PREVALENCE OF SOIL-TRANSMITTED HELMINTHIC INFECTIONS AND FACTORS ASSOCIATED WITH PERSISTENT TRANSMISSION AMONG PRE-SCHOOL AGED CHILDREN IN WEST B DISTRICT, UNGUJA ZANZIBAR

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER OF SCIENCE IN TROPICAL DISEASES CONTROL

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **''Prevalence of Soil-transmitted Helminthic infections and factors associated with persistent transmission among Pre-school aged children in west B district, Unguja Zanzibar''**, in (partial) fulfillment of the requirements for the degree of Master of Science in Tropical Diseases Control of Muhimbili University of Health and Allied Sciences.

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Date

DECLARATION AND COPYRIGHT

I, Hafidh A. Khamis, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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DEDICATION

This work is dedicated to my mother Mrs. Fatma Salim Ahmed, brothers and sisters especially my sister Ms Riziki Kombo Mwinyi who is always there for me, for their love, care, and encouragements which, empowered me to accomplish this work. God bless you.

ABSTRACT

Background: The risk of contracting Soil-transmitted Helminthic infections (STHs) is recognized to be shared by pre-school aged children (PSAC) and school aged children (SAC) due to sanitation and hygiene practices. The national efforts in Zanzibar for the control of STHs infections have predominantly focused on SAC, excluding PSAC. Even though preventive chemotherapy (PC) using mebendazole has been used in reproductive and child health (RCH) clinics during deworming and vitamin A supplementation campaigns since 2004; the results have not been optimal because attendance starts to decline after the age of 12 months. This means that some PSAC patients do not receive PC at a time when they are most vulnerable for STHs infections. This study examined the prevalence of STHs infections, the association between water, sanitation, and hygiene (WASH)-related factors and STHs infections, as well as the uptake of PC among 348 PSAC from 1 to 5 years of age in West B, Unguja – Zanzibar.

Objective: This study aimed to determine the current prevalence of STHs and risk factors associated with continued transmission among PSAC in West B district, Unguja – Zanzibar.

Methodology: A household-based cross-sectional study was carried out among PSAC in West B district. Multistage random sampling was used to recruit 348 PSAC. Interviews using structured questionnaires were conducted with mothers and caregivers of PSAC. The information sought was related to socio-demographic characteristics, level of knowledge of the disease, household water availability, personal hygiene and sanitation, as well as uptake of PC and associated factors. The prevalence of STHs and estimation of its intensity was assessed by analyzing stool samples through formalin-ether concentration technique (FECT) and the Kato-Katz technique (KKT), for STHs egg detection. Egg counts were represented as egg per gram (EPG). Data were analyzed by the statistical computer package (SPSS version 22) and summarized by descriptive and analytical statistics; proportions were compared by the Fisher's Exact Test**.** In addition, logistic regression analyses were performed to determine association between dependent and independent variables. The 95% Confidence interval and significance level of 0.05 were used.

Results: Out of 348 stool samples, 5 were infected with at least one type of STHs, giving an overall prevalence of 1.4%, and overall light intensity. The prevalence of STHs was significantly associated with occupation of mothers and caretakers (p= 0.007), place of residency (p=0.02), knowledge of mothers and caretakers on STHs infections (p=0.000), cleansing agent at hand

washing place (p=0.013), hand washing practices with water and soap after defecation (p=0.026). The overall attendance at RCH clinic was high (94.5%) and those who attended RCH clinics received and benefitted from periodic uptake of preventive chemotherapy (PC). Main water source for domestic use was improved piped water, but very few (12.1%) treated water before drinking. Majority of households (82.5%) had hand washing facility, about half (48.3%) had water and soap at the hand washing place. High number of respondents (94.3%) had their fingernails trimmed at the time of survey together with their correspondent children. Latrine coverage was 100%, and majority (95.9%) use flush toilets, though disposal of child fecal matter was unhygienic in about 35.9%. Logistic regression analysis identified a family size as a significant factor contributing to continued STHs transmission, family size of more than five household members have an AOR of 0.117 (95% CI= 0.016-0.854, p=0.034).

Conclusion and recommendations: PSAC are a potential source of continued transmission of STHs; mothers and caretakers' occupation, poor water treatment habit, unhygienic disposal of feces of child as well as poor hand washing habit among households bring further risks of STHs transmission in the general population. Health education should be given to mothers and caretakers on the importance of treating water for domestic use, personal hygiene and sanitation, especially the proper and hygienic way of disposing fecal matter of the child.

