 (TB drug combination)	Correct	33	55	Good knowledge
	Incorrect	27	45	
Q18 (Duration of TB treatment)	Correct	24	40	Poor Knowledge
	Incorrect	36	60	
Q19 (TB vaccination age)	Correct	54	90	Excellent Knowledge
	Incorrect	6	10	
Knowledge Questions specific to Early TB detection				

Q20 (Best way to identify TB patients)	Correct	32	53	Good knowledge
	Incorrect	28	47	
Q21 (Location for TB screening)	Correct	51	85	Excellent Knowledge
	Incorrect	9	15	
Q22 (Management of patients with TB symptoms)	Correct	26	43	Poor knowledge
	Incorrect	34	57	
Q23 (Appropriate TB screening questions)	Correct	49	82	Excellent Knowledge
	Incorrect	11	18	
Q24 (Action for patients with persistent cough)	Correct	16	27	Poor knowledge
	Incorrect	44	73	
Q25 (Accurate TB symptoms)	Correct	52	87	Excellent Knowledge
	Incorrect	8	13	
Q26 (Patients eligible for TB screening)	Correct	44	73	Good knowledge
	Incorrect	16	27	
Q27 (TB and HIV relationship)	Correct	19	32	Poor knowledge
	Incorrect	41	68	
Q28 (Eligibility for TB screening in HIV clinic)	Correct	42	70	Good knowledge
	Incorrect	18	30	
Q29 (Quickest investigation for HIV infected persons)	Correct	29	48	Poor knowledge
	Incorrect	31	52	

Appendix H: Nurses Individual Scores in Practices towards early TB detection

S/N	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43	Q44	Q45	Total	Mean	Category
1.	2	-	4	2	-	-	4	-	4	3	-	-	-	-	-	-	19	1	Very Poor practice
2.	1	2	4	-	-	4	3	-	4	4	-	-	-	-	-	-	22	1	Very Poor practice
3.	3	-	4	4	-	2	4	-	3	4	-	-	-	-	-	-	24	2	Very Poor practice
4.	2	-	3	-	1	2	3	2	2	3	2	-	-	3	2	1	26	2	Very Poor practice
5.	2	2	3	1	-	2	4	2	2	3	1	-	-	1	-	3	26	2	Very Poor practice
6.	-	4	2	-	3	3	3	2	1	-	-	-	-	4	-	4	26	2	Very Poor practice
7.	1	1	2	1	-	1	3	4	2	1	1	1	1	2	4	2	27	2	Very Poor practice
8.	4	-	2	1	-	2	4	2	2	3	-	-	-	2	4	1	27	2	Very Poor practice

9.	2	-	4	2	-	4	4	2	2	2	-	-	1	-	-	4	27	2	Very Poor practice
10.	4	2	2	2	-	2	3	3	-	3	2	1	1	1	1	1	28	2	Very Poor practice
11.	3	1	3	2	1	4	1	2	2	1	-	-	2	-	3	3	28	2	Very Poor practice
12.	4	2	2	2	-	1	3	3	3	3	1	1	1	2	1	1	30	2	Very Poor practice
13.	4	2	2	2	-	2	4	2	3	3	2	-	-	2	1	1	30	2	Very Poor practice
14.	4	-	3	2	-	1	4	3	3	4	2	1	1	2	-	-	30	2	Very Poor practice
15.	3	2	4	2	-	1	4	4	3	2	-	2	2	1	-	-	30	2	Very Poor practice
16.	4	-	4	-	-	4	4	1	-	4	2	1	-	-	4	2	30	2	Very Poor practice
17.	3	-	3	-	-	2	3	2	3	4	2	2	2	1	2	2	31	2	Very Poor practice

