FACTORS ASSOCIATED WITH TUBERCULOSIS PREVENTIVE THERAPY PRESCRIPTION FOR CONTACTS OF BACTERIOLOGICALLY CONFIRMED TB PATIENTS IN BUSHENYI, SOUTHWESTERN UGANDA

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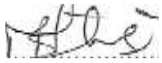
DECLARATION AND APPROVAL

Declaration by student

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

Dr. Katatuubuka E. Dan Mugisha 

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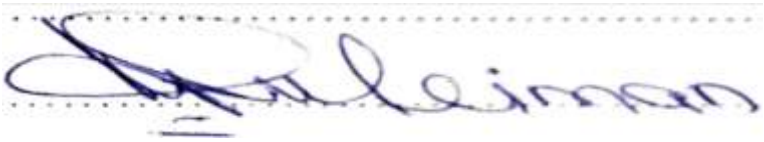
Sign:  Date: 3/9/ 2024

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DEDICATION

This thesis is dedicated to my mother Kyomuhendo Egrance, to my wife Ninsiima Ruth and our children Gabriel, Gideon, Godwin and Grace.

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Appreciation goes to my supervisors Prof. Suleiman Mbaruk and Dr Alfred Owino who guided me through this journey, and to my friend Apollo Aruho Tinka for the constant encouragement on this journey.

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ABSTRACT

This research focused on establishing the factors associated with tuberculosis preventive therapy prescription for contacts of bacteriologically confirmed TB patients in Bushenyi district, south western Uganda. The study-specific objectives were: a) to establish proportion of eligible contacts of Pulmonary Bacteriologically Confirmed (PBC) TB patients who had been prescribed TPT in Bushenyi district, South Western Uganda, b) To find out the health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi District, Southwestern Uganda. and c) to establish the knowledge, perceptions, and attitudes factors affecting TPT prescription for contacts of TB patients in Bushenyi District Southwestern Uganda. This was a cross-sectional study. A data abstraction tool was used to pick data for computing the proportions of TPT prescription. A self-administered, semi-structured questionnaire was employed to collect the research data on health system factors and knowledge perceptions and attitudes among health workers. The respondents were health care workers and health facility managers in all the seventeen TB diagnostic and treatment health facilities in Bushenyi districts. The proportions of eligible contacts of PBC TB patients who had been prescribed TPT in Bushenyi was 77.1%, way below the 90% target set by WHO and MOH-NTLP. Exploratory Factor Analysis was conducted to identify health system factors affecting TPT prescription for contacts of PBC TB patients. Six explanatory factors were revealed, and these are: latent TB testing, TPT service delivery, TPT financing, human resources for TPT, monitoring and evaluation for TPT, and health workers' attitude towards TPT. In the bivariate logistic regression analysis, perception of patient as being uncomfortable with TPT (OR 4.42 95% CI:1.87-11.7; p=0.001), low healthcare worker's knowledge of TB and TPT (OR 3.94 95% CI: 1.61-11.1; p=0.005), and negative healthcare worker's attitude towards TPT prescription (OR 4.56 95% CI: 1.28-29.2; p = 0.045) were significantly associated with low TB prescription. However, in the multivariate logistic regression analysis, the perception of patient being uncomfortable with TPT (aOR 5.58 95% CI: 2.18-16.0; p = <0.001). and gaps in knowledge among healthcare worker about TB and TPT (aOR 5.97 95% CI: 2.08-19.6; p=0.002) were significantly associated with less likelihood of TPT prescription by a healthcare worker. In conclusion, this study found lower TPT prescription in the study area (77.1%) and identifies six key factors accounting for low TPT prescription. These are: Latent TB testing, TPT service delivery, TPT financing, human resources for TPT, Monitoring and evaluation for TPT, and healthcare workers' attitude towards TPT. Furthermore, it identified that knowledge gap on TB and TPT among healthcare workers, a perception that patients are uncomfortable with TPT and negative healthcare workers' attitudes towards TPT prescription were significantly associated with low TB prescription. This study recommends close monitoring of the TPT program for contacts at all the TB DTUs, prioritizing the lower level health centers, improving the human and financial resources for TPT, undertaking TPT capacity-building activities including training and mentorship for health workers, and designing simple, easy-to-use TPT guidelines and job aids.

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LIST OF ABBREVIATIONS AND ACRONYMS

BCG	Bacille Calmette-Guérin
COVID-19	Corona Virus Disease
DTU	Diagnostic and Treatment Units
DHO	District Health Officer
EFA	Exploratory Factor Analysis
HC	Health Centre
HSD	Health Sub-District
HCW	Healthcare workers
HIV/AIDS	Human Immunodeficiency Virus /Acquired Immunodeficiency Syndrome
IPC	Infection Prevention and Control
IEC	Information Education and Communication
IGRA	Interferon-Gamma-Release Assay
KMO	Kaiser-Meyer-Olkin
KIU	Kampala International, University
MoH	Ministry of Health
M&E	Monitoring and Evaluation
NTLP	National TB and Leprosy Programme
OR	Odds Ratio
OPD	Out Patient Department
PLHIV	People living with HIV
PHC	Primary Health Care
PCA	Principal Components Analysis
PNFP	Private Not-For-Profit
PFP	Private-for Profit
PPP	Public-Private Partnership
PBC	Pulmonary Bacteriologically Confirmed
3HP	Rifapentine Isoniazid
TST	Tuberculin Skin Test
TPT	Tuberculosis Preventive Therapy
UNHLT	United Nations High Level Targets
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.0 Introduction to the Chapter

This chapter gives the research background, clarifies the problem that the research is aiming to solve and the purpose of the research, the study questions, objectives, justification, the scope, assumptions made in this study, and what the researcher considered as limitations and delimitations.

1.1 Background of the study

Tuberculosis (TB) is an ongoing significant public health concern throughout the whole world. It is believed that a quarter of the people alive in the world have Mycobacterium tuberculosis in their bodies (WHO, 2023b), which makes TB such a big burden to the world population (Bunyasi et al., 2017). World Health Organization (WHO) reported that in 2022 alone, TB was the second killer infectious disease after Corona Virus Disease (COVID-19) and it killed almost twice the number of patients who died of Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome (HIV/AIDS) (WHO, 2023b).

Developing countries, which host nearly half of the global population, are disproportionately affected by TB compared to developed countries. Under-developed nations shoulder above 95% of the TBTB-related morbidity and mortality (WHO, 2021a). Africa contributes one in four of all the TB cases identified, as well as a third of all the TBTB-related deaths globally (Law et al., 2020). East Africa is equally highly burdened with TB (Molla et al., 2022). In 2018, 378,000 TB patients were newly diagnosed in East Africa. In the same period, 91,000 (24%) TBTB-related deaths were also reported in the same region (Obakiro et al., 2020).

Thirty countries are heavily burdened with TB globally, Uganda inclusive. TB incidence rate in Uganda is 200 cases per 100,000 population every year. TB-related mortality in Uganda is high at 12% far above the targeted rate of less than 5% (Uganda National Tuberculosis and Leprosy Programme, 2020). In 2020, Otero et al. (2020) established that in developing countries, up to 4.4% of the contacts of Pulmonary Bacteriologically Confirmed (PBC) TB patients develop TB disease. A Ugandan implementation study by (Esther et al., 2018) reported a higher yield of TB at 6.1%, among contacts of PBC TB patients.

TB disease can be prevented using antibiotics also known as Tuberculosis Preventive Therapy (TPT) for individuals at risk. A TPT program impact assessment done in India revealed new evidence of new TB cases falling by 87% and the prevalence of TB dropped by 42%, among younger people (Dorjee et al., 2021). Equally, England registered a 29% decline in TB incidence since the launch of the multi-pronged strategy in 2015, code-named the Collaborative TB Strategy for England (Public Health England, 2021).

Although TPT is a low-cost, high-impact intervention in the control of TB disease, implementation of TPT guidelines is still low in developing countries (WHO, 2023b). Globally, only two million (10%) of the targeted 20 million TB contacts were initiated on TPT between 2018 and 2020 (WHO, 2023b). This low TPT rate is attributed to the TPT program initially focusing on people living with HIV whose TPT coverage is over 95% (WHO, 2021a). Additionally, the COVID-19 emergence disrupted TB care and negatively affected access to TPT (Cilloni et al., 2020).

WHO developed a catch-up plan to guide national TB programs expedite the recovery of TB services from COVID-19 pandemic effects. These guidelines include TPT surge for people with latent TB disease (The Global Fund, 2020). This catch-up plan was in response to the low TPT coverage for contacts of PBC TB patients.

Uganda's National TB and Leprosy Programme (NTLP) adopted WHO guidelines and rolled out a TPT program for all contacts of TB patients in 2021 (MOH, 2021). The TPT is provided free of charge at all public and Private Not-For-Profit (PNFP) Diagnostic and Treatment Units (DTUs) across the country (MOH, 2021). However, proportion of TB contacts initiated on TPT in Uganda remains very low at 6% of 2018-2021 United Nations High Level Targets (UNHLT) (WHO, 2021c).

1.2 Statement of the Problem

The WHO target for TPT uptake among contacts of PBC TB patients is 90% (WHO, 2020b; Stella Zawedde-Muyanja et al., 2020). A TPT program impact assessment done in India showed an 87% reduction in TB incidence in children and adolescents. The prevalence of TB dropped by 42%, among the same age group during the same period (Dorjee et al., 2021). Equally, England registered a 29% decline in TB incidence since the launch of the multi-pronged strategy in 2015, code-named the Collaborative TB Strategy for England (Public Health England, 2021).

Uganda is well stocked with highly efficacious TPT medicines (WHO, 2020b). However, only 6% of TB contacts have been initiated on TPT, way below the WHO target of 90% (WHO, 2020b; Stella Zawedde-Muyanja et al., 2020). The TPT implementation review done

in South Africa found that lack of knowledge on TPT and negative attitude and perception of TPT by health workers were strongly associated with low TPT prescription(Baloyi et al., 2022) .The reasons for the low TPT prescription in Uganda are not well established in the available literature. The accessed literature on TPT studies done in Uganda for the reviewed period of 2017-2022 focused patient level factors (Lwevola et al., 2021). None focused on health workers and the health system.

There was need to study the TPT prescription for contacts of PBC TB patients from the health worker and health system perspective. This undertaking purposed to demonstrate the proportion of contacts of PBC TB patients that are prescribed TPT and the factors associated with TPT prescription for associates of PBC TB patients in Bushenyi District, South Western Uganda.

1.3 Purpose of the study

This research focused on finding out the factors associated with TPT prescription for contacts of PBC TB patients in Bushenyi District, South Western Uganda. Establishing these factors will be useful to Ministry of Health (MOH), in designing appropriate interventions like trainings and mentorship programs for health workers and health facility managers, aimed at changing their perceptions and attitudes towards TPT prescription for contacts of PBC TB patients.

1.4 Objectives of the study

General Objective

To establish factors associated with TPT prescription among PBC TB patients in Bushenyi District, South Western Uganda

Specific Objectives

The intentions of this undertaking were threefold:

a) To establish the proportions of eligible contacts of PBC TB patients who are prescribed TPT in Bushenyi district, South Western Uganda.
b) To establish the health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi District, Southwestern Uganda.
c) To establish the knowledge, perception and attitude factors among Healthcare Workers (HCWs) affecting TPT prescription for contacts of PBC TB patients in Bushenyi District Southwestern Uganda.

1.5 Research questions

In this research, I purposed to respond to the following:

a) What proportion of eligible contacts of PBC TB patients were prescribed TPT in Bushenyi District, South Western Uganda?
b) What healthcare system factors affect TPT prescription for contacts of PBC TB patients in Bushenyi District, South western Uganda?

c) What are the knowledge, perception and attitude factors among healthcare workers (HCWs) that affect TPT prescription for contacts of PBC TB patients in Bushenyi District Southwestern Uganda?

1.6 Justification of the study

Globally, tuberculosis (TB) is the second leading cause of death from a single infectious agent; the first being Corona Virus Disease (C0VID-19) (WHO, 2023a). It is estimated that in 2022, 7.5 million people were diagnosed with TB and an estimated 1.3 million died of TB, almost twice the number of people killed by HIV/AIDS. (WHO, 2023a). Low and middle-income contribute more than 80% of TB cases and TB-related mortality in the whole world.(Tumuhimbise & Musiimenta, 2022). In 2022, the WHO region of Africa contributed 23% and the WHO region of South-East Asia contributed 46% of all the TB cases notified(WHO, 2023b).

At the World Health Assembly of 2014, WHO adopted the End-TB strategy, which has three pillars; a) Integrated, patient-centered TB care and Prevention, b) bold policies and supportive systems, and c) intensified research and innovation. (WHO, 2015). TB preventive therapy (TPT) is a core element of the first pillar of the END-TB strategy. TB infection was elevated from being a mere clinical issue of no public significance to a key and essential element of the first pillar of the end TB strategy. This is because patients with TB infection serve as a reservoir for TB infection (Matteelli et al., 2023). The guiding objective of the strategy is to treat patients with latent TB and limiting progression to TB disease. The strategy

targets shrinking TB deaths by 90% as well as to reduce 80% of the number of new TB occurrences by 2030 (Raviglione & Sulis, 2016; (WHO, 2017)).

There is strong evidence of TPT reducing TB incidence in both, developed and developing countries. However, uptake of TPT, especially for contacts of PBC TB patients has remained slow in many countries (WHO, 2020b, 2021a, 2023b). Some of the reasons for this slow uptake include the cascading nature of TPT implementation, requiring prioritization by ministries of health, supportive policies by governments, and commitment of resources by national TB programs, all of which have not been well realized (Matteelli et al., 2023; Salazar-Austin et al., 2019).

Uganda, one of the highly burdened countries, adopted the WHO consolidated guidelines on TB and in March 2021, the guidelines for the programmatic management of latent TB were launched (MOH, 2021). However, TPT uptake for contacts of PBC TB patients remains low. The reasons for the low performance in TPT for contacts of PBC TB patients in Uganda are not clear, though the Ministry of Health (MoH) pointed out the lack of knowledge among health workers (MOH NTLP, 2023). Low coverage of TPT in contacts of PBC TB patients living in areas with a high burden of TB poses a high risk of spreading the TB disease (WHO, 2015).

This study into factors affecting TPT prescription sought to understand the possible causes of low TPT prescription in Bushenyi district, South Western Uganda. The lessons learnt will inform the NTLP in designing appropriate strategies and interventions for improved TPT

prescription among contacts of PBC TB patients. This may contribute to lowering of TB incidence, TB Prevalence and TB related mortality at the national level.

1.7 Scope of the study

This research was done in Bushenyi district, an area that is heavily burdened with TB in Uganda, with incidence of over 200 cases per 100,000 population. Although this TB incidence rate cuts across the whole south western region, Bushenyi district was purposively selected because it has a good blend of three district-level hospitals, Health center IVs, Health center IIIs and good mixture of both public health facilities and Private-Not-For Profit health facilities. This blend is not found in the other districts in South western Uganda. This research considered health workers as research respondents. Health workers are a key pillar of a health system and are critical in the implementation of TPT guidelines (Basu, 2020; Sharma et al., 2020). Bushenyi district has a wide coverage of health facilities (17 TB diagnostic and treatment units) that provide TB care including TPT.

A cross-sectional study design was employed with mixed methods of collecting both qualitative and quantitative data. I conducted a retrospective review of records of 781 Pulmonary Bacteriologically Confirmed (PBC) TB contacts line listed for contact tracing and used frequencies and descriptive statistics to describe contact tracing cascade and determine the proportion of PBC TB contacts initiated on Tuberculosis Preventive Therapy (TPT) among those eligible. A sample of 220 healthcare workers and health facility managers involved in the prescription of TPT was targeted. I distributed semi-structed questionnaires

to 200 health workers. These are the ones that were available and willing to participate in the research and of these 173 returned completed questionnaires.

1.8 Limitations

In the retrospective review of records of contact tracing, the contact tracing register did not have a provision for documenting reasons for not prescribing TPT for the eligible contacts of PBC TB patients. To mitigate this limitation, the questions to capture potentials reasons for not prescribing TPT were included in the self-administered questionnaire. Additionally, in this research, I focused on healthcare workers (both trained health workers and health system managers) and TPT commodities, as essential pillars of a health system. The study participants and sample size in the study area are a limitation since the district has a finite number of health workers. Not all the targeted respondents were available, reachable and willing to participate at the time of collecting data. This may limit generalization of findings from this study.

I concentrated on TPT for contacts in this research undertaking. Whereas TPT among PLHIV is widely studied, not much attention has been given to TPT for contacts. The absence of many studies on the TPT for contacts in Uganda affected the comparability of the findings from this study.

1.9 Delimitations

This study specifically focused on the health system and health worker variables. Conceptually, this study focused on health facility managers, healthcare workers, private not-

for-profit (PNFP) facilities, and public health facilities. In Uganda, as a government policy, HIV and TB services are largely offered by the government to reduce the cost of service delivery and affordability(TB CARE 1, 2013). This, therefore, restricted the research to PNFPs and Public health care facilities. As an operational factor, and because in Uganda there is no regional-specific information about TB burden, this research was limited to Bushenyi district out of convenience, and ease of data collection.

1.10 Assumptions of the study

Most of the literature accessed focused on TPT for PLHIV. Whereas there could be PLHIV among the accessed data, specifically for aspect of the study that established the proportion of TPT in Bushenyi district, this, however, does not significant affect the outcome of this study when compared with the studies that focused on PLHIV.

1.11 Operational definition of key terms

TB Preventive Therapy was defined as the medicines prescribed to eligible clients for sole purpose of preventing them from developing TB disease. Its synonyms will include Isoniazid preventive therapy and TB chemoprophylaxis.