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LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
CHMT	Council Health Management Team
CI	Confidence Interval
COR	Crude Odds Ratio
DALYs	Disability-Adjusted Life-Years
DOT	Direct Observed Therapy
ECD	Early Childhood Development
EPG	Eggs Per Gram
FECT	Formalin-Ether Concentration Technique
IRB	Institutional Review Board
KKT	Kato-Katz Technique
LPDR	Lao People's Democratic Republic
MDA	Mass Drug Administration
MoHSW	Ministry of Health and Social Welfare
MUHAS	Muhimbili University of Health and Allied Sciences
NTD	Neglected Tropical Diseases
OR	Odds Ratio
PC	Preventive Chemotherapy
PSAC	Pre-school Aged Children
RCH	Reproductive and Child Health
SAC	School Aged Children
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
STHs	Soil-Transmitted Helminths
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
ZFDA	Zanzibar Food and Drugs Agency

DEFINITION OF TERMS

Disability Adjusted Life Years

Is a measure that combines years of healthy life lost due to premature death and years lived with the disability resulting from the health condition or its consequences.

Household

A household is any group of people who live in a housing unit (a house or apartment), regardless of whether they relate to one another or not, as defined by the Census Bureau for statistical purposes.

Hygiene

Conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness.

Mass drug administration

Is a public health strategy where a specific population, often in a defined geographic area, is provided with a particular medication or drugs, regardless of individual infection status; however, exclusion criteria may apply.

Morbidity

Detectable, quantifiable clinical consequences of infections and diseases that adversely affect human health.

Pre-school aged children

All children between the ages of 12-59 months who are not yet attending primary school.

Prevalence of infection

Refers to the total number of individuals in a population who have a disease or health condition at a given time point in a specific population. It is usually expressed into percentage.

Preventive chemotherapy

Large-scale delivery of safe, single-administration, quality-assured medications, either alone or in combination, at regular intervals to entire populations, in endemic areas as periodic mass drug administration in communities or provided to specific target groups, such as school children or via the health services themselves.

Sanitation

Sanitation is defined as preventing human contact with wastes through maintenance of sanitary conditions by providing services like wastewater disposal and garbage collection and offering facilities and services for the secure disposal of human waste, including urine and feces. Lack of proper sanitation is a major source of disease globally. Improving sanitation is proven to have a significant beneficial on health, both in families and throughout communities.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Among the neglected tropical diseases (NTDs) that are intended to be eliminated as public health problems by 2030 include; Soil-transmitted Helminthiasis, Lymphatic Filariasis, Schistosomiasis, Onchocerciasis, Buruli Ulcer, Chagas Disease, Dengue and Chikungunya, Dracunculiasis, Echinococcosis, food borne Trematodiases, Human African Trypanosomiasis, Leishmaniasis, Leprosy, Snakebites Envenoming, Mycetoma, Chromoblastomycosis and other deep mycoses, Rabies, Scabies and other Ectoparasitoses, Taeniasis and Cysticercosis, Trachoma, and Yaws (1). Approximately 1.5 billion people, or 24% of the global population, are infected with Soil-transmitted Helminths (STHs), making them one of the most prevalent infections globally (2,3). Approximately one-third of the global population is contaminated with at least one STH species, which include *Ancylostoma duodenale* and *Necator americanus* (hookworms), *Ascaris lumbricoides* (round worms), and *Trichuris trichiura* (whipworms) (2,3). The majority of these infections have been reported from sub-Saharan Africa, South America, and Asia. In tropical and subtropical regions, these infections primarily affect the most impoverished and disadvantaged communities that have limited access to clean water, poor sanitation, and poor hygiene [WASH] (2,3).

Humans can be infected by consumption of eggs from contaminated soil (*A. lumbricoides* and *T. trichiura*) or by active skin penetration of infective larvae in the soil [hookworms] (3). The World Health Organization (WHO) sets new global targets in the roadmap for NTDs 2021-2030 to achieve the Sustainable Development Goals (SDGs). Ninety percent (90%) reduction in the number of people in need of treatment against NTDs, 75% reduction in Disability-Adjusted Life-Years related to NTDs, 100 countries achieving elimination of at least 1 NTD and eradication of 2 NTDs- Dracunculiasis and Yaws (4).

Major progress has been achieved. currently, 42 nations, territories, and regions have eradicated at least one disease, 600 million fewer people than in 2010 need interventions against several NTDs. Funding and advocacy give nations the assistance they need to implement NTD interventions. Significant progress has been achieved on a national and

international level. For instance, leprosy and other NTD programs receive major support from Brazil, India, and Indonesia (1).

There are several current challenges along the NTD control supply chain such as inaccurately estimating and calculating what medicine is required, unexpected distribution delays, intricate national regulations, such as those pertaining to specific labeling and pre-shipment inspection. Delays in the customs clearance of medications, limited ability to manage data and plan strategically, which may cause distributions to be delayed. Inadequate supply of medications to medical facilities, insufficient clarity and reporting regarding the stock of medications in every healthcare facility, and wastage brought on by understanding of "open bottle" regulations or the expiration dates of medications (1).