18.	3	2	3	2	1	2	3	2	3	4	2	-	-	-	2	2	31	2	Very Poor practice
19.	4	2	4	-	2	2	3	-	1	2	3	1	2	2	1	2	31	2	Very Poor practice
20.	3	-	3	3	-	1	4	2	3	3	2	2	2	2	1	1	32	2	Poor Practice
21.	4	2	3	2	-	2	4	4	2	2	2	1	1	-	2	1	32	2	Poor Practice
22.	4	2	3	2	-	1	4	2	2	4	2	1	1	4	-	-	32	2	Poor Practice
23.	2	2	4	-	-	4	4	2	2	4	-	-	-	-	4	4	32	2	Poor Practice
24.	4	-	4	-	1	4	4	4	2	2	2	-	-	1	4	-	32	2	Poor Practice
25.	3	3	2	2	-	2	4	2	4	4	-	-	-	4	-	2	32	2	Poor Practice
26.	4	2	2	2	-	2	4	3	3	3	2	1	1	2	1	1	33	2	Poor Practice

27.	4	-	3	2	-	2	3	3	4	3	2	2	2	-	2	1	33	2	Poor Practice
28.	4	2	2	2	-	1	4	3	3	4	2	1	1	2	1	1	33	2	Poor Practice
29.	4	-	4	2	-	4	3	4	1	4	2	1	1	1	-	2	33	2	Poor Practice
30.	4	-	4	2	-	4	4	2	2	4	2	-	-	2	2	2	34	2	Poor Practice
31.	4	-	3	2	-	1	4	4	2	4	3	2	2	2	1	-	34	2	Poor Practice
32.	4	1	4	2	1	2	4	3	3	4	3	1	1	1	-	-	34	2	Poor Practice
33.	4	2	2	2	-	2	3	3	4	4	2	1	1	2	1	1	34	2	Poor Practice
34.	4	2	2	2	1	2	3	3	4	3	2	1	1	2	1	1	34	2	Poor Practice
35.	4	1	4	2	1	4	4	-	4	4	1	-	-	-	1	4	34	2	Poor Practice

36.	4	2	3	2	-	1	4	3	4	4	2	2	2	-	2	-	35	2	Poor Practice
37.	4	2	2	2	1	2	4	4	4	2	2	1	1	2	1	1	35	2	Poor Practice
38.	4	2	2	2	1	1	4	4	4	4	2	1	1	1	1	1	35	2	Poor Practice
39.	4	-	4	2	-	4	4	3	3	4	2	-	-	2	2	2	36	2	Poor Practice
40.	4	-	4	-	4	4	4	4	2	2	1	1	-	-	4	2	36	2	Poor Practice
41.	4	-	4	-	1	4	4	4	2	4	2	1	2	-	4	-	36	2	Poor Practice
42.	3	-	4	3	-	4	4	4	3	4	3	-	-	3	3	-	38	2	Poor Practice
43.	4	-	4	-	4	4	4	4	2	2	1	1	-	1	4	4	39	2	Poor Practice
44.	4	-	4	2	2	2	4	4	4	4	2	1	1	-	4	2	40	3	Poor Practice

45.	4	-	4	1	1	4	-	1	1	4	4	4	4	-	4	4	40	3	Poor Practice
46.	4	2	3	2	2	2	4	4	3	3	2	1	1	2	4	2	41	3	Poor Practice
47.	4	2	4	2	1	2	4	4	4	3	2	1	1	2	3	2	41	3	Poor Practice
48.	4	2	4	2	1	2	4	4	4	4	3	1	1	-	4	2	42	3	Poor Practice
49.	4	2	4	2	1	2	4	4	4	3	3	1	1	2	3	2	42	3	Poor Practice
50.	4	2	4	2	1	2	4	4	4	3	2	2	2	2	3	2	43	3	Poor Practice
51.	4	2	4	2	-	2	4	4	4	3	3	2	2	2	3	2	43	3	Poor Practice
52.	4	2	4	2	2	2	4	4	4	3	2	2	2	2	3	2	44	3	Poor Practice
53.	4	2	4	2	2	3	4	4	4	3	3	1	1	2	3	2	44	3	Poor Practice