TPT prescriber was defined as any qualified health worker such as doctor, nurse, midwife, or clinical officer who is authorized by Ugandan laws to write, authorizing giving of TPT to clients/patients

Healthcare workers include trained health workers, the auxiliary workers such as counselors and linkage facilitators and health system managers at the health facilities where data collection was done.

Prescription was defined at the act of informing the patients about TPT and writing it down instructions for the patients to have TPT dispensed for them.

TPT prescription was defined as a written instruction by a health worker that given permission to contacts of PBCs to be issued with TPT medicines.

TPT coverage was defined as the proportion of eligible contacts who have been given TPT medicines.

TB contacts were defined as people living in the same home or have regular interaction with the index TB patient that has confirmed TB of the lungs.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter introduces the literature regarding TB burden among contacts of PBC TB patients. It reflects upon WHO's guidance regarding the use of TPT in the management of latent TB infection. The chapter is organized thematically, focusing on the burden of TB among contacts of people with confirmed PBC TB, the role of TPT concerning management of latent TB infection and the level of its uptake, the factors affecting TPT prescription and uptake for the various eligible groups including contacts of PBC TB patients and the perceived relationship between the TPT prescription and the observed factors. This relationship is presented in the conceptual framework and the recap of the literature review is provided at the end of the chapter. Empirical and theoretical literature for this chapter was sought using engines such as, google scholar, PubMed, PubMed Central, Cochrane Library and Embase for peer reviewed journal articles. Various phrases such as TB contact tracing, contact investigation, TB contact evaluation, TB preventive Therapy, Isoniazid preventive therapy, TB chemoprophylaxis, TPT uptake, TPT and HIV, and TPT prevalence, were used.

2.2. The burden of TB among contacts of PBC TB patients

Twenty-five percent of the global population is infected with TB (Falzon et al., 2022). In 2021, WHO reported that TB persists as a very significant cause of sickness and death worldwide. Tuberculosis (TB) is the second leading cause of death from a single infectious agent; the first being Corona Virus Disease (COVID-19) (WHO, 2023a). In 2022, it is estimated that 7.5 million people were diagnosed with TB and an estimated 1.3 million died

of TB, almost twice the number of people killed by HIV/AIDS. (WHO, 2023a). The African continent is disproportionately affected by TB. For example, in 2020, a quarter of the TB cases world-wide and a third of all people who died of TB in the whole world were reported on the African continent (Law et al., 2020). In 2022, the WHO region of Africa contributed 23% of all the TB cases notified and the WHO region of South-East Asia contributed 46% (WHO, 2023b). There is little departure from the status-quo in a span of two decades. In 2002, WHO reported that 65% of TB cases and 71% of deaths, globally, were coming from low-income countries (WHO, 2002) majority of which were in Africa. The reasons cited for this occurrence are insufficiency of basic health services, poor nutrition, poor living conditions that facilitate the spread of TB, insufficient diagnosis, and longer time lags between disease identification and treatment initiation (WHO, 2002).

2.3 Prevention of TB

TB prevention is a core component of the End-TB strategy. The key TB prevention methods are;

a) TB Prevention therapy (TPT),

b) Vaccination of children with the Bacille Calmette-Guérin (BCG) vaccine,

c) The implementation of TB Infection Prevention and Control (TB IPC), and

d) Addressing the risk factors that are embedded in the broader determinants that influence the TB epidemic. Those factors include; alcohol use disorders, diabetes, HIV infection, smoking, and undernourishment.

TB preventive therapy (TPT) is the main healthcare intervention to prevent the spread of TB recommended by WHO for people living with HIV, close and household contacts of people

living with HIV, and all other people at high risk of TB disease such as diabetic patients and health workers (WHO, 2023b).

TB preventive therapy (TPT) is given as one antibiotic or a combination of anti-tuberculosis antibiotic medicines to people with the latent form of TB to prevent them from progressing to TB disease. TPT has the double benefit of preventing both, TB disease and TB-related deaths and also prevents the economic effect of TB disease on a health system (Pathmanathan et al., 2018). TB preventive therapy is a core component of the END-TB program which was started by WHO in 2014. This intervention targets shrinking TB deaths by 90% as well as to reduce 80% of the number of new TB occurrences by 2030 (Raviglione & Sulis, 2016).

TPT was first developed in the 1950s after observing the TB preventive effects of Isoniazid (Salazar-Austin et al., 2019). WHO issued its first Isoniazid preventive Therapy guidelines in 1993, targeting the people most at risk of contracting TB - the People living with HIV/AIDS (PLHIV) and the under five-year-old child contacts of bacteriologically confirmed TB patients (Matteelli et al., 2023). In 2018, WHO released the updated and consolidated guidelines on programmatic management of latent TB infection, in which TB preventive therapy was expanded to cater for more populations most at risk of developing TB. One of these groups is the above five-year-old contacts of bacteriologically confirmed TB patients. These guidelines were further updated in 2020 and 2021, with stronger evidence of the benefit of TPT among various groups (WHO, 2018, 2020a, 2021b).

In 2021, WHO reported that less than 60% of the eligible contacts of PBC TB patients were initiated on TPT (Falzon et al., 2022). Globally, the proportion of people with significant

exposure to TB and have accessed TPT is still very low; and this too reflects on the Ugandan scene, where the proportion of exposed latent TB patients who access TPT was 6% as of 2020. This was way below the WHO target of 90% (WHO, 2021a; S. Zawedde-Muyanja et al., 2018).

Well-trained healthcare workers and health facility managers are an integral part of a successful TPT program. Equally important is the consistent supply and availability of TPT medicines at the health facilities (Ahmed et al., 2021; Egere et al., 2016). Lessons from the Gambian TPT study were that addressing factors that pertain to the health system for example, training healthcare workers as well as addressing access by delivering TPT to communities improved TPT uptake among contacts of PBC TB patients. The training addressed technical components as well as perceptions and attitudes (Egere et al., 2016). Studies from developed countries, such as The United Kingdom revealed improvement in the uptake of TPT once the health system issues were addressed (Public Health England, 2021). A Ugandan study, though focusing on the uptake of Interferon-Gamma-Release Assay (IGRA) in clients exposed to TB patients, further revealed improved uptake once health workers were trained and sent to communities (Muchuro et al., 2022). From the reviewed literature, no information has been found related to factors attributed to low TPT coverage in Bushenyi district and Uganda at large.

2.4 Factors affecting TPT prescription

TPT is administered to prevent TB disease among PLHIV, children, adolescents, and adults who have been significantly exposed to TB patients (WHO, 2021a). Much of the attention

has been given to improving TPT among the PLHIV as evidenced by the high TPT coverage among HIV-positive patients (WHO, 2021a). Adequate logistical support, political will, and financial commitments are some of the reasons for the success of the TPT program for PLHIV (Basu, 2020). HIV patients have regular and more frequent interaction with health care systems during ART clinic refill visits. This partly makes their access to TPT much easier compared to contacts of bacteriologically confirmed TB patients.

Whereas TPT among PLHIV is widely studied, not much attention has been given to TPT for people with elevated exposure to TB. In the absence of very effective vaccines against TB, TPT remains the most efficient and most cost-effective way of managing latent TB infection in high-burden settings such as Uganda. Sharma et al. found low acceptability of TPT uptake among health workers in India (Sharma et al., 2020). Sharma's findings agree with earlier studies which found that limited knowledge of TPT among health workers, perception of the potential side effects of TPT, perceived poor patients' comfort with TPT disclosure, inadequate TPT supplies, fragmented responsibilities, and lack of integration of TB and HIV clinics and absence of a tuberculin skin test result were associated with low TPT prescription by health workers (Ahmed et al., 2021). Attention given to addressing the health system-related issues is, therefore, an important issue and starting point in understanding the low TPT coverage for contacts of bacteriologically confirmed TB patients. This study conceives the following factors, hereunder discussed, as key in understanding the low TPT coverage in a high TB burden setting such as Uganda.

2.4.1. Training of health workers

There is a growing body of literature focusing on the three key strands of TB and TPT, i.e. in children under 5 years, in People Living with HIV (PLHIV), and in contacts above 5 years. The majority of the accessed literature focuses on PLHIV and child contacts under 5 years. This is so because TPT was primarily introduced for PLHIV and child contacts under 5-year-old contacts of PBC TB patients (WHO, 2018, 2020a, 2021b)). Both PLHIV and children under 5 years were regarded as people at a high risk of contracting and progressing from latent TB infection to TB disease because of their compromised and young immunities respectively (WHO, 2020a). This primary focus on PLHIV and later the children under 5 years necessitated the development of and critical attention to training about TPT as the main healthcare approach to TB prevention (WHO, 2018, 2020a, 2021b). Even with the developed WHO guidelines on the use and rolling out of the same by health workers, there are still wide country-based gaps in the implementation of the recommended WHO consolidated guidelines on TB prevention (H. Manisha et al., 2022; Roscoe et al., 2020). However, for the contacts of PBC TB patients above 5 years, where little attention has been given, there is inadequate knowledge among health workers on the implementation of TPT (Hoddinott, 2020; Spruijt et al., 2020). Inadequate training on TPT guidelines was, generally, identified as a common barrier to TPT implementation. Training of health workers was recommended, especially for enhancing their knowledge and skills regarding TPT (Martinez et al., 2021; Singh et al., 2017), building of confidence in prescribing TPT (Dongo et al., 2021; Teklay et al., 2016), increasing awareness and understanding eligibility criteria for TPT (H. Manisha et al., 2022), and cultural-based sensitivities related to TPT (Spruijt et al., 2020).

2.4.2. TPT guidelines

Prior to the development of TPT as the main TB prevention strategy in the healthcare system, Bacille Calmette-Guérin (BCG) vaccination for children was relied upon for prevention against TB. However, the protection from BCG vaccination reduces in later years of one's life (WHO, 2018). With the realization of the protective properties of isoniazid against TB, TPT guidelines were developed and recommended for adoption in various groups, especially with PLHIV and children under 5 years. Other molecules, such as Rifapentine Isoniazid (3HP), were developed and recommended for use as TPT. (WHO, 2018, 2020a, 2021b). However, even with these guidelines in place, the adoption in different countries, especially the highly TB burdened countries, was different and implementation continued to be different (Szkwarko et al., 2017). Calls for standardization of these guidelines have been made by various commentators, citing lack of uniformity in implementation and monitoring for treatment outcomes, complexity of the guidelines, and non-adherence to the existing guidelines by the healthcare workers (Martinez et al., 2021; Roscoe et al., 2020; Singh et al., 2017; Szkwarko et al., 2017; Van Ginderdeuren et al., 2019). More evidence showed that TPT is beneficial to the various groups of people at the most risk of contracting TB and progressing to TB disease, and was thence recommended for use across the various groups as the main TB preventive strategy in the healthcare system (WHO, 2020a, 2021b). The TB Preventive Therapy guidelines, have however, received varied adoption and rolling out in different countries. Different reasons to this effect are fronted, and amongst these are non-prioritization by the Ministries of Health with respect to other more pressing public health concerns (Teklay et al., 2016), and lack of sufficient resources (Oxlade et al., 2021; Szkwarko et al., 2017).

2.4.3. Stigma, Attitudes and perceptions to TPT

"It is not easy to identify those patients who need IPT. There could be missed opportunities. Providing this single drug on top of the stock outs, obviously resistance may develop" (Teklay et al., 2016). TPT has not received the scale-wide acceptance envisaged by the WHO as the main preventive strategy against TB due to, in part, healthcare workers' perceptions, and attitudes towards TPT.

There are 3 key themes that are identifiable within the stigma, attitudes and perception factor: healthcare worker issues, institutional and business-related issues. Some healthcare givers were noted as being sceptical about TPT, because of their inability to rule out TB disease from among the potential clients for TPT (Szkwarko et al., 2017). There was reported reluctance to initiate clients on TPT for fear of causing isoniazid resistance, partly due to knowledge gaps and/or inconsistent supply of TPT commodities, especially Isoniazid and the perception among health workers that patients were not likely to adhere to TPT and complete the dose (Baloyi et al., 2022; Roscoe et al., 2020).

Institutional issues related to government and private-not-for-profit institutions predominantly being the providers of TB prevention, care and treatment services. Healthcare givers opined that it was disadvantageous initiating patients on TPT when they were not sure of the continuous and adequate supply of TPT commodities. Equally, due to differing priorities in healthcare giving in different countries, especially the TB-highly burdened countries, there was reported non-uniformity in supervision of TB prevention, care and treatment services across healthcare facilities (Chijioke-Akaniro et al., 2023; Tumuhimbise & Musiimenta, 2022).

Private-for-profit healthcare practitioners, because of business-related issues prefer to refer TB care to government institution for fear of stigma on their facilities, as well as TB care, in itself not attracting interest business-wise. For example, Tumuhimbise & Musiimenta(2022) note of, "… TB management is not something that may bring in money quickly, it is not a direct income-generating activity…"(p.7), and "…the point is, the patient will know that, yes, TB cases are being managed in this hospital, they will stigmatize the hospital …that will not be in my own interest. I will lose a lot of patients…" (Chijioke-Akaniro et al., 2023).

2.4.4. Knowledge about TB and TPT

The lack of knowledge about TB and TPT among healthcare workers was widely identified as a critical factor in the low uptake and implementation of TPT across country jurisdictions (Baloyi et al., 2022; Falzon et al., 2022; H. Manisha et al., 2022; Singh et al., 2017; Szkwarko et al., 2017). This lack of knowledge, in effect, led to several consequences. Noteworthy are: limited and/no prioritization of TPT by the healthcare workers in favor of other healthcare services, and considering it as extra load to their routines (Baloyi et al., 2022; Falzon et al., 2022); the inability to rule out TB and thus hindering initiation of eligible patients on TPT (Van Ginderdeuren et al., 2019); and perceived lack of efficacy of TPT and fear of patients developing resistance to TB medicines (Baloyi et al., 2022; Belgaumkar et al., 2018; Hoddinott, 2020). These knock-on effects, jointly or independently resulted in limited and/no patient awareness, education, and sensitization about TPT and its importance in the prevention, and the necessity for strict adherence to TPT prescriptions (Baloyi et al., 2022).

2.4.5. TPT commodities

The availability of TPT commodities – Tuberculin Skin Test (TST) kits, and Interferon Gamma Release Assay (IGRA) blood tests, supplies for TB diagnostics, and TPT medicines and pyridoxine – are essential for effective implementation of a TPT program. TPT commodities were reported to be inadequate - either running out of stock or having limited supplies than required or completely being unavailable. This demoralized healthcare workers, and caused fear of initiating patients on TPT when they were not sure of adequate supplies, as well as fear of patients developing drug resistance when they do not complete the full dose as prescribed (Martinez et al., 2021; Singh et al., 2017; Van Ginderdeuren et al., 2019). Additionally, poor integration of clinics such as Out Patient Department (OPD), TB clinic and HIV clinics was reported as a key barrier to TPT implementation, complicating access to medicines by the patients. TPT implementation integration refers to receiving of TPT along with medications for other ailments from the same location, clinic, and at the same time (Jacobson et al., 2017). Further to this and related to the healthcare worker perception, was an issue of complexity of TPT medication and pill burden. Some healthcare workers perceived that TPT medication was complex and lasted longer duration and would be a burden to patients, especially those that had other chronic ailments that required prolonged medication (Hoddinott, 2020; Szkwarko et al., 2017).

2.4.6. Ownership of health facilities

Ownership of health facilities is generally grouped into three broad categories, namely; a) Public, meaning that they are largely government-owned, b) Private-for Profit (PFP), and Private-Not-For- Profit (PNFPs) (Abor, 2015). PNFPs are either faith-based health facilities,

community-owned, or civil society-owned health facilities. Whereas all the different categories of health facilities are allowed to provide TB and TPT services through the Public-Private Partnership (PPP) arrangement (Tumuhimbise & Musiimenta, 2022), private facilities were observed to be reluctant to provide TB and TPT services because it doesn't attract business as reported by Chijioke-Akaniro et al., (2023) or were not supported with the required TPT supplies, commodities and training of health workers in the provision of TPT services (Tumuhimbise & Musiimenta, 2022). TB remains an issue of public health concern, most governments don't have full control and full supervision of private health facilities, and this would complicate TB management if it's left to the private health facilities that are business-oriented (TB CARE 1, 2013).

2.4.7. Contact tracing

Contact tracing is the process of identifying people who have recently been in contact with someone diagnosed with an infectious disease(Adler, 1982) and it is the first step in the TPT cascade, the other steps being TB screening among the contacts, TPT initiation among those eligible for it and TPT completion (Szkwarko et al., 2017). Whereas ruling out TB in a patient prior to initiating TPT is key(MOH, 2021; WHO, 2021b), healthcare workers' incompetence in TB screening, diagnosis, and TPT initiation were raised as key barriers to contact tracing(Chijioke-Akaniro et al., 2023; Szkwarko et al., 2017; Tumuhimbise & Musiimenta, 2022). Additionally, lack of contact tracing guidelines and/or non-adherence to the guidelines were also reported as barriers as well. The non-availability of tools for the monitoring and evaluation of contact tracing programs, and non-availability of financial

resources to support contact tracing activities were noted as key bottle-necks to contact tracing(Szkwarko et al., 2017).