These parasites are highly transmissible, where they affect over 260 million pre-school aged children, 654 million school aged children, 108 million adolescents, and 138.8 million pregnant and lactating women worldwide (2).

Pre-school aged children and school aged children are particularly vulnerable, due to their weak immunity and habit of playing in fecal-contaminated soil. This disease causes millions of morbidities among under-five children who live in developing countries. Major morbidities are intestinal obstruction, malnutrition, rectal prolapse, anemia, stunting, and diminished physical fitness as well as impaired memory and cognition (5).

The burden of these diseases expressed as Disability-adjusted life-years (DALYs) has been estimated at: 3.2 million for *Necator americanus*, 1.33 million for *A. lumbricoides*, and 0.65 million for *T. trichiura* (6).

Children can be reinfected if their environments are contaminated, so anthelminthic treatment needs to be repeated on a regular basis. In order to control STHs infections, both adults and children must be treated (7).

Over 89 million children in Africa are estimated to be infected with STHs, with many having at least two STHs species infections. Schools are frequently targeted to take part in PC interventions for STHs infections (8).

In Tanzania, Trichuriasis and Ascariasis are known to be highly endemic with hospital records suggesting that all regions have some degree of infection with the prevalence of 38.4% and 32.1% respectively (9). The major contributory factors to such high levels of infection are

limited access to safe water and poor environmental sanitation. PSAC have been demonstrated to be at an increased risk of STHs and could potentially be a source of transmission in the community (9).

There are several challenges facing National NTD planning and implementation; little NTD planning responsibility is delegated to other levels. The national level has not succeeded in bottom-up planning to incorporate the NTD interventions. Consequently, the Council Health Management Team (CHMT) has paid less attention to the organization and execution of NTD interventions (10). The inadequate gathering of routine information; campaign and community data presents another challenge. Restrictions on data and information sharing for planning and quantification, as well as limited availability of data and information that have been analyzed (10).

The strategies to promote an extensive approach to the planning and implementation of the National NTD program are; enhanced governance through cooperation and coordination, targeted NTD technical assistance, persistent advocacy, strengthened leadership, responsive NTD plans, enhanced NTD service management use and learning and improvement (10).

The ministry of Health and Social Welfare (MoHSW) of Zanzibar reported that STHs cases (Ascariasis, Trichuriasis and Hookworm infections) continue to be diagnosed during routine service provision at health facilities (11). As of December 2021, the number of STHs cases decreased from 20,833 (in 2020) to 19,438 (in 2021). However, 10,126 more STH cases were reported in Unguja Island than Pemba (11).

Overall, there is paucity of published research about the prevalence and factors associated with the continued transmission of STHs infections among PSAC in Tanzania, specifically in Zanzibar. Therefore, the purpose of this study is to identify the burden and risk factors that are associated with the continued transmission of STHs infection among PSAC, identifying gaps, which will help policymakers to establish better strategies so as to improve the quality of life among those children and the community as a whole.

1.2 Problem Statement

Soil-transmitted Helminths are a significant global public health issue, particularly in areas with poor sanitation. Over 1.5 billion people are infected globally, primarily in tropical and subtropical regions. The highest prevalence is in sub-Saharan Africa, The Americas, China, and East Asia. Children, particularly PSAC and SAC, are among the most vulnerable, as infections often impair physical and cognitive development. The WHO recommends preventive chemotherapy (PC) as a primary intervention, especially in at-risk populations like children and women of reproductive age. Additionally, improvements in sanitation, hygiene, and access to clean water are critical for breaking the transmission cycle (12).

In Tanzania, the overall prevalence varies across regions, but in high risk areas like Muleba district, prevalence rates of over 32% have been reported. Factors such as poor sanitation, inadequate access to clean water, and suboptimal hygiene practices, favor the transmission. Efforts to reduce STHs prevalence focus on both treatment and improving sanitation and hygiene practices to interrupt transmission (13)

In Zanzibar, like most endemic countries for Soil-transmitted Helminths, control efforts rely on annual school-based MDA which excludes PSAC who are actually at risk of being infected. To achieve sustained elimination/eradication of STHs diseases, it requires the implementation of an integrated approach using a combination of these intervention strategies (WASH, PC, and behavioral changes). However, in Zanzibar, only PC has been implemented over the years (14).

Despite increased awareness of the role of WASH and behavioral change in controlling STHs, there is still insufficient knowledge in understanding how WASH and behavioral change factors contribute to STHs which is crucial for designing targeted interventions (15).

This study is designed to establish the prevalence of STHs in PSAC and factors associated with continued transmission in West B district, Unguja Zanzibar.