54.	4	2	4	2	2	3	4	4	4	3	3	1	1	2	3	2	44	3	Poor Practice
55.	4	2	4	2	2	2	4	4	4	3	2	2	2	2	3	2	44	3	Poor Practice
56.	4	2	4	2	2	2	4	4	4	4	3	2	2	2	2	2	45	3	Poor Practice
57.	4	2	4	2	1	2	4	4	4	4	3	2	2	2	3	2	45	3	Poor Practice
58.	4	2	4	2	2	3	4	4	4	4	3	2	2	2	3	2	47	3	Poor Practice
59.	4	2	4	2	1	3	4	4	4	4	3	2	2	2	4	2	47	3	Poor Practice
60.	4	2	4	2	2	4	4	4	4	4	4	2	2	2	3	2	49	3	Good Practice
Total	212	77	201	98	48	145	220	175	176	194	111	60	62	85	122	96			
Mean	4	1	3	2	1	2	4	3	3	3	2	1	1	1	2	2		2.17	

Appendix I: Nurses' Performance per Question Assessing Practices towards Early TB detection

Variable	Always	Frequently	Never	Rarely	Sometimes	Mean	SD	Practice Score
Q30 (Educating patients about TB)	44 (73.33%)	8 (13.33 %)	1 (1.67 %)	2 (3.33 %)	5 (8.33 %)	3.533	0.911	Excellent Practice
Q31 (Referral for coughing patients)	1 (1.67 %)	1 (1.67 %)	21 (35.00 %)	4 (6.67 %)	33 (55.00 %)	1.283	1.027	Very Poor Practice
Q32 (Referral for patients with bloody sputum)	34 (56.67%)	13 (21.67 %)	-	-	13 (21.67 %)	3.350	0.820	Excellent Practice
Q33 (Consideration of chest pain in TB diagnosis)	1 (1.67 %)	2 (3.33 %)	11 (18.33 %)	4 (6.67 %)	42 (70.00 %)	1.633	0.882	Very Poor Practice
Q34 (Referral for vomiting patients)	2 (3.33 %)	1 (1.67 %)	30 (50.00 %)	17 (28.33 %)	10 (16.67 %)	0.800	1.005	Very Poor Practice
Q35 (Referral for patients with night sweats)	16 (26.67%)	5 (8.33 %)	1 (1.67 %)	10 (16.67 %)	28 (46.67 %)	2.417	1.109	Poor Practice
Q36 (Collection of sputum samples)	45 (75.00%)	13 (21.67 %)	1 (1.67 %)	1 (1.67 %)	-	3.667	0.729	Excellent Practice
Q37 (Referral for patients with negative TB lab results)	28 (46.67%)	11 (18.33 %)	5 (8.33 %)	2 (3.33 %)	14 (23.33 %)	2.917	1.266	Poor Practice
Q38 (Collection of sputum samples for microscopy only)	25 (41.67%)	14 (23.33 %)	2 (3.33 %)	4 (6.67 %)	15 (25.00 %)	2.933	1.118	Poor Practice
Q39 (Use of GeneXpert for TB detection)	29 (48.33%)	20 (33.33 %)	1 (1.67 %)	2 (3.33 %)	8 (13.33 %)	3.233	0.927	Good Practice

Q40 (Referral for chest X-ray)	2 (3.33 %)	13 (21.67 %)	10 (16.67 %)	6 (10.00 %)	29 (48.33 %)	1.850	1.055	Very Poor Practice
Q41 (Referral for Tuberculin Skin Test)	1 (1.67 %)	-	18 (30.00 %)	26 (43.33 %)	15 (25.00 %)	1.000	0.844	Very Poor Practice
Q42 (Referral for Interferon-Gamma Release Assays)	1 (1.67 %)	-	19 (31.67 %)	22 (36.67 %)	18 (30.00 %)	1.033	0.883	Very Poor Practice
Q43 (Use of Molecular tests for TB detection)	3 (5.00 %)	2 (3.33 %)	17 (28.33 %)	9 (15.00 %)	29 (48.33 %)	1.417	1.094	Very Poor Practice
Q44 (Referral of HIV-positive patients for TB diagnosis)	13 (21.67%)	13 (21.67 %)	12 (20.00 %)	13 (21.67 %)	9 (15.00 %)	2.033	1.461	Poor Practice
Q45 (Consideration of TB culture results)	6 (10.00%)	2 (3.33 %)	12 (20.00 %)	14 (23.33 %)	26 (43.33 %)	1.600	1.153	Very Poor Practice