2.4.8. Monitoring and Evaluation (M&E) tools

Szkwarko et al.,(2017) recommended that M&E tools be considered important for tracking and monitoring the implementation of TPT programs at both facility and community levels. The availability, uniformity, and completeness of M&E tools for TPT significantly contribute to the effective implementation of TPT programs and strategies. However, in a number of high burden TB countries, it was noted that either a national TPT register was missing (Hoddinott, 2020), and Singh et al., (2017) recommended the introduction of M&E tools for effective monitoring of TPT programs. In other jurisdictions, where the register was present, there was varied healthcare workers' understanding of the TPT indicators in the registers (Baloyi et al., 2022). Furthermore, where the register was available, there was inconsistency, incompleteness, and low quality of the data reported, all making the evaluation of TPT program difficult (Baloyi et al., 2022; Falzon et al., 2022; Hoddinott, 2020; Van Ginderdeuren et al., 2019). A call for standardization of the M&E tools was made to address the identified anomalies as a way of improving TPT implementation (Hoddinott, 2020; Szkwarko et al., 2017; Van Ginderdeuren et al., 2019).

2.4.9. Supervision for TPT

Supervision in health services delivery is a core system function and it is very necessary for ensuring delivery of quality services, harness staff productivity and create a work environment that supports staff to deliver and comply with the set standards and guidelines

(Anoke et al., 2021). Lack of supervision was noted as a key bottleneck to TPT implementation that caused confusion as to which health workers were meant to provide TPT. In South Africa, one study revealed this confusion classically, "…. TPT is seen as the duty of Primary Health Care (PHC) in which nurses should be initiating patients on TPT and not the doctors. We as doctors assume that we are only required to attend to complicated cases such as complicated TB, severe ailments, and side effects of medication"…(Baloyi et al., 2022). Elsewhere, the failure of managers to supervise and monitor TPT implementation resulted in the non-prioritization of TPT by health workers (Teklay et al., 2016).

2.4.10. Financing for TPT

Whereas the success of TPT program implementation is dependent on the availability of finances for effective service coverage, lack of funding, and non-prioritization of TPT by governments and ministries of health over other public health priorities such as malaria and HIV/AIDS in high-burden TB countries were found to be real barriers (Szkwarko et al., 2017). The financial constraints in these countries were further compounded by the emergence of the COVID-19 pandemic that caused agencies, governments, and ministries of health to re-locate resources, including finances, equipment and human resources for health from TB and TPT programs to other priorities like COVID-19 control (Oxlade et al., 2021).

2.4.11. Deployment at service delivery point

Human resources play a critical role in the delivery of quality, efficient and effective health services. In TPT implementation programs, the availability and deployment of adequate, competent and motivated human resources is a key success component (Nyawira et al., 2022). In Nepal, it was found that scarcity of staff, lack of trained healthcare workers capable

of screening for TB and initiating TPT, and continuous absenteeism of healthcare workers deployed at TB clinics, negatively affected the TB service delivery (Marahatta et al., 2020). Equally, the under-deployment of healthcare workers at busy service delivery points resulted in healthcare workers being overwhelmed by work (Hoddinott, 2020) Staff who were overwhelmed by work at their workstations tended to prioritize other healthcare services, neglecting TPT. To this effect, it was noted that "… as nurses [we] see many patients in a day and sometimes forget to initiate patients on IPT and especially if [we] have a shortage of staff …"(Baloyi et al., 2022). Additionally, the deployment of healthcare workers at service delivery points without clarifying their job descriptions, roles, and responsibilities resulted in TPT being neglected, with each cadre thinking that prescribing TPT was not their responsibility. This led to disregarding of TPT prescription, and Baloyi and others note that "...We are not communicating effectively as health workers. Nobody is really checking on one another and communicating about patients that are on this TPT medication….." (Baloyi et al., 2022).

2.5 Conceptual framework for relationship between factors affecting TPT prescription for contacts of P-BC TB patients and the prescription rates

The conceptual framework for this undertaking is shown in figure 1 below and it establishes the perceived association between the dependent variables, the independent variables and the intervening variables. The dependent variable is the TPT prescription by health workers. The independent variables are grouped into two groups; a) the health worker factors such as training on TPT, availability of TPT guidelines, attitudes and perception, knowledge about TPT and b) the health system factors which include ownership of the health facility, availability of TPT commodities, availability of monitoring and Evaluation tools and

provision of contact tracing services. Intervening variables such as supervision, deployment of health workers at service delivery points and financing were considered as indicated in figure 2-1 below.

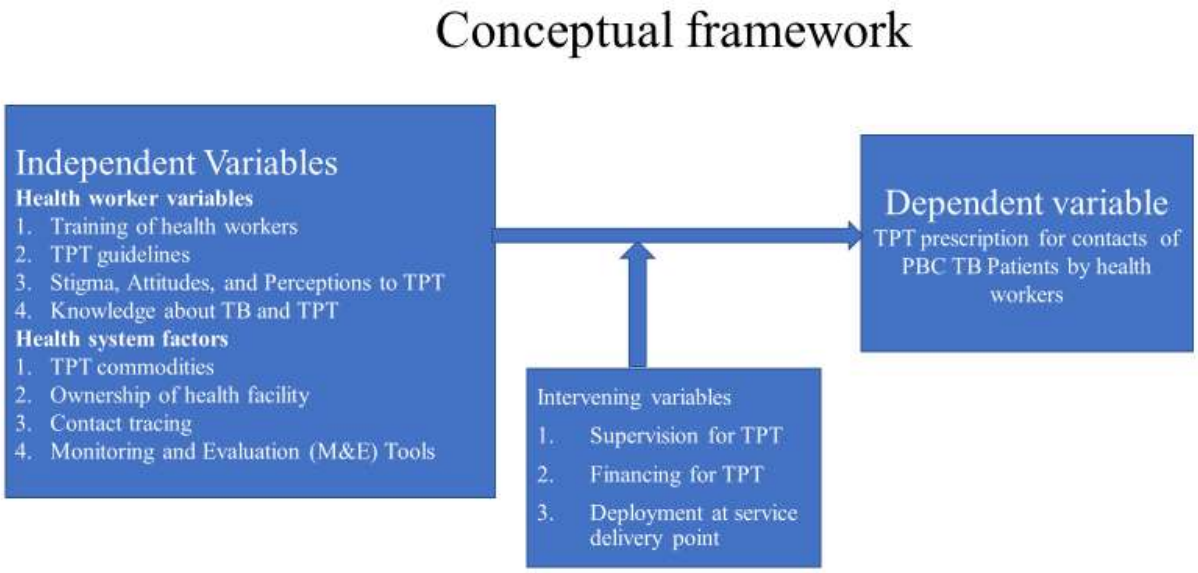

Figure 2- 1: Conceptual framework for factors affecting TPT prescription for contacts of P-BC TBTB patients

2.6 Recap of literature review

The chapter highlighted the burden of TB among contacts of PBC TB clients. It explored what TPT does and the advances made in TPT programming for PLHIV and contacts of TB patients. Throughout the exploration made on the factors accounting for low TPT implementation, particularly among healthcare workers, it argues that with the high burden of TB particularly in the developing world and with the absence of an effective vaccine against TB, TPT remains the most effective approach of preventing TB disease among the

TB infected patients, and achieving the elimination of TB globally. However, much attention has been given to TPT for PLHIV and pediatric contacts. TPT for adult contacts of bacteriologically confirmed patients remains an unexplored area.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section sets out the research methodology, design, the study variables, as well as location of the research. It further discusses the research scope, target population, the sampling techniques and procedures, research instruments, the data collected and the data analysis procedure.

3.2 Research Design

To establish factors affecting TPT prescription, I conducted a cross-sectional research study among healthcare workers and health facility in-charges in Bushenyi District. The study focused largely on the health system-based factors in which healthcare workers are a key component, and Setia, (2016) states that a cross-sectional study is appropriate for pre-determined participants to assess the outcomes of a study. Descriptive design was used to answer objective one while analytical design was used to establish the relationships between various variables concerning TPT for contacts.

3.3 Research Methodology

This research took a quantitative approach in which data was collected using a retrospective data abstraction tool and a self-administered, semi-structured questionnaire. A retrospective data abstraction tool, shown in Appendix 5, was used to collect data of 781 contacts PBC TB patients. A self-administered questionnaire was administered to 200 respondents accessed in 17 health facilities in Bushenyi District. A self-administered semi-structured questionnaire utilized, given as appendix 6, was utilized to assess the health system factors and the

healthcare workers' knowledge, perceptions, and attitudes, towards TPT for contacts of PBC TB patients.

To understand the prevailing low TPT prescription rates in the study area, the following independent variables were considered: Training on TPT guidelines, availability and knowledge of TPT guidelines, attitude towards TPT, perception about TPT, Availability of registers for TPT documentation, Ownership of the health facility and availability of TPT commodities, including tests for latent TB and TPT medicines, at health facilities, active implementation of contact tracing, supervision of TPT guidelines implementation, deployment of health workers trained in TPT guidelines and financing for TPT activities. Similar variables have been used in understanding the TPT among PLHIV clients. It was postulated that since TPT is used for curtailing the development of TB disease from TB infection, similar variables can be used to study TPT for contacts of PBC TB patients (Ahmed et al., 2021; Basu, 2020; Egere et al., 2016; Sharma et al., 2020). This study, however, considered supervision of the TPT program and deployment at a service delivery point and financing for TPT program as intervening variables that affect the level of TPT prescription. A more supervised program is more likely to succeed. Equally, having a trained health worker deployed in the TB unit is likely to lead to more TPT prescription for contacts of PBC TB patients.

3.4 Location of the study

The research was done in 17 TB Treatment and Diagnostic health Units (DTUs) of Bushenyi district. The number of these facilities was obtained from the district health facility master list. Bushenyi is a rural district located 377.5 km in the South West of the capital Kampala.

It has 11 sub counties, 76 parishes and 625 villages. Its land area is 698.5 Sq.km. It has a population of 248,300 people of whom 122,200 (49.2%) are male while 51.8% are female. (Mugarura et al., 2021).

TB incidence in Uganda is generally very high with 200 new TB patients for every 100,000 people in the population. The latest national TB prevalence survey neither showed any regional variance nor any district specific data (MOH Uganda, 2015).

The study location was purposively selected because the district has varied levels of health facilities under different ownership arrangements. Bushenyi district is shown in figure 3-2 below.

Figure 3- 1: Map of Uganda showing Bushenyi District (in red), the study area

3.5 Population for the study

The population used for the study was the healthcare workers and health facility managers working in the seventeen DTUs in Bushenyi district. All those involved in TB diagnosis, health education on TB prevention, testing for TB and management of TB were considered. Bushenyi has a total of 487 health workers spread among its seventeen TB diagnostic and treatment units (Bushenyi health records information system, 2022). The number of health workers per DTU in Bushenyi is summarized in table 3-1.

Table 3- 1:Number of health workers per DTU in Bushenyi district

Health Sub-District (HSD)	Health Facility	Number of Health care workers
Igara East Health Sub-district	Ruhumuro HCIII	9
Igara East Health Sub-district	Kyabugimbi HCIV	52
Igara East Health Sub-district	Kyeizooba HCIII	13
Igara East Health Sub-district	Kabushaho HCIII	10
Igara East Health Sub-district	Ryeishe HCIII	9
Igara East Health Sub-district	Ankole tea HCIII	8
Igara West Health Sub-district	Comboni Hospital	90
Igara West Health Sub-district	Kyamuhunga HCIII	10
Igara West Health Sub-district	Nyabubare HCIII	10
Igara West Health Sub-district	Kakanju HCIII	10

Igara West Health Sub-district	Bitooma HCIII	9
Bushenyi-Ishaka Municipality HSD	Ishaka Adventist Hospital	80
Bushenyi-Ishaka Municipality HSD	KIU Hospital	100
Bushenyi-Ishaka Municipality HSD	Bushenyi Medical Centre	25
Bushenyi-Ishaka Municipality HSD	Bushenyi HCIV	37
Bushenyi-Ishaka Municipality HSD	Bushenyi Prison HCIII	9
Bushenyi-Ishaka Municipality HSD	Katungu Mission HCIII	6
Total		487

Source: Bushenyi district health office, 2022

3.6 Sampling procedures and techniques

The targeted population was all the health workers in Bushenyi district TB diagnostic and treatment health units (DTUs). I utilized a non-probability sampling method in which the respondents were conveniently accessed, an approach that was cost friendly considering the limited budget I was working with. With permission from the district health office, I gained contact with the health workers at each facility through the health facility in charges. I then requested the facility in-charges to mobilize health workers for briefing and seeking consent to take part in the research. The questionnaires were then distributed to the consenting health workers there and then. To avoid disrupting work and rushed responses, I left the questionnaires with the health workers to be responded to at their convenient time. Weekly reminders were made to health facility in-charges and the filled questionnaire were collected after four (4) weeks from the date of distribution.

Each healthcare worker responded to one questionnaire. The inclusion criteria in this study was all healthcare workers and auxiliary healthcare workers involved in TB screening, TB diagnosis, TB care, TB treatment and TB prevention activities.

3.7 Sample population

I used Slovin's (1960) formula of sampling: n = N/ (1+N (e2))

Where n was sample size

N= population

E= standard error

So, n = 487/ (1+487(0.052). n = 220 study participants

3.8 Research instruments used

A data abstraction tool (Appendix 5) was used to collect data on contacts who had been elicited from the identified PBC TB patients. This tool was utilized assess data of 781 contacts of PBC TB patients from all the DTUs in Bushenyi district. The data collected using this data abstraction tool was utilized to answer objective one of the study. An anonymous self-administered semi-structured questionnaire (Appendix 6) was utilized to pick quantitative data from the health workers. The data collected with a semi-structured questionnaire had 3 sections. Section one had demographic and general information related to the respondent such as the workstation, position, and TPT training. The second section had Likert-type questions (5-level scale) starting from strongly disagree to strongly agree, while responding to questions generally regarding TPT administration. The third section a combination of Likert-type questions (5-level scale) and close-ended questions relating to questions that assessed the knowledge, attitudes, and perceptions of the health care workers

about TPT prescription. These sections directly focused on addressing research objectives two and three respectively.

3.9 Testing for validity and reliability/trustworthiness

The reliability and internal consistency of the data collection tools were assessed using Cronbach's alpha (Taber, 2017). The results for overall reliability and reliability if an item is dropped are shown in the table 3-2. The overall Cronbach alpha output was 0.74 suggesting an acceptable level of reliability and internal consistency of the tool – questionnaire – used to collect the data and reach the target objective with the results thereof. From table 3-2, the questionnaire had 21 variables that were used for extraction of factors sought as affecting TPT prescription in Bushenyi. All variables presented a raw alpha, if an item were dropped, above 0.70, suggesting that none of the items were to be dropped, and all were reliable.

Table 3- 2:Showing reliability and internal consistency of the questionnaire

95% confidence boundaries

	lower	Alpha	Upper
Feldt	0.68	0.74	0.8
Duhachek	0.69	0.74	0.8

Variable	raw_alpha	std. alpha	G6(smc)	average_r	S/N	ase	mean	sd	median_r
Overall reliability									
	0.74	0.78	0.85	0.14	3.5	0.028	3.6	0.42	0.14
Reliability if an item is dropped									

	raw_alpha	std. alpha	G6(smc)	average_r	S/N	alpha se	Var.r	median_r
X1	0.72	0.75	0.83	0.13	3.0	0.030	0.025	0.13
X2	0.73	0.76	0.84	0.14	3.1	0.029	0.026	0.13
X3	0.73	0.76	0.84	0.14	3.1	0.029	0.026	0.13
X4	0.74	0.77	0.84	0.14	3.3	0.028	0.027	0.14
X5	0.74	0.77	0.84	0.14	3.3	0.028	0.027	0.14
X6	0.75	0.78	0.85	0.15	3.5	0.027	0.027	0.14
X7	0.74	0.77	0.85	0.15	3.4	0.028	0.027	0.14
X8	0.72	0.76	0.84	0.14	3.2	0.030	0.026	0.13
X9	0.74	0.77	0.84	0.14	3.4	0.028	0.026	0.13
X10	0.73	0.77	0.85	0.14	3.4	0.029	0.026	0.14
X11	0.72	0.76	0.84	0.14	3.2	0.030	0.028	0.13
X12	0.73	0.77	0.85	0.14	3.4	0.029	0.028	0.14
X13	0.73	0.76	0.84	0.14	3.2	0.029	0.028	0.13
X14	0.77	0.79	0.86	0.16	3.8	0.024	0.024	0.15
X15	0.73	0.77	0.84	0.14	3.3	0.030	0.024	0.14
X16	0.73	0.77	0.84	0.14	3.3	0.029	0.025	0.14
X17	0.73	0.77	0.85	0.14	3.4	0.029	0.026	0.14
X18	0.71	0.76	0.84	0.13	3.1	0.031	0.028	0.13
X19	0.74	0.77	0.85	0.14	3.3	0.029	0.028	0.14
X20	0.73	0.76	0.84	0.14	3.2	0.029	0.028	0.13
X21	0.74	0.77	0.85	0.14	3.4	0.028	0.027	0.14

3.10 Data collection methods and procedures

After acquiring authorization to undertake research in the district (see appendix 4), I distributed both the retrospective data abstraction tool and the semi-structured questionnaires to all the earmarked DTUs in Bushenyi. Every DTU is overseen by a designated person called health facility in-charge. These were contacted, prior to arrival at the facility, and relied upon for mobilization of the health workers. The health facility in-charges helped in filling the retrospective data abstraction tools and mobilization of health workers at DTUs for briefing and seeking consent for taking part in the research. The questionnaires were later distributed to the consenting health workers. Weekly reminders were made to health facility in-charges and the filled questionnaire were collected after 4 weeks from the date of distribution. All the data was collected between the month of August and September 2023.