1.3 Conceptual Framework

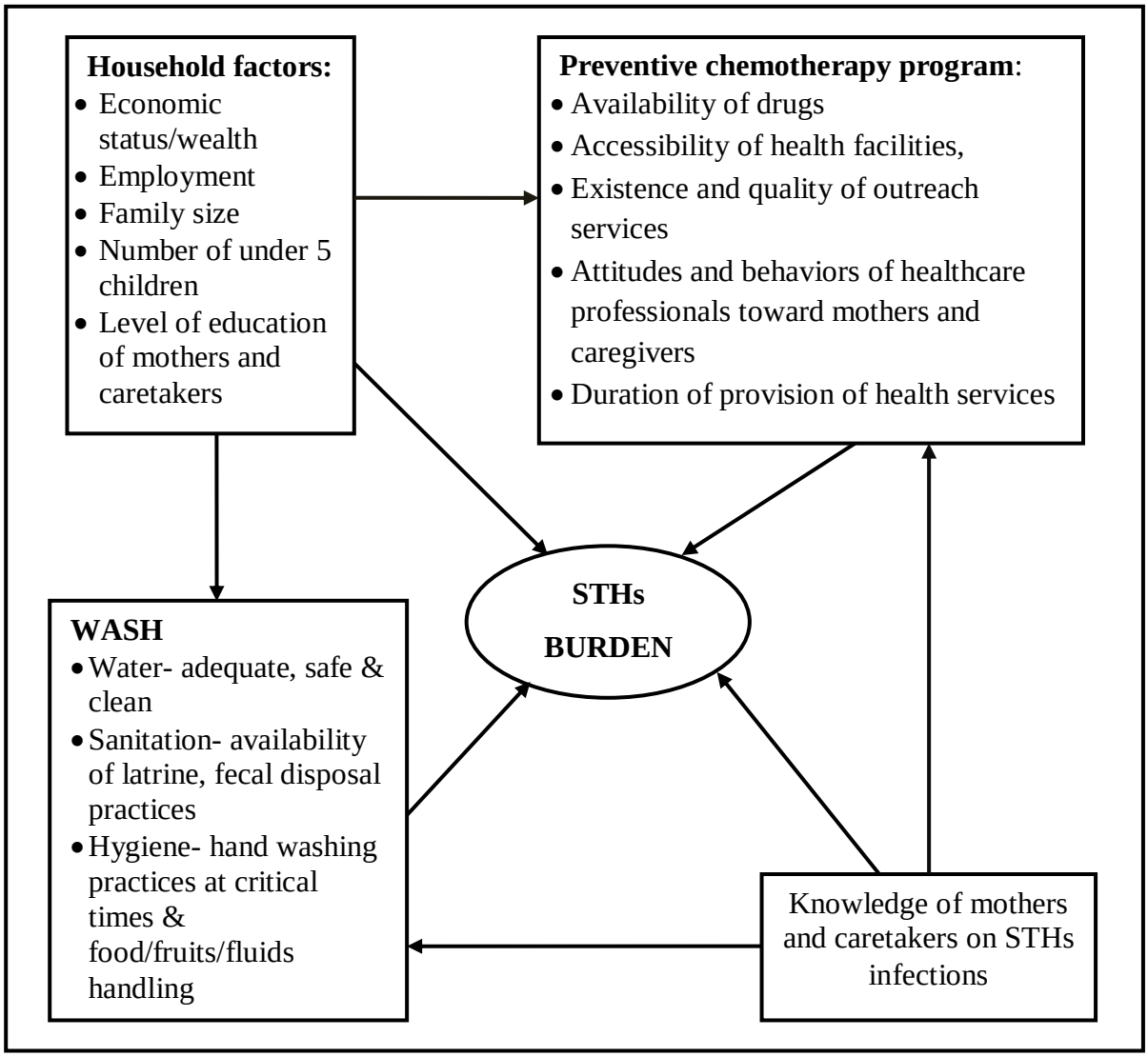


Figure 1: Conceptual framework which illustrates the predisposing factors associated with the continued transmission of soil-transmitted helminths among preschool-aged children.

Description of the conceptual framework

The conceptual framework is developed based on the knowledge gained from readings on the epidemiology of STHs infections, preventive chemotherapy for neglected tropical diseases, and other services provided for monitoring childhood illnesses including growth monitoring, immunizations and the like (16–20).

The soil harbors the infective stage of STHs. Warm temperatures and moist soil are ideal for the development or hatching of eggs released from their host. Access to clean water for drinking and household tasks, as well as household sanitation and hygiene habits, are factors that contribute to the spread of the disease. Household factors such as poverty, family size, and level of education, however, can have an impact on the use of safe water and the practices of hygiene and sanitation.