Appendix J: Nurses Individual Scores in Perceived barriers to early TB detection

S/N	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60	Total	Mean	Category
1.	4	4	2	2	3	4	1	2	4	4	4	3	4	4	3	48	3.20	High Barrier
2.	4	2	2	2	4	4	4	2	4	4	4	3	3	3	3	48	3.20	High Barrier
3.	4	2	2	2	3	3	4	2	4	4	3	3	3	3	3	45	3.00	High Barrier
4.	4	2	2	3	4	3	2	1	4	4	4	3	4	3	3	46	3.07	High Barrier
5.	4	2	2	2	3	4	2	4	4	4	4	3	3	3	3	47	3.13	High Barrier
6.	4	2	2	2	4	4	2	2	4	4	3	3	3	4	3	46	3.07	High Barrier
7.	4	3	3	1	4	3	2	1	3	3	3	3	2	3	3	41	2.73	Moderate Barrier
8.	4	2	2	2	4	4	4	3	4	4	3	3	3	3	3	48	3.20	High Barrier
9.	4	2	2	2	4	4	2	2	4	4	4	4	3	3	3	47	3.13	High Barrier
10.	4	2	2	2	4	4	1	2	4	4	3	4	3	3	3	45	3.00	High Barrier
11.	4	1	2	2	4	4	1	2	4	4	4	3	3	4	3	45	3.00	High Barrier
12.	4	2	2	3	3	4	2	4	4	2	3	3	3	3	3	45	3.00	High Barrier
13.	4	3	4	2	3	4	1	2	4	4	4	3	4	3	3	48	3.20	High Barrier

14.	4	2	2	2	4	4	4	2	4	4	4	4	3	3	3	49	3.27	High Barrier
15.	4	2	2	3	4	4	4	2	4	4	3	3	3	3	3	48	3.20	High Barrier
16.	4	3	4	3	4	3	4	2	4	4	3	3	4	3	3	51	3.40	High Barrier
17.	4	4	3	1	4	4	4	2	4	4	4	4	3	4	3	52	3.47	High Barrier
18.	4	2	2	2	4	4	4	2	4	4	3	3	4	3	3	48	3.20	High Barrier
19.	4	3	2	2	4	4	1	2	4	4	3	3	3	3	3	45	3.00	High Barrier
20.	4	2	2	3	4	4	1	2	4	4	4	3	4	4	3	48	3.20	High Barrier
21.	3	2	2	2	4	4	4	2	4	4	4	4	4	3	3	49	3.27	High Barrier
22.	4	2	2	2	4	4	4	1	3	3	4	3	4	3	3	46	3.07	High Barrier
23.	4	4	2	3	3	4	1	1	4	4	4	3	3	4	4	48	3.20	High Barrier
24.	4	3	4	3	4	3	4	4	4	4	3	3	3	4	3	53	3.53	High Barrier
25.	4	4	2	2	4	4	4	2	4	4	4	4	3	4	4	53	3.53	High Barrier
26.	4	2	2	2	4	4	4	2	4	4	4	4	4	4	4	52	3.47	High Barrier
27.	4	4	4	1	4	4	4	2	4	4	4	3	4	4	3	53	3.53	High Barrier
28.	4	4	1	1	4	4	4	2	4	4	4	4	4	4	4	52	3.47	High Barrier

29.	4	2	2	3	3	3	4	2	4	4	3	3	4	3	3	47	3.13	High Barrier
30.	4	3	2	2	4	4	1	2	4	4	3	3	4	3	3	46	3.07	High Barrier
31.	3	2	2	2	4	3	1	2	4	4	3	3	4	3	3	43	2.87	Moderate Barrier
32.	4	2	1	2	4	3	4	2	4	4	4	3	3	3	3	46	3.07	High Barrier
33.	4	2	2	2	4	4	4	2	4	4	4	4	4	4	4	52	3.47	High Barrier
34.	3	3	3	3	2	2	3	3	2	3	3	1	2	1	2	36	2.40	Moderate Barrier
35.	4	4	4	1	4	4	4	2	4	4	3	3	4	4	4	53	3.53	High Barrier
36.	4	3	2	3	4	3	4	1	4	4	4	3	4	4	4	51	3.40	High Barrier
37.	4	4	3	3	3	4	3	3	3	4	3	4	3	4	3	51	3.40	High Barrier
38.	4	4	2	4	4	3	4	2	4	4	4	3	4	4	3	53	3.53	High Barrier
39.	2	3	2	2	2	1	3	2	3	3	3	3	4	2	3	38	2.53	Moderate Barrier
40.	4	4	1	2	4	3	4	2	4	4	4	3	4	4	4	51	3.40	High Barrier
41.	3	3	4	3	4	3	4	3	4	3	4	3	4	3	4	52	3.47	High Barrier
42.	3	3	2	3	4	2	3	2	3	3	3	4	3	4	3	45	3.00	High Barrier