3.11 Data analysis techniques and procedures

The data was entered into Micro Soft Excel sheet. None of the entries from the 17 DTUs concerning the 781contacts of PBC TB patients for contact tracing were dropped. The data was analyzed still in MS Excel for descriptive statistics (sums and percentages) of contacts of PBC TB patients traced at a particular health facility, contacts screened, contacts presumed with TB, contacts eligible for TPT, and finally contacts Prescribed TPT. This guided in establishing the proportions of eligible contacts of PBC TB patients prescribed with TPT in Bushenyi District, as a precursor for establishing whether there is low TPT prescription.

I analyzed the data collected using the self-administered semi-structured questionnaire using R statistical software. I first entered all the data into MS Excel for cleaning purposes before

importation into R, a statistical analysis software (R Core Team, 2023). In MS Excel, and for purposes of quantitative analysis, the questionnaire responses were figuratively coded and converted into CSV format which is importable into R. Section one of the semi-structured questionnaire was descriptively analyzed for ownership of the health facilities; gender of the respondent – male or female; training on TPT guidelines and duration elapsed since the last training was undertaken; and department where the respondents were engaged – from where they handled TB care. Section two of the semi-structured questionnaire was inferentially analyzed to assess the factors that affected TPT prescription in the Bushenyi district. Factor analysis was used as an inferential statistical method.

Section three of the semi-structured questionnaire was also inferentially analyzed in R statistical software for assessing the knowledge, attitudes, and perceptions of the health workers about TPT prescription for PBC TB patients in Bushenyi district. Both bivariate and multivariate analyses were undertaken to identify individual and a combination of predictor variables. The Odds Ratio (OR) was preferred. The OR is a statistical measure used in both bivariate and multivariate analyses. "The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. Odds ratios are most commonly used in case-control studies; however, they can also be used in cross-sectional and cohort study designs as well" (Szumilas, 2010)

3.12 Ethical considerations

An introductory letter (Appendix 1) and the research approval letter (Appendix 2) were received from Mount Kenya University for data collection. These documents served to introduce me to the Bushenyi district health office before accessing respondents. Ethical

clearance was also requested from Bishop Stuart University Research Ethics Committee, one of the local Research Ethics Clearance Committees. Approval was then sought from the Bushenyi district health office (See Appendix 4) to allow me to access and collect data from the health facilities. A copy of the authorization letter by the District Health Officer (DHO) was delivered to the health facility managers. Consent to take part in the research was effectively sought from the target respondents. (See Appendix 6).

3.12.1 Anonymity and confidentiality

For confidentiality purposes, respondents' names were not collected. The data collected was not shared with any third party and will only be used for academic purposes. To ensure anonymity further, no respondent identification information was collected and special identifiers only were used in the final report.

3.12.2 Privacy voluntary participation and withdrawal from the study

The study participants were informed of their freedom to voluntarily participate in the study, and of their freedom to withdraw from the study at any stage without any penalty (see appendix 6). Further to this, respondents were informed of the importance of completing the study and that they could decline to answer any questions and/or the entire questionnaire if they objected to the contents. They were also allowed time to fill the questionnaire at their most convenient time and place. Participation were informed that no direct benefits were to be given to those participating or denied for those who declined to participate.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter explains results of the study, and the interpretation of the results obtained. The results are presented in relation to objectives of the study. Objective 1 relates to establishing the proportions of eligible contacts of PBC TB patients prescribed with TPT in Bushenyi DTUs. Objective 2 relates to finding out the health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi. Objective 3 relates to establishing the knowledge, perceptions and attitude factors among health workers affecting TPT prescription in Bushenyi district. The results of the study are later discussed, and implications thereof given.

Objective 1: Proportions of eligible contacts of PBC TB patients prescribed with TPT in Bushenyi

Data was abstracted from 15 DTUs that, at the time of access, had data on contacts of PBC TB patients for the selected period of interest. Seven hundred and eighty-one (781) contacts of confirmed PBC TB patients were elicited for contact tracing at the 15 DTUs. Figure 4-1. shows the contact tracing cascade for the DTUs in Bushenyi District.

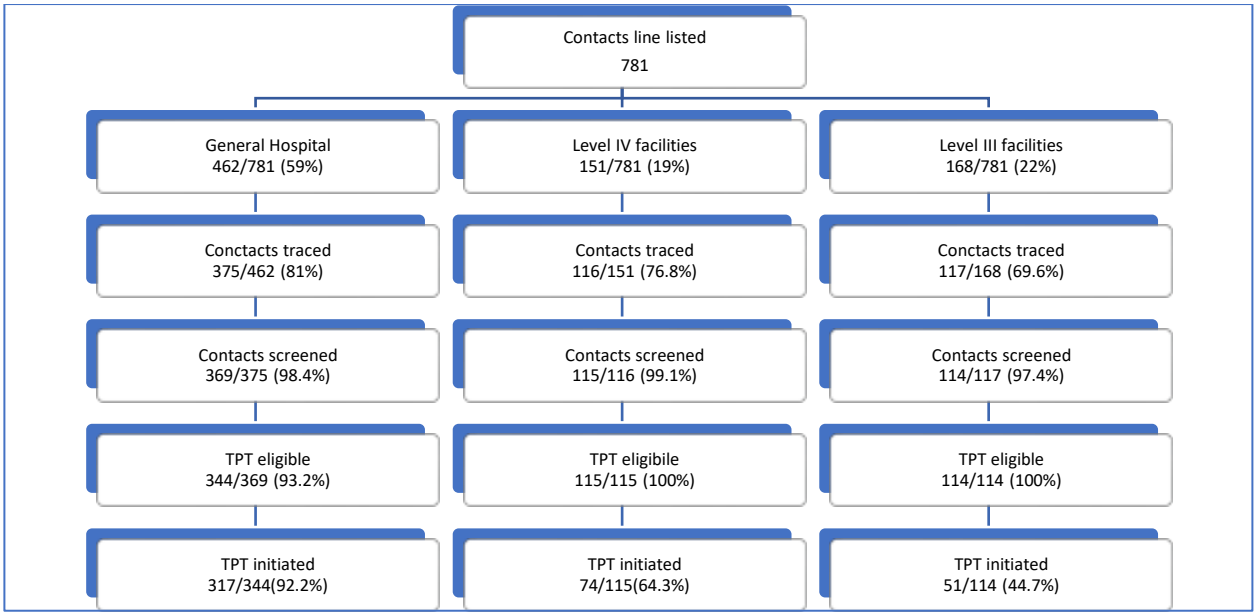

Figure 4- 1: Contact tracing cascades for Bushenyi DTUs

Of the 781 contacts, 608 (77.8%), were done contact tracing and of those contact traced, 598 (98.4%) were screened for TB. Of those screened 573 (95.8%) were identified as eligible for TPT initiation. Of all the contacts eligible for TPT initiation, only 442 (77.1%) were prescribed TPT. Table 4-1 gives details of abstraction from each DTU.

Significant variation in contact tracing and TPT performance was observed at the different health facility levels, with better performance observed at general hospitals compared to lower level health facilities. Of the 781 line-listed contacts, 462(59%) were at general hospitals, 151(19%) were at HC IV while 168(22%) were at HC IIIs. A total of 375/462 (81%) of the contacts at general hospitals were contact traced, 116/151 (76.8%) were contact traced at HC IV, while 117/168 (68.6%) were contact traced at HC IIIs. A total of 369/375 (98.4%) contacts were screened for TB at general hospitals, 115/116 (99.1%) screened at all

HC IVs while 114/117 (97.4%) at HC IIIs were screened for TB. Among those screened for TPT eligibility, 93.2% of the contacts at general hospitals were eligible for TPT at the general hospitals while100% of the contacts at HCIVs were eligible s and HCIIIs. However, TPT prescription was highest at general hospitals with (317/344) 92.2% of the eligible contacts initiated on TPT. At HC IVs, TPT prescription was (74/115) 64% while at HCIII, only (51/114) 44.7% of the eligible contacts were prescribed TPT. The summary of the cascade at each level is shown in figure 4-1.

Table 4- 1: Contact tracing cascade for Bushenyi DTUs

Health facility	Health facility level	Ownership	Contacts Traced	Contacts screened	Contacts Presumed with TB	Contacts with no signs and symptoms of TB	Contacts eligible for TPT	Contacts Prescribed TPT
Ankole Tea Health Centre (HC) III	Level III	PNFP	8	8	0	8	8	6
Bitooma HC III	Level III	PNFP	8	8	0	8	8	0
Bushenyi HC IV	Level IV	Public	84	83	0	83	83	42
Bushenyi Medical Center HC III	Level III	PNFP	32	32	0	32	32	2

Comboni Hospital	General hospital	PNFP	222	216	5	211	211	191
Ishaka Adventist Hospital	General hospital	PNFP	125	125	20	105	105	100
Kampala International, University (KIU) Teaching Hospital	General hospital	PFP	28	28	0	28	28	26
Kabushaho HC III	Level III	Public	5	5	0	5	5	5
Kakanju HC III	Level III	Public	10	10	0	10	10	1
Kyabugimbi HC IV	Level IV	Public	32	32	0	32	32	32
Kyamuhunga HC III	Level III	Public	7	7	0	7	7	7
Kyeizooba HC III	Level III	Public	14	11	0	11	11	11
Nyabubare HC III	Level III	Public	7	7	0	7	7	1
Ruhumuro HC III	Level III	Public	8	8	0	8	8	0

Ryeishe HC III	Level III	Public	18	18	0	18	18	18
Totals			**608**	**598**	**25**	**573**	**573**	**442**
%age performance				98.4%	4.2%	95.8%	95.8%	77.1%

Objective 2: Health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi district

From the 17 DTUs, out of the 220-sample population, 200 respondents were accessed as the study participants. Out of those, only 173 returned completed questionnaires and these are the questionnaires that were used in the analysis, marking an overall 87% response rate. Table 4-2 shows the response rate from each DTU.

Table 4- 2: Showing response rate from each DTU

Health Sub-District (HSD)	Health Facility	Number of Health care workers	Number of Healthcare workers accessed	Number of Completed Questionnaires returned	Response Rate
Igara East	Ruhumuro HCIII	9	5	4	80%
Igara East	Kyabugimbi HCIV	52	35	27	77%
Igara East	Kyeizooba HCIII	13	8	8	100%
Igara East	Kabushaho HCIII	10	5	4	80%
Igara East	Ryeishe HCIII	9	5	4	80%

Igara East	Ankole tea HCIII	8	3	3	100%
Igara West	Comboni Hospital	90	32	25	78%
Igara West	Kyamuhunga HCIII	10	3	3	100%
Igara West	Nyabubare HCIII	10	4	3	75%
Igara West	Kakanju HCIII	10	5	5	100%
Igara West	Bitooma HCIII	9	4	4	100%
Bushenyi-Ishaka	Ishaka Adventist Hospital	80	30	28	93%
Bushenyi-Ishaka	KIU Hospital	100	32	30	94%
Bushenyi-Ishaka	Bushenyi Medical Centre	25	9	9	100%
Bushenyi-Ishaka	Bushenyi HCIV	37	12	10	83%
Bushenyi-Ishaka	Bushenyi Prison HCIII	9	4	3	75%
Bushenyi-Ishaka	Katungu Mission HCIII	6	4	3	75%
Total		487	200	173	87%

Sociodemographic characteristics of healthcare workers attending facilities and baseline characteristics of the DTUs

Of the 173 healthcare workers who returned completed questionnaires, 88 (51%) were female while 85 (49%) were male. A total of 92 (53%) worked at PNFP facilities,80 (46%) worked at public health facilities while 1 (1%) of the respondent was from a private-for- profit facility. The respondents trained in TPT were 142/173 (82%); of these, 61 (43%) had been trained in the last six months. 21 (15%) had been trained between 6-12 months, while 60 (42%) had been trained in the last 1-2 years – all dates considering the time prior to data collection. A total of 124 (72%) reported that they were direct prescribers of TPT, while 49 (28%) were indirect prescribers. The indirect prescribers were mostly the auxiliary staff such as the counselors and the laboratory staff. In terms of level of facility, 70 (40%) of the respondents worked at a general hospital, 13 (8%) worked at a health center IV, 87 (50%) worked at a health center III, and 3 (2%) worked at a health center II. The details of the baseline sociodemographic characteristics are shown in the table 4-3.

Table 4- 3: Socio-demographic characteristics of the respondents and baseline characteristics of the DTUs

Baseline characteristics	**Frequency (n)**	**Proportion (%)**
Ownership		
Private-for-Profit facility	1	1%
Private-not-for-Profit	92	53%
Public health facility	80	46%
Sex		
Female	88	51%

Male	85	49%
Trained in TPT Guideline	142	82%
Timing of TPT Guideline training		
Within the last 6 months	61	35%
6-12 months ago	21	12%
1-2 years	60	35%
TB prescriber status		
Direct TPT prescriber	124	72%
Indirect TPT prescriber	49	28%
Facility Level		
General hospitals	70	40%
Level IV facilities	13	8%
Level III facilities	87	50%
Level II facilities	3	2%

To understand further the representativeness of participants as far as TPT prescription is concerned, and assess for possible selection bias among the participants, an analysis was done. It was noted that 142 (82%) had ever been prescribed TPT while 31(18%) had never been prescribed TPT. Of the 142 who had ever prescribed TPT, 104 (73%) were direct prescribers in their current work while 38 (27%) were indirect prescribers such as counselors and auxiliary staff who linked patients to TPT prescription points. 120/142 (85%) of those who had ever prescribed TPT had been trained in TPT in the last two years before data collection. The analysis summary is shown in Table 4.4 below. It noted that the collected data was a good representative of the entire population.

Table 4- 4: Showing assessment for possible selection bias

Involvement of participants in TPT-related work			
Baseline characteristics	**Prescribed TPT**, N = 142 (82%)[1]	**TPT Not prescribed**, N = 31 (18%)[1]	**p-value**[2]
Ownership			0.025
Private-for-Profit facility	1 (0.7%)	0 (0%)	
Private-not-for-Profit	69 (49%)	23 (74%)	
Public health facility	72 (51%)	8 (26%)	
Sex			0.6
Female	71 (50%)	17 (55%)	
Male	71 (50%)	14 (45%)	
Trained in TPT Guideline	120 / 142 (85%)	22 / 31 (71%)	0.075
Timing of TPT Guideline training			0.2
Within the last 6 months	48 (40%)	13 (59%)	
6-12 months ago	20 (17%)	1 (4.5%)	
1-2 years ago	52 (43%)	8 (36%)	
TB prescriber status			0.3
Direct TPT prescriber	104 (73%)	20 (65%)	
Indirect TPT prescriber	38 (27%)	11 (35%)	
Facility Level			0.6
General hospitals	56 (39%)	14 (45%)	
Level IV facilities	12 (8.5%)	1 (3.2%)	
Level III facilities	72 (51%)	15 (48%)	
Level II facilities	2 (1.4%)	1 (3.2%)	

Involvement of participants in TPT-related work

Baseline characteristics	**Prescribed TPT**, N = 142 (82%)[1]	**TPT Not prescribed**, N = 31 (18%)[1]	**p-value**[2]

[1]n (%); n / N (%)

[2]Fisher's exact test; Pearson's Chi-squared test

Exploratory Factor Analysis (EFA)

To answer objective two and understand the health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi district, I employed exploratory factor analysis to examine the underlying factors. For convenience and easy legibility, the variable items were abbreviated as X1 through to X21 corresponding to the number of the variable items (see table 4-5 for variable descriptions and relevant abbreviations used).

Table 4- 5: Showing variable descriptions and abbreviations used

Variable identifier	**Variable description – same as used in the respondent questionnaire**
X1	Contact tracing and TPT programs are sufficiently supervised at the facility
X2	This facility has a focal person who coordinates TPT activities
X3	This facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients
X4	TB patients are routinely given health education on the need for contacts screening and TPT
X5	Contact screening for TB and TPT prescription is done by this facility
X6	TPT activities for contacts interfere with routine facility activities

X7	Adequate Information Education and Communication (IEC)materials on TPT for Contacts of TB patients are available and routinely used at this facility
X8	TPT programs for contacts of TB patients are adequately funded at this health facility
X9	Contact tracing and TPT programs are financed by the implementing partners
X10	Contact tracing and TPT programs are financed by the facility through Primary Health Care (PHC) and/or other facility funds
X11	This facility has adequate number of health workers to deliver TPT
X12	Contact screening for TB and TPT prescription mainly is done by lay workers e.g. linkage facilitators
X13	Contact screening for TB and TPT prescription mainly is done by trained health workers
X14	Stock out of TPT commodities happen regularly at this facility
X15	This facility has adequate tests kits for latent TB infection testing before initiating TPT among contacts of TB patients
X16	Liver function tests are done are done at this facility
X17	This facility utilizes digital platforms to deliver TPT services
X18	All health workers here are trained in TPT data collection and reporting
X19	This health facility routinely submits TPT service delivery to district health managers
X20	This health facility routinely reviews, analyses the data and utilizes it to improve TPT service delivery
X21	This facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients

In undertaking factor analysis in R, I imported into R a CSV format file with the coded data. Initially, I checked the questionnaire responses for reliability and internal consistency using the widely used Cronbach alpha test (Tsang et al., 2017). Tsang et al., guide that Cronbach's

alpha ranges from 0 to 1. Cronbach's alpha of 0 (zero) indicates no internal consistency - the variable items are not correlated with one another, and Cronbach's alpha of 1 (one) indicates that there is perfect internal consistency - all the variable items are perfectly correlated with one another. They guide that a Cronbach's alpha of at least 0.70 indicates adequate internal consistency. The overall Cronbach alpha output was 0.74 suggesting an acceptable level of reliability and internal consistency of the tool – questionnaire – used to collect the data and reach the target objective with the results thereof. From table 4-5, the questionnaire had 21 variables that were used for extraction of factors sought as affecting TPT prescription in Bushenyi. All variables presented a raw alpha, if an item were dropped, above 0.70, suggesting that none of the items were to be dropped, and all were reliable. Whereas (Taber, 2017) critiques the arbitrary use of Cronbach alpha for measurement of internal consistency, he doesn't dispute the use of this threshold value of 0.7, but recommends for clarity in usage. Therefore, in this study, I used this threshold for measurement of the internal consistency of the variable items relied upon for establishing the latent factors for TPT prescription (see the table 4-6).