The current control strategy is preventive chemotherapy, and the uptake of PC is determined by both household factors and community knowledge and awareness of STHs infections. Household factors such as level of education, which has an impact on comprehension and compliance with PC guidelines, economic status, which has an impact on accessibility to medication and healthcare services, and family size, may pose more challenges to ensuring all members receive and adhere to preventive medications.

Community knowledge and awareness serve as the foundation for promoting and sustaining effective WASH practices, creating more resilient environment against STHs infections. Education campaigns can be pivotal in empowering communities to make informed choices regarding WASH, as well as increased awareness may lead to communities actively maintaining hygienic health practices, cleanliness in public spaces, playgrounds, and open areas, reducing environmental contamination and STHs transmission and ultimately contributing to improved public health outcomes.

1.4 Rationale

According to a report of the MoHSW of Zanzibar, the number of infected people with STHs in West B district increased from 2019 to 2021 compared to other districts in Zanzibar. The number of infected people was 1,395, 1,525, and 2,651 in 2019, 2020, and 2021, respectively. Therefore there was a need to conduct a research in that district in order to determine the risk factors associated with the persistent transmission of STHs infections (14).

Findings from this study will provide information on the magnitude of STHs infections among PSAC, availability and access to clean and safe water, sanitation and hygiene practices, uptake of PC and the associated factors in West B district.

Information obtained from this study will guide policy makers and program managers in decision making and enhancing control strategies that will facilitate STHs eradication.

1.5 Research Questions

Overall research question

- What is the prevalence of soil-transmitted helminthic infections and factors associated with persistent transmission among PSAC in West B district, Unguja-Zanzibar?

Specific research questions

1. What is the prevalence and intensity of STHs infections among PSAC in West B district, Unguja -Zanzibar?
2. What is the level of knowledge of mothers and caretakers on transmission, prevention and treatment of STHs infections among PSAC in West B district, Unguja -Zanzibar?
3. What is the level of uptake of PC among PSAC in the past six months before the survey in West B district, Unguja-Zanzibar?
4. What WASH-related factors are associated with the transmission of STH infection among PSAC in West B district, Unguja-Zanzibar?

1.6 Objectives

Broad objective

- To determine the prevalence of Soil-transmitted Helminthic infections and factors associated with persistent transmission among PSAC in West B district, Unguja-Zanzibar

Specific objectives

1. To determine the prevalence and intensity of STHs infections among PSAC in West B district, Unguja-Zanzibar.
2. To determine the level of knowledge of mothers and caretakers on transmission, prevention and treatment of STHs infections among PSAC in West B district, Unguja-Zanzibar.
3. To determine the proportion of PSAC dewormed in the past six months before the survey in West B district, Unguja-Zanzibar.
4. To determine the association between WASH-related factors and STHs transmission among PSAC in West B district, Unguja-Zanzibar.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Biology of soil-transmitted helminths

The "biology of Soil-transmitted Helminths" refers to the study of the life cycle, reproduction, behavior, and ecological relationships of parasitic worms that are transmitted through the soil. These Helminths, such as *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms, infect humans primarily when their eggs or larvae, present in contaminated soil, are ingested or larvae penetrate the skin (3). Key aspects of the biology of Soil-transmitted Helminths include;

Life cycle: The life cycle of these parasites often involve stages in both the environment (soil) and a human host. Eggs from infected individuals are shed in feces, contaminate the soil, and develop into infective larvae or eggs.

Transmission: The parasites are typically transmitted when people come into contact with contaminated soil, either through direct ingestion of soil particles, eating contaminated food, or through skin contact with soil (as in case of hookworms).

Infection in human: Once inside the body, the larvae or eggs mature into adult worms in the intestines, where they can cause a range of health issues, including malnutrition, anemia, and impaired cognitive and physical development in children.

Environmental conditions: Helminths thrive in areas with poor sanitation, warm and moist soil, and where human feces contaminate the environment (3,8).

2.2 Epidemiology of soil-transmitted helminths

STHs infections are among the most common infections worldwide and represent a significant public health threat. WHO reported in 2020 an estimated 1.5 billion people infected with STHs worldwide, with over 267 million PSAC.

These infections are widely distributed in tropical and subtropical regions due to a combination of factors, such as living conditions and climatic influences. Indeed, the highest burden of STHs infections is observed in Southeast Asia and sub-Saharan Africa, where warm and humid climates provide favorable conditions for the survival of STHs parasites, while poor living conditions, inadequate access to safe water, and a lack of proper sanitation facilities further contribute to their transmission. Poorest and most deprived communities consequently bear the high burden of the disease (21).