43.	4	3	3	4	3	2	2	3	3	3	3	3	2	3	3	44	2.93	Moderate Barrier
44.	4	4	3	4	4	4	4	2	4	4	3	3	4	4	4	55	3.67	High Barrier
45.	4	4	2	2	4	3	4	2	4	4	4	4	4	4	4	53	3.53	High Barrier
46.	3	4	3	3	4	3	3	2	2	3	3	3	4	4	3	47	3.13	High Barrier
47.	3	3	3	2	2	3	2	3	2	3	3	4	3	3	4	43	2.87	Moderate Barrier
48.	3	3	3	3	2	4	3	3	3	4	2	1	2	2	3	41	2.73	Moderate Barrier
49.	4	3	3	4	3	3	3	4	3	3	4	3	3	4	3	50	3.33	High Barrier
50.	4	2	3	2	3	1	2	2	3	3	3	2	2	2	3	37	2.47	Moderate Barrier
51.	4	3	4	3	3	2	2	2	3	4	1	1	1	1	4	38	2.53	Moderate Barrier
52.	4	4	4	4	4	4	4	3	4	4	2	3	3	3	3	53	3.53	High Barrier
53.	3	3	2	2	3	3	2	2	2	3	3	3	4	3	4	42	2.80	Moderate Barrier
54.	3	3	2	4	3	3	1	3	4	1	1	3	1	1	3	36	2.40	Moderate Barrier
55.	3	3	3	3	3	3	2	3	3	3	2	2	3	2	3	41	2.73	Moderate

																		Barrier
56.	3	4	4	4	3	2	2	3	2	3	2	3	3	3	3	44	2.93	Moderate Barrier
57.	3	4	2	2	2	1	1	3	4	3	3	3	2	3	4	40	2.67	Moderate Barrier
58.	3	4	4	2	3	3	2	4	4	3	4	3	2	3	3	47	3.13	High Barrier
59.	3	3	3	4	3	3	3	3	4	4	3	4	3	4	4	51	3.40	High Barrier
60.	1	1	3	3	1	1	1	4	4	2	2	2	1	2	2	30	2.00	Moderate Barrier
Total	220	172	151	149	209	197	168	140	219	217	197	185	192	192	194			
Mean	3.67	2.87	2.52	2.48	3.48	3.28	2.80	2.33	3.65	3.62	3.28	3.08	3.20	3.20	3.23		3.11	

Appendix K: Performance per question assessing Barriers to Early TB detection

Variable	Agree	Disagree	Strongly Agree	Strongly Disagree	Mean	SD	Barrier Level
Q46 (Impact of few trainings on TB detection)	15 (25.00 %)	1 (1.67%)	43 (71.67%)	1 (1.67 %)	3.667	0.601	High Barriers
Q47 (Access to laboratory)	20 (33.33 %)	21 (35.00%)	17 (28.33%)	2 (3.33 %)	2.867	0.873	Moderate Barrier
Q48 (Availability of time and space)	14 (23.33 %)	33 (55.00%)	10 (16.67%)	3 (5.00 %)	2.517	0.833	Moderate Barrier
Q49 (Effectiveness of referral processes)	18 (30.00 %)	29 (48.33%)	8 (13.33%)	5 (8.33 %)	2.483	0.833	Moderate Barrier
Q50 (Delays in receiving TB results)	18 (30.00 %)	5 (8.33%)	36 (60.00%)	1 (1.67 %)	3.483	0.725	High Barriers
Q51 (Impact of human resource constraints)	21 (35.00 %)	5 (8.33%)	30 (50.00%)	4 (6.67 %)	3.283	0.885	High Barriers
Q52 (Effect of charges for laboratory use)	8 (13.33 %)	14 (23.33%)	26 (43.33%)	12 (20.00 %)	2.800	1.205	Moderate Barrier
Q53 (Impact of workload)	13 (21.67 %)	36 (60.00%)	6 (10.00%)	5 (8.33 %)	2.333	0.774	Moderate Barrier
Q54 (Availability of diagnostic equipment)	11 (18.33 %)	5 (8.33%)	44 (73.33%)	-	3.650	0.633	High Barriers