Table 4- 6:Showing reliability and internal consistency of the questionnaire

95% confidence boundaries

	lower	Alpha	Upper
Feldt	0.68	0.74	0.8
Duhachek	0.69	0.74	0.8

Variable	raw_alpha	std. alpha	G6(smc)	average_r	S/N	ase	mean	sd	median_r
	Overall reliability								
	0.74	0.78	0.85	0.14	3.5	0.028	3.6	0.42	0.14
	Reliability if an item is dropped								
	raw_alpha	std. alpha	G6(smc)	average_r	S/N	alpha se	Var.r	median_r	
X1	0.72	0.75	0.83	0.13	3.0	0.030	0.025	0.13	
X2	0.73	0.76	0.84	0.14	3.1	0.029	0.026	0.13	
X3	0.73	0.76	0.84	0.14	3.1	0.029	0.026	0.13	
X4	0.74	0.77	0.84	0.14	3.3	0.028	0.027	0.14	
X5	0.74	0.77	0.84	0.14	3.3	0.028	0.027	0.14	
X6	0.75	0.78	0.85	0.15	3.5	0.027	0.027	0.14	
X7	0.74	0.77	0.85	0.15	3.4	0.028	0.027	0.14	
X8	0.72	0.76	0.84	0.14	3.2	0.030	0.026	0.13	
X9	0.74	0.77	0.84	0.14	3.4	0.028	0.026	0.13	
X10	0.73	0.77	0.85	0.14	3.4	0.029	0.026	0.14	
X11	0.72	0.76	0.84	0.14	3.2	0.030	0.028	0.13	
X12	0.73	0.77	0.85	0.14	3.4	0.029	0.028	0.14	
X13	0.73	0.76	0.84	0.14	3.2	0.029	0.028	0.13	

X14	0.77	0.79	0.86	0.16	3.8	0.024	0.024	0.15
X15	0.73	0.77	0.84	0.14	3.3	0.030	0.024	0.14
X16	0.73	0.77	0.84	0.14	3.3	0.029	0.025	0.14
X17	0.73	0.77	0.85	0.14	3.4	0.029	0.026	0.14
X18	0.71	0.76	0.84	0.13	3.1	0.031	0.028	0.13
X19	0.74	0.77	0.85	0.14	3.3	0.029	0.028	0.14
X20	0.73	0.76	0.84	0.14	3.2	0.029	0.028	0.13
X21	0.74	0.77	0.85	0.14	3.4	0.028	0.027	0.14

After testing for the internal consistency, I tested for presence of any multicollinearity among the variable items using the Pearson's correlation. Shrestha (2021) guides that if the bivariate correlation analysis yields values of 0.8 and above, then it indicates multicollinearity among those pairs and one of the variables can be removed. Upon the Pearson correlation, R affords the incorporation of significance of the correlations with the p-values, and these were jointly assessed and indicated in a heatmap (see figure 4-2). From the study data analysis, the highest value is 0.74 which is below the threshold, and therefore, no variable item was removed.

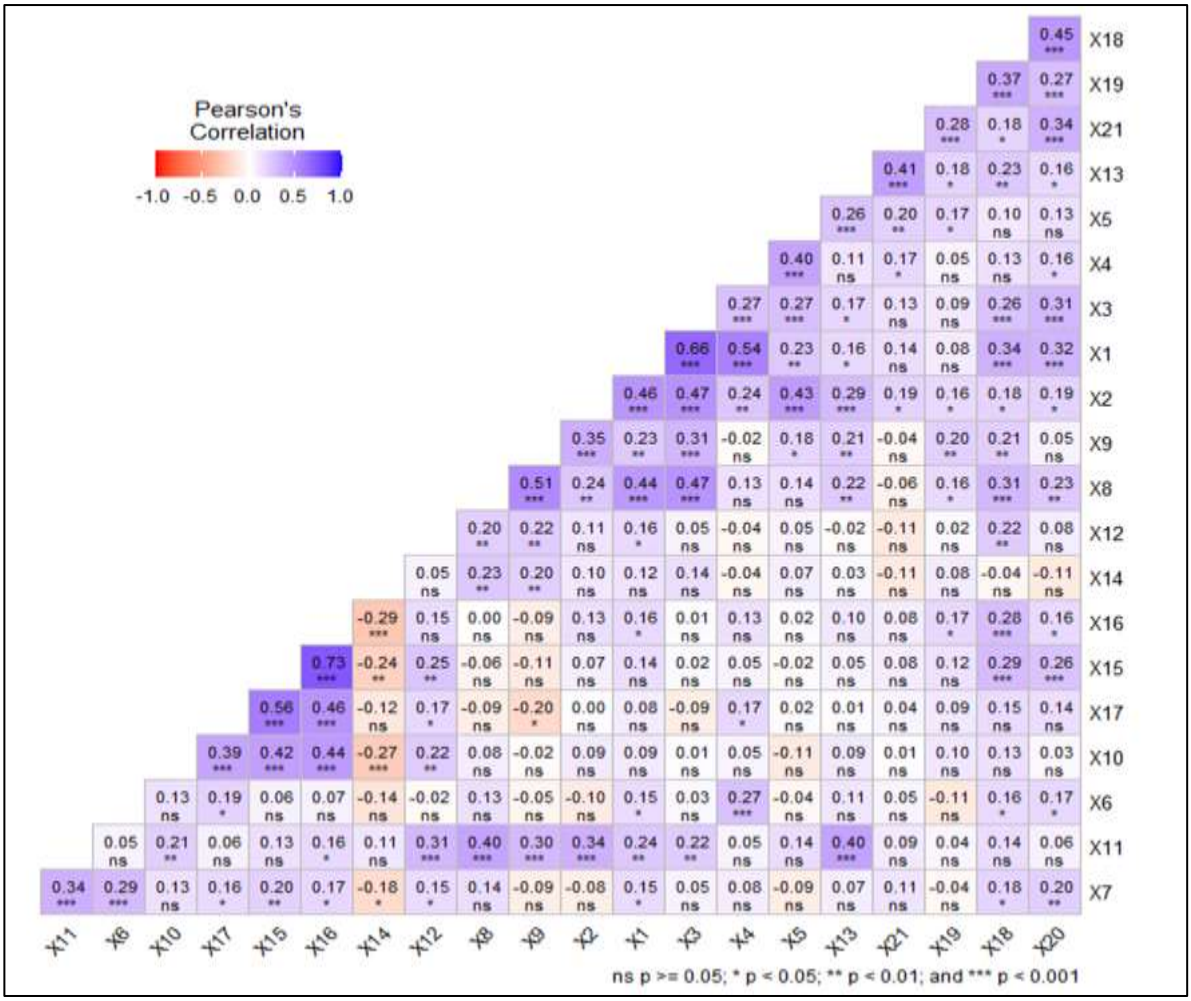

Figure 4- 2: Showing Pearson correlation analysis

Positive Correlations: Variables indicated in purple exhibit a positive correlation coefficient ranging from 0.26 to 0.73 and bearing asterisk (***) indicating the strength of the relationship, and suggesting a moderate positive relationship between them.

Negative Correlations: Variables X16 and X14 show a negative correlation coefficient of -0.29, indicating a moderate negative relationship (bearing asterisk ***).

No Correlation: Variables bearing an "ns" alongside the coefficients demonstrate ranges between 0.15 and -0.14, indicating a weak association

I further assessed the appropriateness of the data for exploratory factor analysis by testing the sample adequacy, using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity methods. Shrestha (2021) guides that for factor analysis to be applicable to a dataset, the KMO threshold should be 0.6. This study's dataset yielded an overall KMO of 0.73 indicating a suitable enough dataset to be subjected to factor analysis. The Bartlett's test checks whether the variables are strongly correlated to be subjected to the dimension reduction techniques of factor analysis, and a p-value < 0.05 is significant enough for factor analysis to be used (Shrestha 2021). This study's dataset yielded a Bartlett's test of sphericity of $2.2 \times 10^{-16,}$ greenlighting for use of factor analysis (see table 4-7 and appendix 7 for details of KMO and Bartlett's test results).

Table 4- 7: Showing Kaiser-Meyer-Olkin and Bartlett's Test Results

Kaiser – Meyer – Olkin (KMO) Measure of Sampling Adequacy		0.73
Bartlett's test of Sphericity	Approx. Chi-Square	726.11
	Degrees of freedom	20
	Sig.(p-value)	0.000 (2.2×10^{-16})

Using the Shrestha (2021) guidance, I then estimated the eigen values using the Principal Components Analysis (PCA) method for each of the 21 variables of the dataset and extracted eigen values that are greater than 1 (Kaiser's criterion) to represent the number of feasible

factors expected in the dataset. The principal component analysis, used for extraction of factors, identified six factors with eigenvalues exceeding 1, explaining 63% of the variance (See table 4-8).

Table 4- 8: Showing variables' original and extracted eigen values

	Initial Eigen values			**Extracted Eigen values**		
Component	**Total**	**%ge of variance**	**Cum %ge**	**Total**	**%ge of variance**	**Cum %ge**
1	4.242	20.2	20.2	4.242	20.2	20.2
2	2.921	13.9	34.1	2.921	13.9	34.1
3	1.769	8.4	42.5	1.769	8.4	42.5
4	1.549	7.4	49.9	1.549	7.4	49.9
5	1.403	6.7	56.6	1.403	6.7	56.6
6	**1.271**	**6.1**	**62.7**	**1.271**	**6.1**	**62.7**
7	0.937	4.5	67.2			
8	0.898	4.3	71.5			
9	0.821	3.9	75.4			
10	0.678	3.2	78.6			
11	0.660	3.1	81.7			
12	0.576	2.7	84.4			
13	0.503	2.4	86.8			
14	0.490	2.3	89.1			
15	0.430	2.0	91.1			
16	0.422	2.0	93.1			

17	0.356	1.7	94.7
18	0.339	1.6	96.4
19	0.314	1.5	97.9
20	0.218	1.0	98.9
21	0.204	1.0	99.9(100)

I also undertook a parallel analysis scree plot, and it showed that 6 factors were feasible as the latent possible factors. I further undertook a rotation of the variables using the oblique-promax method. Parallel analysis indicated that six factors surpassed the obtained eigenvalue, but only three did so with some leeway as seen in Figure 4-3.

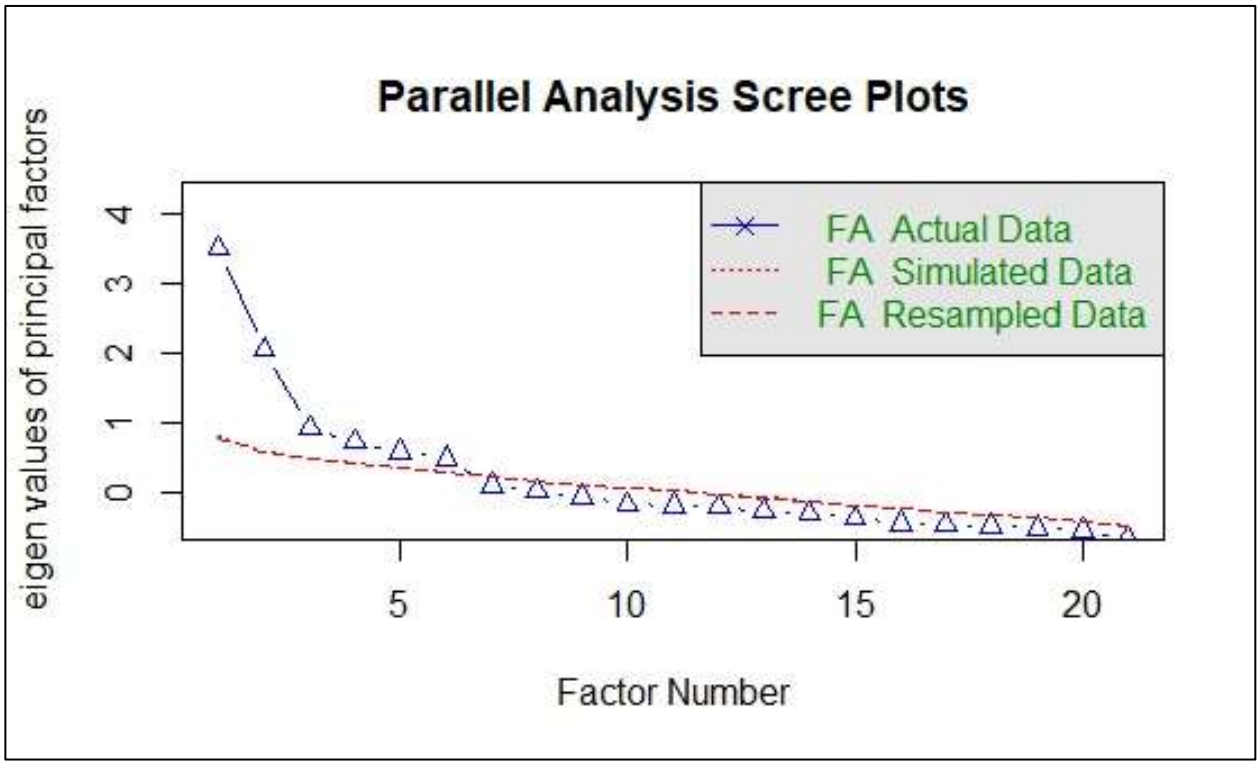

Figure 4- 3:Parallel analysis scree plots

PCA was chosen due to its suitability for capturing the maximum variance in the observed variables. This method is particularly useful when the primary goal is dimensionality reduction without a specific emphasis on uncovering underlying constructs. An oblique rotation was also preferred because it allows factors to be correlated, and the output is quicker than in direct oblimin rotations. The overall aim was to get a simple pattern of results where each variable loads highly onto one and only one factor (Brown, 2009; Watkins, 2018).

To identify the latent factors behind the measured variables, and upon the principle of a simple structure, a combination of another criterion is necessary, as outlined by (Watkins, 2018) each factor should be loaded by at least three variables (i.e., overdetermined),
each variable should load saliently on only one factor (no complex or cross-loadings),
each factor should demonstrate internal consistency reliability ≥.70, and all factors should be theoretically meaningful.

All other factors were satisfied, except cross-loading by one variable, and the last identified factor having only two factors loading onto it. Two reasons are plausible for this outcome. First, Watkins notes that cross-loading or "complex loadings may not be problematic if there is a clear theoretical reason to believe that the measured variable is influenced by more than one latent construct." (Watkins, 2018). For example, the variable X11 (This facility has adequate number of health workers to deliver TPT) which cross loads onto factor 3 and 4 is relevant and theoretically sound with respect to the identified constructs of financing for TPT and human resources for TPT. Second, I chose a higher loading threshold of loadings > 0.5 because of the test of the hypothesis that 6 factors were sufficient, considering the chi square statistic of 145.24 on 99 degrees of freedom, and a p-value is 0.00172. The complete factor

loadings before skipping the values below the threshold and leaving only the pattern-forming loadings is reported here (see table 4-9).

Table 4- 9: Showing complete factor loadings

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
X15	0.891	0.012	-0.073	-0.069	0.138	-0.050
X16	0.819	0.041	-0.068	0.013	0.078	-0.071
X17	0.598	0.073	-0.157	-0.027	0.009	0.065
X1	0.054	0.909	0.156	-0.118	0.029	0.102
X3	-0.060	0.616	0.250	-0.046	0.118	-0.048
X4	0.006	0.708	-0.213	0.034	-0.104	0.111
X8	-0.155	0.219	0.664	-0.011	0.235	0.173
X9	-0.104	-0.011	0.578	0.063	0.183	-0.206
X11	0.031	-0.081	0.705	0.726	-0.251	0.357
X13	-0.078	-0.120	0.193	0.640	0.166	0.105
X21	-0.101	-0.057	-0.241	0.536	0.350	0.108
X18	0.184	0.043	0.212	-0.033	0.608	0.112
X19	0.126	-0.194	0.061	0.113	0.524	-0.200
X20	0.060	0.122	0.011	0.037	0.576	0.183
X6	-0.102	0.192	-0.007	0.006	0.105	0.508
X7	-0.030	0.028	0.216	0.234	0.065	0.697
X2	0.142	0.371	0.177	0.312	-0.076	-0.344
X5	-0.007	0.248	-0.038	0.300	-0.022	-0.253
X10	0.495	-0.010	0.097	0.059	-0.024	0.068

X12	0.265	-0.010	0.393	-0.010	0.003	0.055
X14	-0.235	0.078	0.279	-0.032	-0.069	-0.158

For factor loading interpretation, I considered items cross-loading and prioritized items with loadings close to one, leading me to establish an item loading threshold of ≥ 0.5. After factor extraction and factor rotation, using an oblique promax type of rotation, the factors loading together were interpreted, thus renaming the factors.

Table 4-10 highlights factor loadings grouped together defining the underlying variables. From the results, six explanatory factors were revealed:

Factor 1 was labeled as latent TB testing, revealed by the following three items in the questionnaire together with their loadings (facility has adequate tests kits for latent TB infection with 0. 0.891; Liver function tests are done at this facility with 0.819; facility utilizes digital platforms to deliver TPT services with 0.598).

Factor 2 was labeled TPT service delivery. This was revealed by the following three items (Contact tracing and TPT programs are sufficiently supervised at the facility with 0.909; this facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients with 0.616; and TB patients are routinely given health education on the need for contacts screening and TPT with 0.708).