STHs infections commonly lead to disease with relatively mild symptoms. However, the severity of the infection and associated morbidity can vary depending on the intensity of the infection. In addition to mild symptoms, more severe forms of the infection can occur, resulting in various clinical manifestations and long-term sequelae. These include anemia, growth impairment, intellectual retardation, and cognitive and educational deficits. Albendazole and mebendazole drugs are effective for treating of STHs infections and they are used in MDA campaigns for STHs control, have indeed demonstrated high efficacy (with a more than 95% egg reduction rate) against *A. lumbricoides* and hookworm infections, but low efficacy against *T. trichiura* infection, with a cure rate of approximately 50%. A high risk of reinfection is observed, probably because of early re-exposure. Therefore, for effective control of STHs infections, it is crucial to provide not only anthelmintic treatment for the reduction of disease morbidity, but also implement comprehensive interventions to prevent exposure to the disease (21).

2.3 Epidemiology and control of STH in Zanzibar

The epidemiology of STHs in Zanzibar provides a useful example of how parasitic infections can persist in a tropical environment and how public health measures are implemented to control them. Historically, Zanzibar had a high burden of STHs infections, particularly due to *Ascaris lumbricoides* and *Trichuris trichiura*. Before intervention efforts, studies in SAC showed prevalence rates of over 70% of these parasites in some areas. By 2007, following interventions (MDA), STHs prevalence had dropped to 59.7% in Unguja. Recent efforts continued through the 2010s, leading to a further reduction. In Pemba, despite efforts, the prevalence remained high, with recent estimates showing about 80% prevalence in 2021 (22)

These reductions are largely attributed to routine PC campaigns, with the focus primarily on SAC, in line with World Health Organization. Studies have shown that MDA programs in Zanzibar, often integrated with schistosomiasis control, have resulted in a marked reduction in the prevalence of STHs. The epidemiology of STHs in Zanzibar underscore the importance of combining treatment with broader public health measures like sanitation improvement to break the cycle of transmission (23)

2.4 Prevalence and intensity of STH in preschool-aged children

Research carried out in different countries on the prevalence and intensity of STHs in PSAC indicates that STHs in this age group is a cause for concern. In several Asian countries, STH has reportedly been identified as a problem among PSAC.

In Indonesia, the prevalence of STHs among PSAC, who are typically at a higher risk of morbidity such as malnourishment and anemia, is still high and accounts for approximately one-third of the population afflicted with STHs infections (24). The study which was conducted in Nangapanda subdistrict, Indonesia revealed that the prevalence of Ascariasis was (47.4%), followed by Trichuriasis (36.2%) and hookworm infection (9.2%). About 28.7% of PSAC, co-infections were found: 2.2% of the PSCs had co-infections with hookworm and *A. lumbricoides*, and 20.6% of the PSCs had co-infections with *T. trichiura*. All three STHs species co-infected with the remaining (5.9%). Most *A.lumbricoides* infections were moderate (49.6%), while *T. trichiura* and hookworm infections were primarily mild (68.0% and 96.0%, respectively) (24).

In China, a study conducted in rural Southwest China showed that the overall prevalence of PSAC was 21.2%, with at least one of the three STHs. 33.9% of PSACs in the province of Guizhou tested positive for infection with one or more STHs. Just 9.7% of PSAC in Sichuan Province tested positive for infections (25).

A survey conducted in Huaphan province in the Lao People's Democratic Republic (LPDR) revealed that 74 PSAC stool samples were submitted in total; 41.9% of the samples had parasite eggs found, with *Ascaris lumbricoides* accounting for the majority (32.4%) (26).

Similar to situations in any other part of the world, PSAC in sub-Saharan Africa experiences STH challenges. In Ghana, a cross-sectional study was conducted among 152 under-5 children in Kadjebi district. The overall prevalence of STHs infections was 44.08% (67/152). Ascariasis, Trichuriasis, and hookworm infections observed were 20.39%, 10.53%, and 13.16%, respectively (27).

In South Africa, a cross-sectional survey was conducted among 1143 PSACs in early childhood development (ECD) facilities and preschools in Ingwavuma rural community. The higher prevalence was *Ascaris lumbricoides* (18.3%), followed by Hookworms (1.6%) and *Trichuris trichiura* (1.2%) (28).

A community-based cross-section survey was conducted among 2462 PSAC in 5 districts of the Gamo Gofa Zone, Southern Ethiopia. STHs infections were detected in 578 out of 24662 cases; the overall prevalence was 23.5%. Ascariasis was the most common (18.6%), followed by Trichuriasis (9.2%) and Hookworms (3.1%). 7.4% of PSAC had two STHs species infections overall. While 15.1% of patients with ascariasis had moderate infection intensities, the majority of positive cases with STHs had low infection intensities (29).