Q55 (Impact of irregular training)	16 (26.67 %)	2 (3.33%)	41 (68.33%)	1 (1.67 %)	3.617	0.640	High Barriers
Q56 (Effect of absence of TB screening guidelines)	27 (45.00 %)	5 (8.33%)	26 (43.33%)	2 (3.33 %)	3.283	0.761	High Barriers
Q57 (Impact of TB stigma)	40 (66.67 %)	3 (5.00%)	14 (23.33%)	3 (5.00 %)	3.083	0.696	High Barriers
Q58 (Influence of perception of TB risk)	25 (41.67 %)	7 (11.67%)	25 (41.67%)	3 (5.00 %)	3.200	0.840	High Barriers
Q59 (Poor supply and use of infection prevention measures)	29 (48.33 %)	5 (8.33%)	23 (38.33%)	3 (5.00 %)	3.200	0.798	High Barriers
Q60 (Lack of awareness and familiarity with updated TB information)	42 (70.00 %)	2 (3.33%)	16 (26.67%)	-	3.233	0.500	High Barriers
Overall Score					3.113	0.430	High Barriers

Appendix L: Summary of Performance on Perceived Barriers' Questions

Barrier	Mean	SD
High Barriers		
Q46. Few trainings to boost the knowledge related to TB detection is a major barrier to my effectiveness in early TB detection.	3.667	0.601
Q54. The absence of diagnostic equipment like x-ray and GeneXpert machines affects my ability to detect cases early.	3.650	0.633
Q55. Irregular trainings is major barriers to effective early TB detection	3.617	0.640
Q50. The delays in receiving TB results from TB laboratory affects my early TB detection practices	3.483	0.725
Q51. Human resource constraints impact my ability to detect TB cases early.	3.283	0.885
Q56. The absence of TB screening guidelines affects my Early TB detection practices at my health facility	3.283	0.761
Q60. My lack of awareness and familiarity with updated TB information influence my early detection efforts.	3.233	0.500
Q58. The belief that TB is a high risks disease influences my early detection practices	3.200	0.840
Q59. Poor supply and use of infection prevention measures impact my ability to detect TB cases early.	3.200	0.798

Q57. Stigma surrounding TB is a major barrier to effective early TB detection	3.083	0.696
Moderate Barriers		
Q47. I find it easy to access the laboratory to take patient samples for TB detection activities.	2.867	0.873
Q52. Charges for laboratory use do not affect the frequency of TB testing for early detection.	2.800	1.205
Q48. I have sufficient time and space for assessing patients during TB detection.	2.517	0.833
Q49. Referral processes operate smoothly in facilitating early detection of TB cases.	2.483	0.833
Q53. My workload allows sufficient time and attention for early TB detection.	2.333	0.774
Overall Score	3.113	0.430

Appendix M: Research Work Plan

Period	Activity
First year to 3rd Year	Developed research concept (Idea papers: 1, 2, and 3) and started on research proposal writing
January2024-March2024	Completed Proposal writing
April 2024	Supervisors approved proposal and recommended Research proposal submission to UCU REC
First 2weeks of Research Submission	Awaits UCU REC approval
Last 2weeks of April 2024	Data collection from study sites
First 2weeks of May 2024	Data analysis and analysis
Last 2weeks of May2024	Presentation of study results to relevant authorities

Appendix N: Dissertation Correction Compliance Report by the Candidate (Post Viva Form)