Factor 3 was labeled TPT financing and was revealed by the following three items (TPT programs for contacts of TB patients are adequately funded at this health facility with 0.644;

Contact tracing and TPT programs are financed by the implementing partners with 0.578; the facility has adequate health workers to deliver TPT with 0.705).

Factor 4 was labelled human resources for TPT and was revealed by the following three items (this facility has adequate number of health workers to deliver TPT with 0.726; contact screening for TB and TPT prescription is mainly done by trained health care workers with 0.640; and this facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients with 0.536).

Factor 5 labelled monitoring and evaluation for TPT. This was revealed by three items (all health workers here are trained in TPT data collection and reporting with 0.606; the health facility routinely submits TPT service delivery reports to district health managers with 0.524; and this health facility routinely reviews, analyses and utilizes it to improve TPT service delivery with 0.576).

Factor 6 was labelled health workers attitude towards TPT. This was revealed by two items (TPT activities for contacts interfere with routine facility activities with 0.508; and Adequate Information Education and Communication (IEC) materials on TPT for Contacts of TB patients are available and routinely used at this facility with 0.697). Details of the revealed factors are summarized in table 10.

Table 4- 10:Health system factors and their total loadings

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Uniqueness
	Factor loadings						
This facility has adequate tests kits for latent TB infection testing before initiating TPT among contacts of TB patients	0.891						0.212
Liver function tests are done are done at this facility	0.819						0.336
This facility utilizes digital platforms to deliver TPT services	0.598						0.590
Contact tracing and TPT programs are sufficiently supervised at the facility		0.909					0.613

This facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients	0.616				0.438
TB patients are routinely given health education on the need for contacts screening and TPT	0.708				0.534
TPT programs for contacts of TB patients are adequately funded at this health facility		0.664			0.399
Contact tracing and TPT programs are financed by the implementing partners		0.578			0.504
This facility has adequate number of health workers to deliver TPT		0.705	0.726		0.165

Contact screening for TB and TPT prescription mainly is done by trained health workers	0.640		0.577
This facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients	0.536		0.461
All health workers here are trained in TPT data collection and reporting		0.608	0.507
This health facility routinely submits TPT service delivery reports to district health managers		0.524	0.659
This health facility routinely reviews,		0.576	0.558

analyses the data and utilizes it to improve TPT service delivery			
TPT activities for contacts interfere with routine facility activities		0.508	0.747
Adequate Information Education and Communication (IEC) materials on TPT for Contacts of TB patients are available and routinely used at this facility		0.697	0.548

The chi square statistic is 145.24 on 99 degrees of freedom. The p-value is 0.00172

After undertaking factor analysis and rotating the factors, I identified a final set of retained variables, from which the factors affecting TPT prescription were framed. See table 4-11 for the retained variables.

Table 4- 11: Showing retained variable after factor rotation

Variable identifier	**Retained variables**
X1	Contact tracing and TPT programs are sufficiently supervised at the facility
X3	This facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients
X4	TB patients are routinely given health education on the need for contacts screening and TPT
X6	TPT activities for contacts interfere with routine facility activities
X7	Adequate Information Education and Communication (IEC)materials on TPT for Contacts of TB patients are available and routinely used at this facility
X8	TPT programs for contacts of TB patients are adequately funded at this health facility
X9	Contact tracing and TPT programs are financed by the implementing partners
X11	This facility has adequate number of health workers to deliver TPT
X13	Contact screening for TB and TPT prescription mainly is done by trained health workers
X15	This facility has adequate tests kits for latent TB infection testing before initiating TPT among contacts of TB patients
X16	Liver function tests are done are done at this facility
X17	This facility utilizes digital platforms to deliver TPT services
X18	All health workers here are trained in TPT data collection and reporting

X19	This health facility routinely submits TPT service delivery to district health managers
X20	This health facility routinely reviews, analyses the data and utilizes it to improve TPT service delivery
X21	This facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients

The internal consistency of these variables (see table 4-12) was undertaken using Cronbach's alpha, resulting in an overall alpha value of 0.74. This suggests an acceptable threshold for internal consistency of the retained variables, and thus supporting the reliability of the derived factors.

Table 4- 12: Showing reliability analysis with Cronbach alpha for retained variables

Reliability analysis for retained variables

raw_alpha	std.alpha	G6(smc)	average_r	S/N	ase	mean	Sd	median_r
0.74	0.76	0.83	0.17	3.2	0.028	3.7	0.47	0.16

95% confidence boundaries

	lower	alpha	upper
Feldt	0.69	0.74	0.8
Duhachek	0.69	0.74	0.8

Therefore, to answer objective two, six health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi district were identified and these are; latent TB

testing, TPT service delivery, TPT financing, human resources for TPT, Monitoring and evaluation for TPT, Health workers' attitude towards TPT

Objective 3: Establishing the knowledge, perceptions and attitude factors among healthcare workers affecting TPT prescription in Bushenyi district, South Western Uganda

To answer objective three of the research, section three of the semi-structured questionnaire was inferentially analyzed for assessing the knowledge, attitudes, and perceptions of the healthcare workers about TPT prescription for PBC TB patients in Bushenyi district. Both bivariate and multivariate analyses were undertaken to identify individual and a combination of predictor variables. The odds ratio (OR) was preferred. The OR is a statistical measure used in both bivariate and multivariate analyses. "The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. Odds ratios are most commonly used in case-control studies; however, they can also be used in cross-sectional and cohort study designs as well" (Szumilas, 2010).

In assessing the knowledge, attitudes and perceptions, I considered 8 variables: sex of the respondent, insufficient training in TPT guidelines, perception of a patient, gaps in knowledge of the usefulness of TPT, stigma towards prescription, negative attitudes towards TPT, facility level, and indirectness of a health worker in TPT prescription. I conceived the notion that given a particular variable considered, would a health worker prescribe TPT for an eligible client? Thus, the Odds ratio seemed the best choice. For example, having the

guidelines in place, and the relevant training about TPT, it would be assumed that a trained healthcare worker would undertake TPT prescription for all eligible clients. However, TPT prescription has consistently remained below the recommended level of at least 90% of all the eligible contacts (WHO, 2020b). Therefore, determining the factors affecting TPT prescription alone might not fully expose the intricate nature of the problem at hand. Due to the nature of the study – cross sectional, and having focused more on the quantitative determination, the odds ratio was used, to estimate the likelihoods of having TPT prescription occurring considering several variables. Both for the bivariate and multivariate analyses, the 95 CI and the p-values were determined, and the p-values of the variable, ORs were considered for significance of the variables. A combination of Likert-type questions (5-level scale) and close-ended questions were used to assess the knowledge, attitudes, and perceptions of the health care workers about TPT prescription.

To establish the knowledge, perceptions and attitudes affecting TPT prescription among health workers in Bushenyi district, I undertook a bivariate and multivariate analysis of the responses related to knowledge, perceptions, and attitudes towards TPT. Bivariate analysis was undertaken to explore individual predictor variables and their direction, and multivariate analysis to evaluate the relationship between the different variables in determining the respondents leaning towards TPT prescription. The following variables were used: insufficient training in TPT guidelines, perception of patients towards TPT, knowledge gaps among HCW, stigma associated with TPT, negative attitude towards TPT, level of health care facility, and direct/indirect TPT prescriber. If this is the objective where you used Likert scale then it's good to explain your Likert scale here, I saw you explaining Likert scale somewhere at the methodology.

Bivariate and Multivariable analysis

In the bivariate logistic regression analysis, perception of patient as being uncomfortable with TPT (OR 4.42 95% CI:1.87-11.7; p=0.001), low healthcare worker's knowledge of TB and TPT (OR 3.94 95% CI: 1.61-11.1; p=0.005), and negative healthcare worker's attitude towards TPT prescription (OR 4.56 95% CI: 1.28-29.2; p = 0.045) were significantly associated with low TB prescription (see table 4-13).

Table 4- 13: Showing Bivariate logistic regression analysis for Low TPT prescription among health workers in Bushenyi district

	Bivariate			
Predictor	N	OR[1,2]	95% CI[2]	p-value
Sex	173			
Female		—	—	
Male		0.82	0.37, 1.79	0.6
Insufficient training in TPT Guideline	173	2.23	0.88, 5.39	0.080
Perception of patient	173	4.42**	1.87, 11.7	0.001
Gaps in knowledge of HCW	173	3.94**	1.61, 11.1	0.005
Stigma towards TPT prescription	173	1.56	0.26, 29.6	0.7
Negative attitudes towards TPT	173	4.56*	1.28, 29.2	0.045

	Bivariate			
Predictor	N	OR[1,2]	95% CI[2]	p-value
Level II/III facilities	173	0.98	0.45, 2.15	>0.9
Indirect TPT prescriber	173	1.51	0.64, 3.39	0.3

[1]*p<0.05; **p<0.01; ***p<0.001

[2]OR = Odds Ratio, CI = Confidence Interval

However, in the multivariate logistic regression, perception of patient being uncomfortable with TPT (aOR 5.58 95% CI: 2.18-16.0; p = <0.001). and gaps in knowledge among healthcare worker about TB and TPT (aOR 5.97 95% CI: 2.08-19.6; p=0.002) were significantly associated with less likelihood of TPT prescription by a healthcare worker (see table 4-14).

Table 4- 14: Showing Multivariate logistic regression analysis for Low TPT prescription among health workers in Bushenyi district

			Multivariable	
Predictor	p-value	OR[1,2]	95% CI[2]	p-value
Sex				
Female		—	—	
Male	0.6	1.17	0.45, 3.08	0.7
Insufficient training in TPT	0.080	1.16	0.39, 3.27	0.8
Guideline				
Perception of patient	0.001	5.58***	2.18, 16.0	<0.001
Gaps in knowledge of HCW	0.005	5.97**	2.08, 19.6	0.002
Stigma towards TPT prescription	0.7	3.22	0.40, 70.3	0.3
Negative attitudes towards TPT	0.045	4.16	1.07, 27.9	0.073
Level II/III facilities	>0.9	1.05	0.43, 2.61	>0.9
Indirect TPT prescriber	0.3	1.45	0.55, 3.73	0.4

[1]*p<0.05; **p<0.01; ***p<0.001

[2]OR = Odds Ratio, CI = Confidence Interval

4.5 Discussion

This study was focused on identifying factors that affect prescription of TPT for contacts of PBC TB patients. To establish these factors, three objectives were followed. First, was to establish the proportion of contacts of PBC TB patients who were prescribed TPT. Second, was to establish the health system factors affecting TPT prescription for contacts of PBC TB

patients. Third, was to assess the knowledge, perception and attitude factors affecting TPT prescription of health workers at diagnostic and treatment units in Bushenyi district. The findings of this study given in sections 4.2 to 4.4 are discussed here, in the same order the results are presented.

Objective 1: The proportion of the contacts of PBC TB patients who were prescribed TPT in Bushenyi district was 77.1%.

For the duration, July 2022 to June 2023, in all the DTUs of Bushenyi District, TPT prescription was 77.1% for eligible contacts of PBC TB patients. This result comes from the 781 line-listed contacts of PBC TB patients. This result is below the 90% target for the Uganda Ministry of Health and WHO (WHO, 2023b) for TPT coverage among contacts of PBC TB patients. This figure of the line-listed contacts is a product of the active elicitation of contacts of PBC TB patient. This implies that 22.9% of the eligible contacts of PBC TB patients are not initiated on TPT. The contacts of PBC TB patients who are not given TPT remain at a high risk of developing TB infection and progressing to TB disease and spreading TB infection to their contacts.

In Uganda, the guidelines for programmatic management of latent TB infections were rolled out in March 2021 (MOH, 2021). This Programme guides healthcare workers on TPT service delivery. Therefore, the 77.1% TPT coverage in the study area, arising out of a contact tracing coverage of 77.8%, was an unexpected result. However, this is not surprising because in a similar Ugandan setting, though in an urban location, contact tracing was relatively low at 58.5% (Baluku et al., 2021). Contact tracing is an important first step of the TPT care cascade and any low levels imply missed opportunities for treatment of latent TB infection (Szkwarko et al., 2017). This implies increased missed opportunities for prevention of progression of

TB infection to TB disease and thus increased risk of spread of TB disease. Reichler et.al, who, in a prospective study in United States of America and Canada found that 9.8% of the contacts who were not treated with TPT progressed to TB disease, 1.8% of the contacts that were partially treated with TPT progressed to TB disease while only 0.2% of those who completed TPT progressed to TB disease (Reichler et al., 2020). Additionally, Chaisson et.al in a cluster-randomized trial of household contacts evaluation and TB preventive therapy in Rio de Janero noted that 73% of contacts had latent TB infection and 4% of the contacts had progressed to TB disease. After five years of the TPT intervention for 37% of the incident TB cases, TB incidence reduced by 15% (Chaisson et al., 2021).

My result in a low-income country setting, despite the presence of programmatic guidelines on TPT, could be so because the TPT implementation barriers identified in other studies, such as healthcare worker, healthcare system, and community-related barriers(Chijioke-Akaniro et al., 2023; Szkwarko et al., 2017; Tumuhimbise & Musiimenta, 2022).

Objective 2: Health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi district

Six factors affecting TPT prescription for contacts of PBC TB patients were revealed, and these are, in their order of significance: TPT service delivery, Latent TB testing, TPT financing, human resources for TPT, Monitoring and evaluation for TPT, and health workers attitude towards TPT.

In this study, healthcare worker attitudes towards TPT came out as the least significant factor contributing to presence of low TPT prescription. However, all the six building blocks of a health system (World Health Organization., 2010) are represented in these revealed factors as barriers to low TPT prescription in the study area. These results are not surprising for this study setting, Uganda being one of the 30 highly-burdened TB/HIV countries globally (WHO, 2021a, 2023a, 2023b). The barriers constraining TPT implementation are exacerbated by the lack of adequate financing prompting diversion from concentrating on TB and TPT to other health priorities (Oxlade et al., 2021; Wynne et al., 2014). Furthermore, developing countries, Uganda being among, rely heavily on donor financing for TPT and TB treatment programs, which funding continues to decrease each year (WHO, 2021a, 2023a, 2023b). This in effect affects directly the TPT service delivery at the individual DTUs and the whole country. Furthermore, there is reduced monitoring and evaluation of TPT implementation right from the national level to the lowest DTUs.

These findings, therefore, contribute to our understanding of the prerequisites for successful TPT program implementation. To implement a TPT program, well-trained human resources are required. These would be able to adequately undertake contact tracing, screen contacts of PBC TB patients, test for latent TPT and correctly prescribe TPT to all eligible patients. However, TPT programs being considered as 'out-of-normal' routine for healthcare workers, need effective monitoring and evaluation, adequate funding for TPT implementation as well as treatment of the screened patients who are confirmed with TB disease, and most particularly, continuous education and training of the healthcare workers.

These results are in line with related studies undertaken in South Africa (Ahmed et al., 2021; Baloyi et al., 2022). Ahmed et.al., though focused on TPT for PLHIV, found that healthcare workers were less likely to prescribe TPT if they perceived patients had stigma towards TPT. Furthermore, they found that poor healthcare workers' knowledge and attitude were associated with low TPT prescription rates. Similarly, Baloyi et.al. identified inadequate monitoring of TPT programs, healthcare workers' skepticism about TPT effectiveness, deprioritized TPT in practice and divergent opinions of cadres of staff responsible for TPT implementation were contributory to TPT prescription.

One factor not supported in this study, but identified in other countries with relatively similar settings, is ownership of healthcare facilities (Abor, 2015; Chijioke-Akaniro et al., 2023; TB CARE 1, 2013; Tumuhimbise & Musiimenta, 2022). In this study I did not find supporting information as to ownership significantly affecting TPT prescription levels. However, in Uganda, almost all TB care and treatment is provided at public facilities and PNFP health facilities (Tumuhimbise & Musiimenta, 2022). This, thus could explain the outturn of this factor in this study, since almost all designated facilities for TB treatment are supported by the government.

Objective 3: Establishing the knowledge, perceptions and attitude factors among healthcare workers affecting TPT prescription in Bushenyi district, South Western Uganda

In this study, the knowledge gap on TB and TPT among healthcare workers (aOR 5.97 95% CI 2.08–19.6; p = 0.002) and perception of patients being uncomfortable with TPT (aOR 5.58 95% CI: 2.18–16; p <0.001) were realized as significant among other tested variables. Furthermore, negative healthcare workers' attitudes towards TPT prescription (OR 4.56 95%

CI: 1.28-29.2; p = 0.045) was also significantly associated with low TB prescription. Knowledge gap and the negative perception of healthcare workers came out strongly significant for both analyses indicating a high likelihood of these barriers happening among the respondents in the study area. Negative attitudes, while appearing only in the bivariate analysis, had a strong odds ratio and equally a high likelihood of being present among the study respondents.

This suggests that healthcare workers who are not well trained in TB and TPT guidelines, and who have negative attitudes towards TPT are less likely to prescribe TPT to eligible clients. It is imperative, therefore, that all healthcare workers involved in TB care and TPT prescription, have full knowledge of the current guidelines, and have had adequate training and education on the TB and TPT guidelines, to carry out TPT implementation adequately. Knowledge gap is related to healthcare workers perceptions and attitudes towards service provision (Baloyi et al., 2022; Falzon et al., 2022; H. Manisha et al., 2022; Singh et al., 2017; Szkwarko et al., 2017). This is true with TPT prescription in this study.