In East Africa, PSAC are as well affected by STHs infections and cause morbidity in different degrees. In Kenya, the survey was conducted in two slum villages, Gatwekira and Soweto West, within the Kibera urban slum area in southern Nairobi. Overall, 40.5% PSAC had at least one STHs infections; *A.lumbricoides* and *T.trichiura* were responsible for almost all infections (23.0% and 26.3%, respectively), hookworm infection was rare (<0.1%) (30).

In Uganda, a cross-sectional study was conducted among 562 PSAC in 6 counties of Hoima district. The overall prevalence of STHs was 26.5%; the most common infection was hookworm (18.5%), which was followed by *A. lumbricoides* (9.8%) and *T. trichiura* (0.5%). The prevalence of STHs infections was considerably increasing with age (31).

In Tanzania, a study was conducted in the rural ward of Kiwangwa, Bagamoyo district, to determine the prevalence and associated risk factors of STHs infections, which involved 115 PSAC. It was discovered that the chosen schools had an overall prevalence of 3.8%. 4 of the 115 pre-primary children had helminth infections (32). *Ascaris lumbricoides* and hookworm were the particular STHs discovered. Of the 4 children afflicted, 2 had a hookworm infection, 1 had a co-infection of *Ascaris lumbricoides* and hookworm, and 1 had a single infection of *Ascaris lumbricoides*. The four affected children attended three different schools (32).

These results indicate that pre-school aged children in Tanzania and most other developing countries are susceptible to contracting STHs. Tanzania has conducted relatively few studies on the prevalence and severity of STHs infections in PSAC. This study will give data on the prevalence and severity of STHs in the West B district to contribute to filling such a knowledge gap.

2.5 Association between knowledge of mothers and Soil-Transmitted Helminths

Knowledge of mothers and caregivers about transmission, prevention, and control of STHs infections play a significant role in reducing the number of infected children and the community burden.

A cross-sectional analytical study which was conducted in Kandahar, Afghanistan revealed that the overall prevalence of STHs infections was (39.1%). The most prevalent STHs species was *A. lumbricoides* (29.4%), followed by *T. trichiura* (12.1%) and hookworm (8.7%). Among the STHs infected patients, single infection, double infection, and triple infections were present in (26.9%), (11.8%), and (0.4%) of the children, respectively (33). Among the reasons for the high prevalence could be a lack of knowledge about the transmission of the parasites or a lack of awareness regarding health and hygiene habits among mothers or caregivers (33).

From February 2 to March 27, 2015, preschool-aged children in Chuahit, Dembia District, North-west Ethiopia, participated in a community-based cross-sectional survey. Mothers were interviewed on the knowledge about *Schistosoma mansoni* and STHs and the result showed that 41.4% of them had never heard about Soil-transmitted Helminthiasis and did not know the symptoms of the disease. Nearly half and two-thirds of the mothers responded that they did not know about ways of transmission and the preventive methods of STHs (34).

A cross-sectional study was conducted at Ingwavuma-uMkhanyakude District in KwaZulu-Natal, South Africa, among caregivers who were present during the screening of their PSAC under their care for STHs. The findings of the study observed limited awareness of the infection, negative attitudes, and bad practices point to serious flaws in the methods used to control STHs today.

It is crucial to involve community stakeholders in the creation and implementation of awareness initiatives in order to enhance disease management at the local level (35).

A cross-sectional study in which mothers or caregivers of PSAC in 51 villages in the Hoima area of Kampala, Uganda, were asked structured questionnaires in order to gather data. The children ranged from 1-5 years old. The results revealed that mothers or caregivers who have knowledge and awareness of STHs infections and deworming of children were independently and statistically linked to a decreased incidence of STHs infections in PSAC (31). The study

also found that open defecation, improper disposal of feces of young children, and a lack of awareness regarding the prevention and spread of STHs were related with STHs infections in PSAC (31).

There is still a gap in the knowledge of mothers and caretakers regarding the transmission of STHs infections. There are only a few studies available worldwide that address the relationship between the knowledge and awareness of mothers and caretakers concerning STHs transmission. Therefore, the purpose of this study is to contribute to filling that gap.

2.6 Factors associated with the uptake of preventive chemotherapy among PSAC

Factors associated with the level of uptake of PC for NTD are grouped into programmatic factors and recipient-based factors. Programmatic factors include delivery issues such as availability of medications and/or promotional materials, distribution time, and staff (36). Additional aspects that fall under the category of programmatic factors include the identification of the drug distributor, the training of the health workers' and drug distributors', motivation of the health staff, and the application of directly observed therapy [DOT] (36).

Regarding the individual recipient factors, the study indicates that the uptake of MDA is based upon the awareness and knowledge of the recipient of both disease and MDA, their comprehension of their individual risk of disease and the advantages of MDA, and their concerns regarding drugs, such as fear of side effects caused by misinformation and rumors about MDA. The personal health of recipient at the time of medication delivery, gender, age, household income, and residency in an urban or rural location are additional recipient-based characteristics linked to MDA uptake (36).