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SCHOOL OF RESEARCH & POSTGRADUATE STUDIES

DISSERTATION CORRECTION COMPLIANCE REPORT BY THE CANDIDATE (POST VIVA FORM)

Date: 9th April 2025

Name of Candidate: Simon Habimana **Reg. No:** RJ21M11/014

Title of Dissertation: Knowledge, Practice, and Barriers of Nurses about Early TB detection in Selected Health Center IVs in a District in Southwestern Uganda

SN	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	Abstract is concise but lacks key findings; minor citation inconsistencies.	Abstract revised. Formatting and citations corrected.	Page v
2	Lines 299–317 misplaced; problem statement redundant; research gap unclear; vague operational definitions.	Text moved to appropriate sections. Problem statement refined. Research gap clarified. Operational definitions updated	Pages 1–12
3	Some sections are descriptive; clearer link to gap needed.	Adjustments made and citations updated.	Pages 14–24
4	Avoid first person; inconsistency in facilities (3 vs 4); no exclusion criteria; no mention of data collection	Facility counts clarified (3 health centers used). Data collection period (Oct–Nov 2023) included. New subsection on data quality control	Pages 26–37

	time; no quality control; clustering not accounted for.	added. Sampling limitations and clustering addressed in limitations. First person maintained following APA7 guidelines.	
5	Face validity alone is weak; CVI recommended.	Acknowledged as limitation and noted for future improvement.	Page 35
	Estimates lack confidence intervals.	Confidence intervals added for key variables.	Pages 43–48
	Too descriptive; limited implication for nursing; important limitations not acknowledged.	Discussion revised to critically compare findings with literature; practical implications emphasized; limitations fully discussed.	Pages 51 –7
	Recommendations not well aligned with findings; limitations not highlighted.	Recommendations revised to reflect findings. Limitations clearly mentioned in the conclusion.	Pages 58–60
	Well organized, minor APA issues.	Reference formatting reviewed and corrected for full APA 7 compliance.	Throughout the document

SN	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	Formatting is consistent, though minor APA and heading inconsistencies exist.	Formatting and APA inconsistencies have been corrected.	All pages
2	Background is contextualized well but lacks current data and deeper insight.	Updated background with recent statistics from WHO TB report of 2024	Pages 1–5
3	Review is more descriptive than analytical. Theoretical framework is underdeveloped.	Revised key studies and the theoretical framework section has been updated. New citations and statistics have been updated.	Pages 14–24
4	Lacks depth in justification of design, tool validation, and analysis choices.	Justified use of descriptive cross-sectional design; described tool development and expert review process; clarified data analysis plan.	Pages 26–37
5	Mainly descriptive statistics; visuals like graphs missing.	Added confidence intervals. Could not decide the variable to present.	Pages 43–48
	Lacks critical depth; recommendations not thoroughly justified; limitations not emphasized.	Improved critical engagement with findings; revised recommendations to align with results; clearly stated limitations in conclusion.	Pages 51 –60
	APA style is generally followed but inconsistently applied; appendices not well referenced.	Revised reference list for APA consistency; in-text references to appendices added.	Pages 46–51; throughout body text

SN	COMMENTS BY VIVA VOCE PANNEL	ACTION TAKEN	INDICATOR
1	Realign all recommendations with the results	Recommendations have been reviewed and rewritten to directly reflect the study's key findings.	Pages 57–58
2	Update the literature section with current sources	The literature review has been updated with more recent sources, including recent WHO TB reports of 2024.	Pages 14–24
3	Health system factors are not included in the barriers	The main document has these barriers accounted for.	Pages 48–49
4	Define the key variables such as early TB detection	Key variables including "early TB detection," "nurses' knowledge," and "barriers" have been clearly defined.	Pages 11–13
5	Align literature from global, regional, and national levels	Literature has been reorganized and aligned systematically to present global, regional (sub-Saharan Africa), and national (Ugandan) trends.	Pages 14–15
	f) Make recommendations	A revised section with more targeted and practical recommendations based on the findings has been included.	Pages 58–60

Simon Habimana  **Dr Karen Drake** 

Candidate's Name Signature Supervisor's Name Signature