This finding agrees with the South African cross-sectional study on factors affecting TPT prescription for HIV patients which established that perception among health workers of poor patient comfort with TPT disclosure (p = 0.01), insufficient TPT training (p = 0.04), and inadequate isoniazid supplies (p = 0.04) were significantly associated with lower prescription rates (Ahmed et al., 2021)

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter summarizes the study findings and gives recommendations arising from the findings of this research. The recommendations are for the various stakeholders including the government authorities/ beneficiaries, and the researchers.

5.2. Summary of the findings

This study had three objectives. These were a) to establish the proportion of eligible contacts of PBC TB patients who are prescribed TPT in Bushenyi district, South Western Uganda. b) to find out the health system factors affecting TPT prescription for contacts of PBC TB patients in Bushenyi District, Southwestern Uganda and c) to establish the knowledge, perception and attitude factors among healthcare workers (HCWs) affecting TPT prescription for contacts of PBC TB patients in Bushenyi District Southwestern Uganda.

Under objective one, it was established that of all the contacts eligible for TPT initiation, only 442 (77.1%) were prescribed TPT. This proportion is far below the 90% target set by both WHO and MOH-NTLP. The performance was worse at lower-level health centers compared to general hospitals.

Under objective two, through exploratory factor analysis, six explanatory factors that affect TPT prescription were revealed. These are a) latent TB testing, b) TPT service delivery c) TPT financing, d) human resources for TPT, e) monitoring and evaluation for TPT and f) health workers attitude towards TPT.

Under objective three, through Bivariate logistic regression analysis, it was established that the perception of patients as being uncomfortable with TPT, low healthcare worker's knowledge of TB and TPT, and negative healthcare worker's attitude towards TPT prescription were significantly associated with low TB prescription in the study area. However, in the multivariate logistic regression analysis, the perception of patients being uncomfortable with TPT. and gaps in knowledge among healthcare worker about TB and TPT were significantly associated with less likelihood of TPT prescription by a healthcare worker.

5.3. Conclusions

I found out that the proportion of contacts of PBC TB patients that were prescribed TPT in Bushenyi district was very low at 77.1%, when compared with the MOH-NTLP and WHO target of 90%. Six health system factors affecting TPT prescription for contacts of PBC TB patients were revealed, and these are: Latent TB testing, TPT service delivery, TPT financing, human resources for TPT, Monitoring and evaluation for TPT, and healthcare workers' attitude towards TPT. Furthermore, knowledge gap on TB and TPT among healthcare workers (aOR 5.97 95% CI 2.08–19.6; p = 0.002), perception of patient being uncomfortable with TPT (aOR 5.58 95% CI: 2.18–16; p <0.001) and negative healthcare workers' attitude towards TPT prescription (OR 4.56 95% CI: 1.28-29.2; p = 0.045) were significantly associated with low TB prescription during this study.

Uganda does not have district-level and/or regional-level statistics for the prevalence and incidence of TB, and later on the performance of TB care and TPT implementation. This

bears heavily on the monitoring of TPT service delivery in the country and the End TB strategy as a whole. This study, therefore, contributes to our understanding, at the lowest level of TB care in this country, of the performance of TPT prescription, and the factors that impinge TPT implementation and performance.

5.4. Recommendations for practice

i) The authorities

The authorities in Bushenyi district monitor closely the TPT program for contacts at all the TB diagnostic and treatment units. Lower-level health centers should be given priority. Human and financial resources for TPT, which tend to be limited at lower-level health facilities were significantly associated with TPT prescription.

The authorities should ensure that all health facilities are adequately resourced for successful TPT program implementation.

Since knowledge gap among health workers on TB and TPT were seen as being significantly associated with low TPT prescription, the authorities should organize TPT capacity building activities including trainings and mentorship for health workers.

The authorities should ensure that TPT programs are routinely monitored and evaluated to enable timely course correction. They should also hold regular TPT services supervision activities assess the quality of the TPT programs at health facilities.

ii) Service users/ beneficiaries

The service users and beneficiaries of TPT programs are key stakeholders. Although this study focused on health system and health factors, I believe that if the potential beneficiaries demand for TPT services, they are more likely to be served. I therefore recommend that

potential beneficiaries should be sensitized about the availability and befits of TPT. This will empower them to demand for TPT services in turn.

iii) Other stakeholders

The other stakeholders in TPT program include Ministry of Health which is responsible for setting guidelines and policies. I recommend that the Ministry of Health should design simple, easy-to-use TPT guidelines and job aids to aid healthcare workers during service delivery. Data and evidence of the impact of TPT should be shared with the health workers. This would improve attitudes of healthcare workers towards TPT since this was a factor significantly associated with low TPT prescription.

5.5. Recommendations for further research in this field of study

This study focused on health workers and health system factors affecting TPT services delivery. It was observed that the healthcare workers perception of patient discomfort with TPT was associated with low TPT prescription. However, I did not explore the patient-level factors affecting TPT uptake and adherence and completion of TPT. As far as I could find out, this is the first study on TPT for contacts in Bushenyi district. I, therefore, recommend that studies be conducted to evaluate factors that affect TPT uptake, adherence to TPT and the impact of TPT on reducing TB incidence among contacts of PBC TB patients in Bushenyi. Further studies should also be conducted among the patients to understand the acceptability of TPT among patients as well as the perceptions of patients regarding TPT.

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APPENDICES

APPENDIX 1: DATA ABSTRACTION TOOL

Data Abstraction tool_ Final Version							
Name of Health facility	Health facility level	Contacts Traced	Contacts screened	Contacts Presumed with TB	Contacts with no signs and symptoms of TB	Contacts eligible for TPT	Contacts Prescribed TPT
Ankole Tea HCIII	Level III						
Bitooma HCIII	Level III						
Bushenyi HCIV	Level IV						
Bushenyi Medical Center HCIII	Level III						
Comboni Hospital	General hospital						
Ishaka Adventist Hospital	General hospital						
KIU Teaching Hospital	General hospital						
Kabushaho HCIII	Level III						
Kakanju HCIII	Level III						
Kyabugimbi HCIV	Level IV						
Kyamuhunga HCIII	Level III						
Kyeizooba HCIII	Level III						
Nyabubare HCIII	Level III						
Ruhumuro HCIII	Level III						
Ryeishe HCIII	Level III						

APPENDIX 2: RESEARCH QUESTIONNAIRE

Background:
I am Dr Katatuubuka E. Dan Mugisha, a student of Master of Public Health at a school of Public Health of Mt Kenya University, Kenya.

Purpose of the research and methods.
I am doing a research to understand factors that affect TB Preventive Therapy (TPT) prescription for contacts of pulmonary bacteriologically confirmed TB patients. This research is a partial fulfilment of the requirements for the degree of Master of Public Health (International Health) from Mt Kenya University, Kenya. This will be a mixed methods study involving use of a questionnaire and focused group discussions. Focused group discussions will be conducted after preliminary analysis of the quantitative data to seek clarity on more nuanced issues.

Request to Participate in the research
I appeal you to voluntarily involve yourself in this inquiry. It will take you about 20 minutes to fill the questionnaire. Participation is not compulsory. No one will be penalized for choosing to stop halfway into the study.

Benefits and Risks
Though the study may not give you direct benefits, your information and opinions will help to shed more light on the quality of TPT care for contacts of PBC TB patients. This will inform the improvements in TPT programming at the various levels of health management and administration. No risk is expected to arise from your participation in this study. In case of any discomfort during this study, contact me through the provided address.

Confidentiality and anonymity
The information you provide will not be disclosed to unauthorized people. You are not required to provide information that reveals your identity. The questionnaire will be coded and only the researcher will know the code used. The hard copies of the questionnaires will be stored securely and equally so will be the soft copies.

Informed consent
I have received information regarding this study; the information requested from me, potential dangers, the benefits involved and my rights regarding this study. I am at liberty to volunteer in this research without any negative consequence arising from my choice. My identity will not be disclosed when using the information that I will provide.
Consent (tick your choice)

Do you consent to voluntarily take part in this study? Tick what applies Yes ☐ No ☐

Name of health facility …….
SECTION A: DEMOGRAPHICS (Tick what applies to you)
Gender: Male ☐ Female ☐
Employment Position
a) Registered nurse
b) Enrolled Comprehensive nurse ☐
c) Midwife ☐
d) counsellor ☐
e) Linkage facilitator ☐

f) Clinical officer
g) Doctor
h) Laboratory technician/technologist
I) other (specify)……
Have you ever had any training in TPT guidelines?
Yes No
When was the last time you had a training in TPT guidelines?
Within the last 6 months
ii) 6-12 months ago
iii)1-2 years ago
Ownership of the health facility where you work (Tick what applies to your facility):
Public health facility (Government health facility)
Private-not-for-Profit (PNFP)
Civil Society Organization (CSO)
Private-for-Profit facility (PFP)
In which department are you currently deployed?
OPD
ART clinic
In-patient
MCH
Community outreach
V) Other (Specify)…….
In which department are contacts of TB patients served?
…….

SECTION B: HEALTH SYSTEM FACTORS

In each of the statements below, for section B, show your level of agreement by ticking or cycling one of the given statements using the 5 points scale. The numbers represent the following responses; 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree

Statement	**Strongly agree**	**Agree**	**Undecided/ Neutral**	**Disagree**	**Strongly disagree**
Leadership and governance					
Contact tracing and TPT programs are sufficiently supervised at the facility					
This facility has a focal person who coordinates TPT activities					
This facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients					
Service delivery					
TB patients are routinely given health education on the need for contacts screening and TPT					
Contact screening for TB and TPT prescription is done by this facility					
TPT activities for contacts interfere with routine facility activities					

Adequate Information Education and Communication (IEC)materials on TPT for contacts of TB patients are available and routinely used at this facility					
Health system financing					
TPT programs for contacts of TB patients are adequately funded at this health facility					
Contact tracing and TPT programs are financed by the implementing partners					
Contact tracing and TPT programs are financed by the facility through Primary Health Care (PHC) and/or other facility funds					
Health workforce					
This facility has adequate number of health workers to deliver TPT					
Contact screening for TB and TPT prescription mainly is done by lay workers e.g. linkage facilitators					
Contact screening for TB and TPT prescription mainly is done by trained health workers					
Medical products and technologies					
Stock out of TPT commodities happen regularly at this facility					
This facility has adequate tests kits for latent TB infection testing before initiating TPT among contacts of TB patients					
Liver function tests are done are done at this facility					
This facility utilizes digital platforms to deliver TPT services					
Health Information systems					
All health workers here are trained in TPT data collection and reporting					
This health facility routinely submits TPT service delivery to district health managers					
This health facility routinely reviews, analyses the data and					

utilizes it to improve TPT service delivery					
This facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients					

SECTION C: KNOWLEDGE, PERCEPTIONS, AND ATTITUDES FACTORS

Patients' TB knowledge and perceptions

How much would you say your patients know about TB

Very Much	Much	some	A little	Nothing

Assessment of pre-existing knowledge, attitudes and practices concerning TPT

How much would you say you know about TB Preventive Therapy (TPT)

Very Much	Much	some	A little	Nothing

With how many of your patients do you talk about TB Preventive Therapy (TPT)?

Every patient	More than half of my patients	Less than half of my patients	Never	Decline to Answer

With how many of the contacts of your Pulmonary Bacteriologically confirmed TB patients do you prescribe TPT to?

Every patient	More than half of my patients	Less than half of my patients	Never	Decline to Answer

Please give your level of agreement to the statements below (Tick one: Y=Yes, N= No, U=Unsure)

	Please give your level of agreement to the statements below	Y	N	U
	TPT lowers someone's risk of developing TB disease			
	TPT is a medication that should be taken regularly for life			
	Without a tuberculin skin test TPT should never be prescribed			
	TPT helps to decrease TB infection in my community			
	TPT jeopardizes the current gains in addressing TB infections in contacts of Pulmonary Bacteriologically Confirmed TB patients			

Please share your thoughts and attitude towards TPT by indicating whether you agree or not with each of these statements

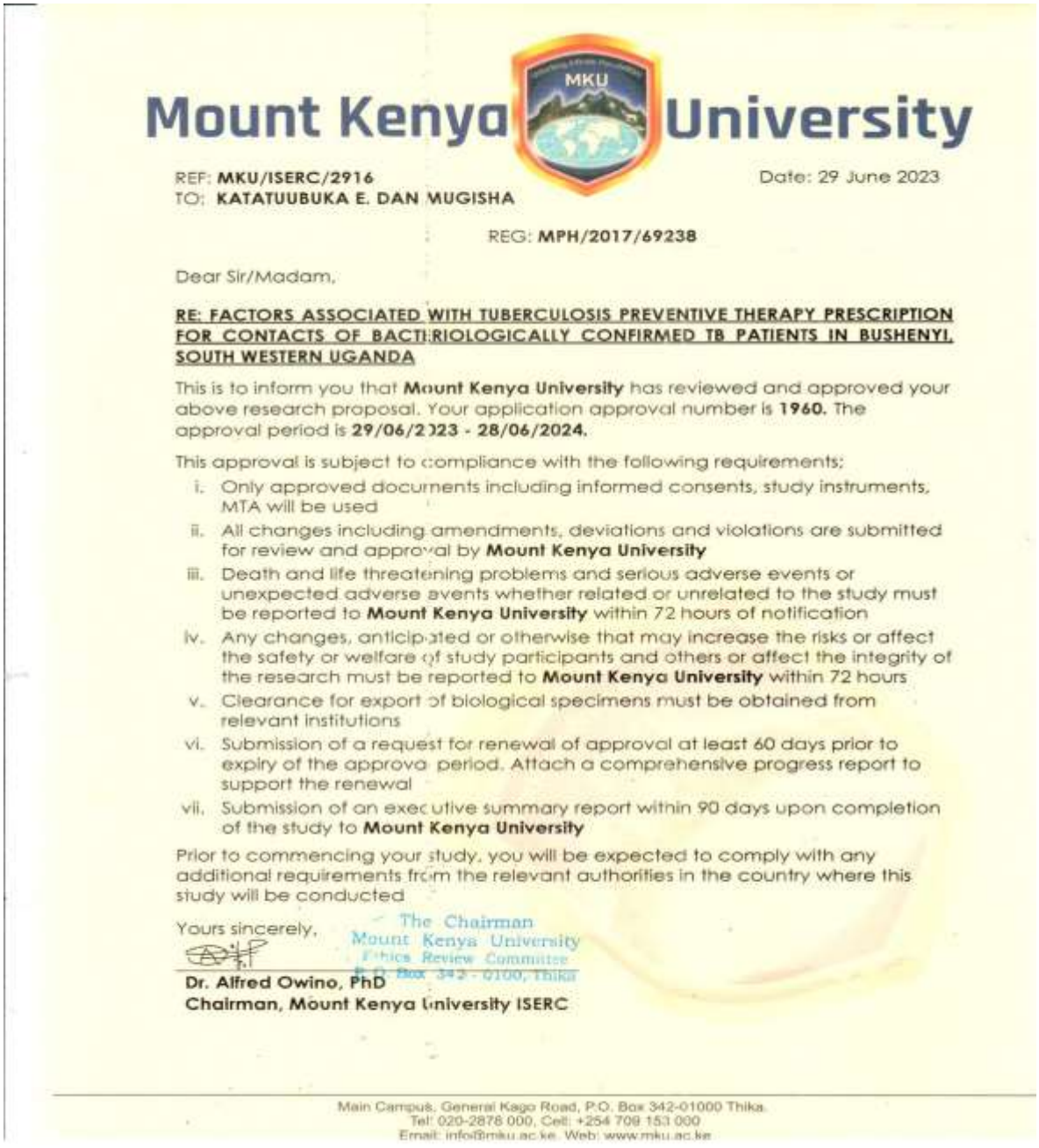
TPT Stigma: Tick Y, N or U (Y=Yes, N= No, U=Unsure)

	Are the following statements true?	Y	N	U
	Others would think less of someone if they knew that the person was taking TPT			
	Others avoid people who they know are taking TPT			
	Most patients who are taking TPT feel comfortable sharing that fact with a close friend(s)			
	Most contacts of PBC TB patients are ashamed to be taking TPT			
	Others think that anyone taking TPT is infected with HIV			
	My patients have no problem in letting others know they are on TPT			

Attitudes concerning TPT: Mark Y, N or U (Y=Yes, N= No, U=Unsure)

	Internalize the following statements	Y	N	U
	TPT does not totally protect contacts of PBCs from getting TB			
	TPT can harm my patients			
	TPT is not good for children and pregnant women			
	Contacts of PBCs are interested in getting TB Preventive Therapy			
	Contacts of PBC TB patients would take TPT medication everyday			
	Using TPT will result TPT drug resistance			

APPENDIX 3: MT KENYA UNIVERSITY ETHICS REVIEW COMMITTEE APPROVAL



Mount Kenya University

REF: **MKU/ISERC/2916** Date: 29 June 2023
TO: **KATATUUBUKA E. DAN MUGISHA**

REG: **MPH/2017/69238**

Dear Sir/Madam,

RE: FACTORS ASSOCIATED WITH TUBERCULOSIS PREVENTIVE THERAPY PRESCRIPTION FOR CONTACTS OF BACTERIOLOGICALLY CONFIRMED TB PATIENTS IN BUSHENYI, SOUTH WESTERN UGANDA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1960.** The approval period is **29/06/2023 - 28/06/2024.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to comply with any additional requirements from the relevant authorities in the country where this study will be conducted

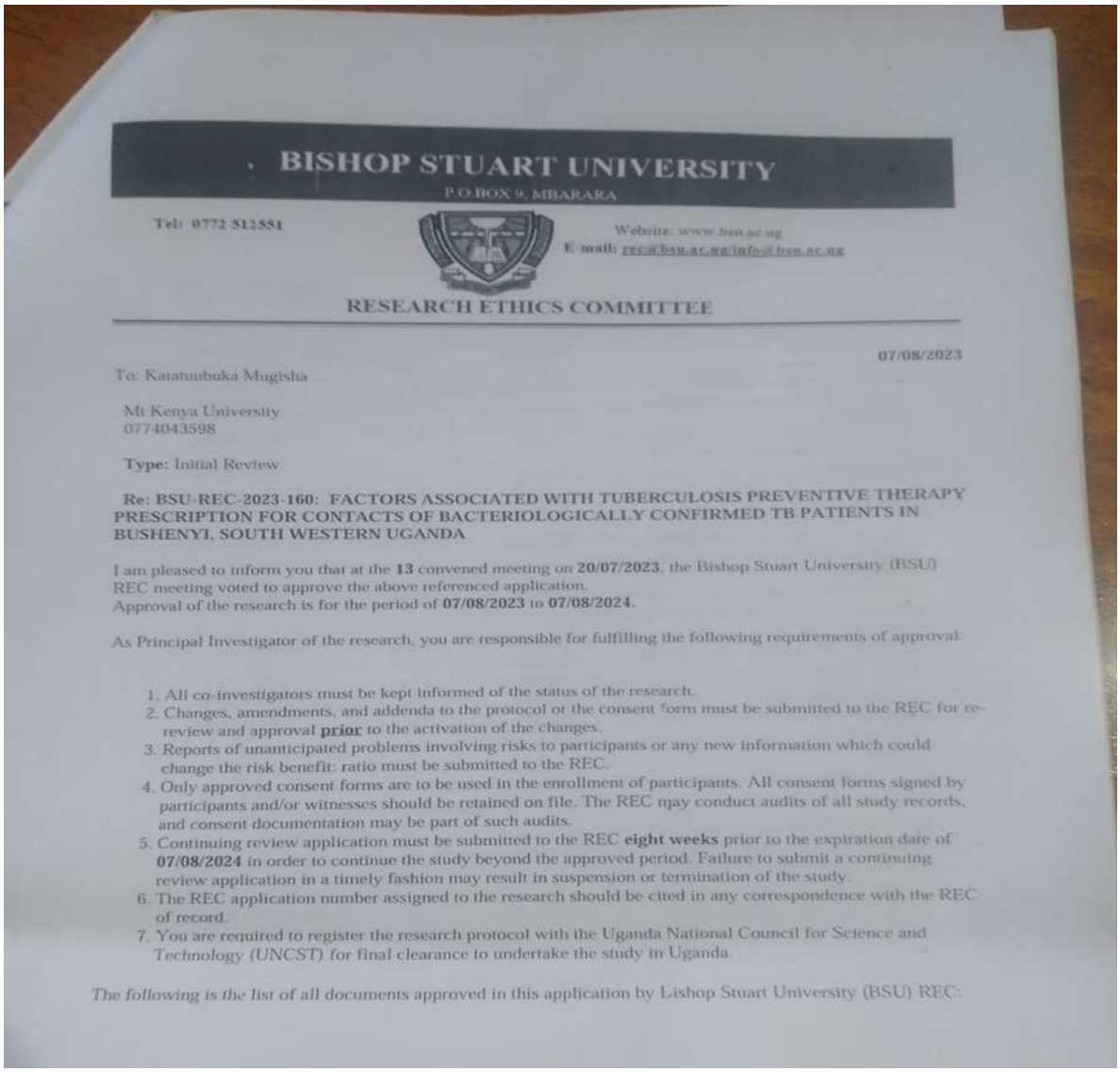
Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P.O Box 342 - 0100, Thika

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000
Email: info@mku.ac.ke. Web: www.mku.ac.ke

APPENDIX 4: BISHOP STUART UNIVERSITY REC APPROVAL LETTER



BISHOP STUART UNIVERSITY

P.O BOX 9, MBARARA

Tel: 0772 512551

Website: www.bsu.ac.ug
E mail: rec@bsu.ac.ug/info@bsu.ac.ug

RESEARCH ETHICS COMMITTEE

07/08/2023

To: Katatuubuka Mugisha

Mt Kenya University
0774043598

Type: Initial Review

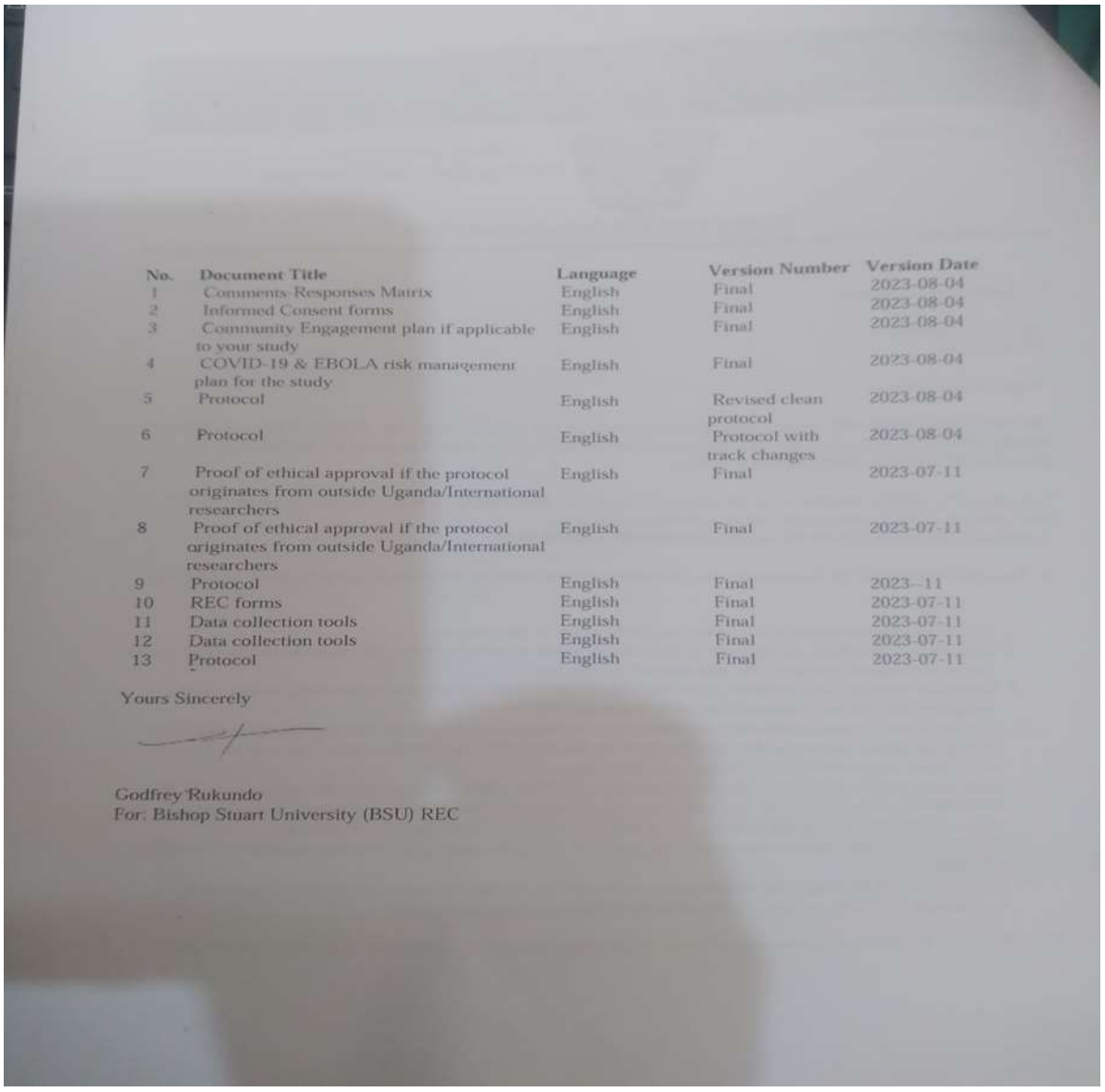
Re: BSU-REC-2023-160: FACTORS ASSOCIATED WITH TUBERCULOSIS PREVENTIVE THERAPY PRESCRIPTION FOR CONTACTS OF BACTERIOLOGICALLY CONFIRMED TB PATIENTS IN BUSHENYI, SOUTH WESTERN UGANDA

I am pleased to inform you that at the **13** convened meeting on **20/07/2023**, the Bishop Stuart University (BSU) REC meeting voted to approve the above referenced application.
Approval of the research is for the period of **07/08/2023** to **07/08/2024.**

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 addenda 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.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants 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. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **07/08/2024** 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.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Lishop Stuart University (BSU) REC:



No.	Document Title	Language	Version Number	Version Date
1	Comments-Responses Matrix	English	Final	2023-08-04
2	Informed Consent forms	English	Final	2023-08-04
3	Community Engagement plan if applicable to your study	English	Final	2023-08-04
4	COVID-19 & EBOLA risk management plan for the study	English	Final	2023-08-04
5	Protocol	English	Revised clean protocol	2023-08-04
6	Protocol	English	Protocol with track changes	2023-08-04
7	Proof of ethical approval if the protocol originates from outside Uganda/International researchers	English	Final	2023-07-11
8	Proof of ethical approval if the protocol originates from outside Uganda/International researchers	English	Final	2023-07-11
9	Protocol	English	Final	2023--11
10	REC forms	English	Final	2023-07-11
11	Data collection tools	English	Final	2023-07-11
12	Data collection tools	English	Final	2023-07-11
13	Protocol	English	Final	2023-07-11

Yours Sincerely

Godfrey Rukundo
For: Bishop Stuart University (BSU) REC

APPENDIX 5: INTRODUCTION LETTER FROM MOUNT KENYA UNIVERSITY

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2017/69238

30th June, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: KATATUUBUKA E. DAN MUGISHA– REGISTRATION NO. MPH/2017/69238

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Epidemiology and Biostatistics** in the school of **Public Health.**

The title of the research is **"Factors Associated with Tuberculosis Preventive Therapy Prescription for Contacts of Bacteriologically Confirmed TB Patients in Bushenyi, South Western Uganda."** It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **July, 2023 and September, 2023.**

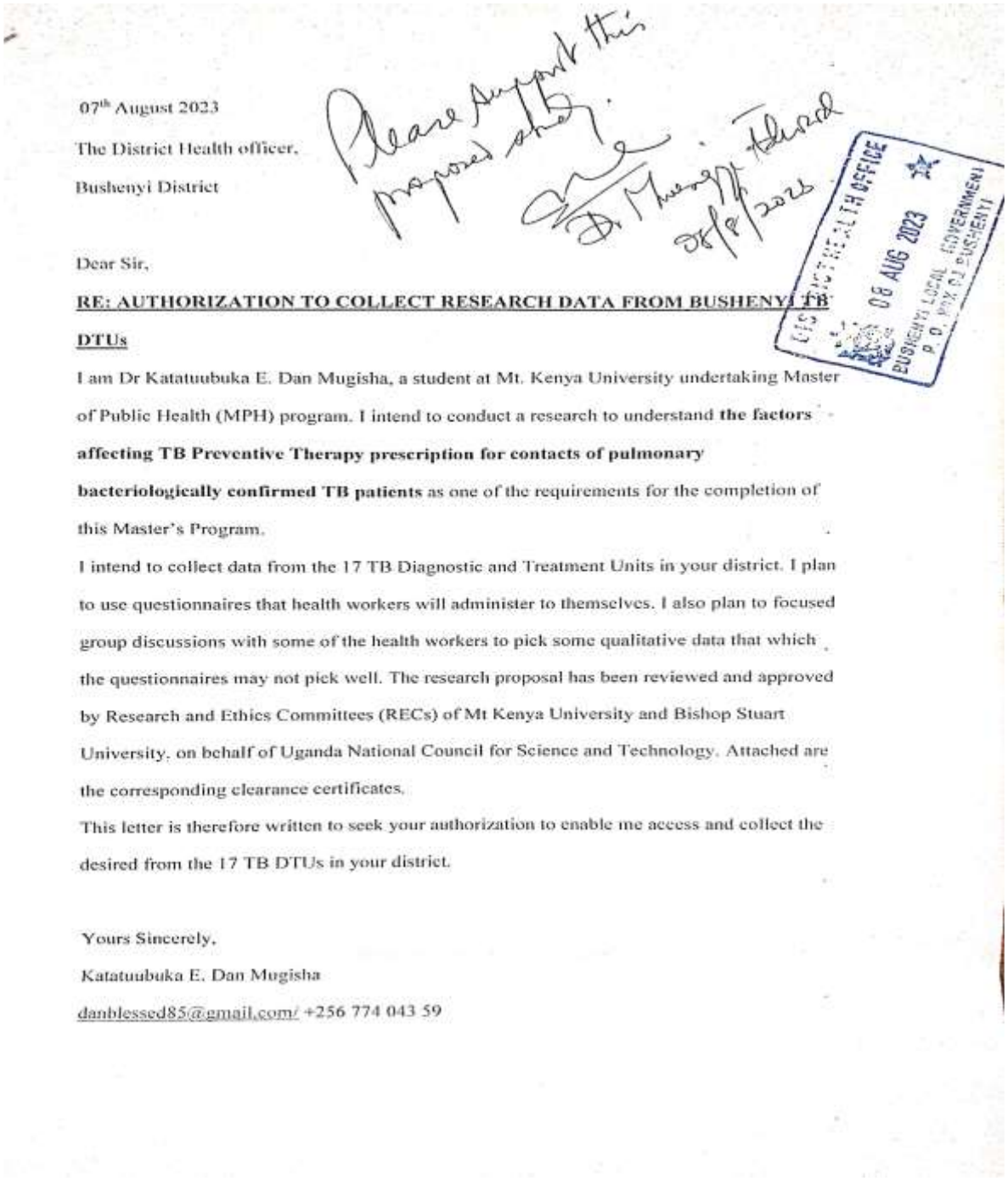
Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
Box 342-01000, THIKA
Office of the Director
Graduate Studies

Dr. Samuel M. Karenga, Ph.D
Director, Graduate Studies
Enc.

APPENDIX 6: DHO'S LETTER OF AUTHORIZATION TO COLLECT DATA



07th August 2023

The District Health officer,

Bushenyi District

Please Approve this proposed study.

Dr. Mugisha Edward

28/8/2023

08 AUG 2023

BUSHENYI LOCAL GOVERNMENT P. O. BOX 61 BUSHENYI

Dear Sir,

RE: AUTHORIZATION TO COLLECT RESEARCH DATA FROM BUSHENYI TB DTUs

I am Dr Katatuubuka E. Dan Mugisha, a student at Mt. Kenya University undertaking Master of Public Health (MPH) program. I intend to conduct a research to understand **the factors affecting TB Preventive Therapy prescription for contacts of pulmonary bacteriologically confirmed TB patients** as one of the requirements for the completion of this Master's Program.

I intend to collect data from the 17 TB Diagnostic and Treatment Units in your district. I plan to use questionnaires that health workers will administer to themselves. I also plan to focused group discussions with some of the health workers to pick some qualitative data that which the questionnaires may not pick well. The research proposal has been reviewed and approved by Research and Ethics Committees (RECs) of Mt Kenya University and Bishop Stuart University, on behalf of Uganda National Council for Science and Technology. Attached are the corresponding clearance certificates.

This letter is therefore written to seek your authorization to enable me access and collect the desired from the 17 TB DTUs in your district.

Yours Sincerely,

Katatuubuka E. Dan Mugisha

danblessed85@gmail.com/ +256 774 043 59

APPENDIX 7: TURN-IT-IN REPORT

Katatuubuka E . DAN MUGISHA

FACTORS ASSOCIATED WITH TUBERCULOSIS PREVENTIVE THERAPY PRESCRIPTION FOR CONTACTS OF BACTERIOLOGI...

Thesis
Post-Graduate Thesis
Mount Kenya University

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APPENDIX 8: RESEARCH SITE MAP

APPENDIX 9: KMO VARIABLE RESULTS

Variable	Variable identifier	KMO_ Value
Contact tracing and TPT programs are sufficiently supervised at the facility	X1	0.72
This facility has a focal person who coordinates TPT activities	X2	0.78
This facility has a clear plan for implementation of TPT program for contacts of PBC TB Patients	X3	0.79
TB patients are routinely given health education on the need for contacts screening and TPT	X4	0.61
Contact screening for TB and TPT prescription is done by this facility	X5	0.67
TPT activities for contacts interfere with routine facility activities	X6	0.62
Adequate Information Education and Communication (IEC)materials on TPT for Contacts of TB patients are available and routinely used at this facility	X7	0.64
TPT programs for contacts of TB patients are adequately funded at this health facility	X8	0.76
Contact tracing and TPT programs are financed by the implementing partners	X9	0.78
Contact tracing and TPT programs are financed by the facility through Primary Health Care (PHC) and/or other facility funds	X10	0.75
This facility has adequate number of health workers to deliver TPT	X11	0.69
Contact screening for TB and TPT prescription mainly is done by lay workers e.g. linkage facilitators	X12	0.67
Contact screening for TB and TPT prescription mainly is done by trained health workers	X13	0.71
Stock out of TPT commodities happen regularly at this facility	X14	0.65
This facility has adequate tests kits for latent TB infection testing before initiating TPT among contacts of TB patients	X15	0.72
Liver function tests are done are done at this facility	X16	0.74
This facility utilizes digital platforms to deliver TPT services	X17	0.8
All health workers here are trained in TPT data collection and reporting	X18	0.82
This health facility routinely submits TPT service delivery to district health managers	X19	0.66
This health facility routinely reviews, analyses the data and utilizes it to improve TPT service delivery	X20	0.77
This facility has the recommended TPT register to collect patient data and services provided for contacts of TB patients	X21	0.67