Several studies have been carried out to identify factors related to PSAC utilization of preventive chemotherapy for STHs control across different countries.

A study conducted in the Laos Peoples Democratic Republic revealed that parents' long travel to campaign sites is the reason behind the poor PC coverage among preschool-aged children (26).

Observation was made in a study that was conducted in the Philippines; municipalities with the lowest rates of deworming coverage had the highest prevalence of STHs in pre-school aged children. Poor MDA distribution methods and parental misperceptions about deworming are the reasons for the low deworming coverage (37).

According to a Kenyan study, children older than a year old rarely attend medical facilities for routine medical treatment. Tablets for deworming and vitamin A are given out during *Malezi Bora* (Good upbringing) clinics. Low attendance suggests that these children are not getting enough deworming treatment. The two main reasons given for not going to *Malezi Bora* were not knowing about it and not having someone to take the child to the clinic (38).

Moreover, a study conducted in Uganda, observed that PSAC who reside in lowland residential areas are more likely to contract STHs than those who live in highland areas. This is because PSAC residents in these areas miss the scheduled deworming treatment due to a number of reasons, including mothers or caregivers' busy schedules that include harvesting crops and preparing gardens for cultivation at the right time for deworming, as well as logistical difficulties that prevent health workers from providing deworming services to children (31). Furthermore, the author argues the case that a lot of children lose out on deworming treatments on National Day Plus due to the poor health-seeking habits of the caregivers (31).

A study conducted in Tanzania showed that there are a number of reasons why vitamin A and deworming campaigns do not receive high coverage. These include mothers or caregivers not knowing about the campaigns, no one is available to take the child during the campaign, the child not being available during the campaign, a lack of supplies at the health facility, and long travel distances, a child becoming sick during the campaign and parents refusing to bring their child due to religious reasons are two other causes (39).

Finding from these studies show that the level of uptake of PC in PSAC in various countries is determined by a number of factors, but these factors seem to be different from country to country. Limited data exist regarding the factors associated with PC uptake in PSAC in various parts of Tanzania including West B district. The goal of this study is to fill the knowledge gap by investigating factors associated with the uptake of PC among PSAC in West B district.

2.7 Relationship between Water, Sanitation, and Hygiene and Soil-transmitted Helminths

The availability of water that is safe to drink is a basic human right. Everyone has the right to adequate, appropriate, safe, physically accessible, reasonably priced water for household and personal use, as well as the right to physically accessible, affordable sanitation that is secure, hygienic, safe, and acceptable in social and cultural contexts and guarantees dignity and privacy. 785 million people lack access to basic drinking water services, 673 million people still defecate in the open, and 2 billion people still lack access to basic sanitation amenities like modernized latrines or private toilets (4).

These risk factors are more common among disadvantaged and vulnerable groups, concentrated in the poorest 40% of the population, who also have the least access to a safe, affordable, and sustainable water supply and sanitation services. It is anticipated that every US dollar invested in water and sanitation will yield a return on health benefits of more than five dollars because of lower health care expenditures for both individuals and society as a whole as well as increased productivity (4).

The association between WASH access and practices and STHs infections was examined by a systematic review and meta-analysis, which found that these factors are typically, though not always, linked to lower risks of STHs infections. Wearing shoes and hookworm infection (OR 0.29, 95% CI 0.18–0.47), piped water usage and *A. lumbricoides* infection (OR 0.40, 95% CI 0.39–0.41), and treated water use and infection by any STHs (OR 0.46, 95% CI 0.36–0.60) were found to have particularly substantial relationships. With the exception of two (piped water consumption for any STHs and sanitation access for hookworm), pooled estimates for all meta-analyses showed at least a 33% reduction in the risks of STHs infection linked to certain WASH habits or access (40).

A survey was conducted in impoverished rural areas of Guizhou and Sichuan Provinces in Southwest China, which revealed that the overall prevalence of STHs infections among PSAC was 21.2%. Only 9.7% of PSAC in Sichuan province tested positive for infection with one or more forms of STHs, compared to 33.9% of PSAC in Guizhou province (25).

The survey revealed that the prevalence rates in the two provinces differed significantly. There are various reasons that have been recognized as contributing to the variation in infection

prevalence between Sichuan and Guizhou. The majority of the differences can be explained by health and sanitation practices, such as not washing hands before eating, and among the most significant associations that explained more than 10% of the variation in incidence between Guizhou and Sichuan is using unsafe drinking water (25).

A cross-sectional study of water, sanitation, and hygiene-related risk factors for soil-transmitted helminth infection in urban school aged and pre-school-aged children in Kibera, Nairobi-Kenya revealed that the most frequent infections were caused by *T. trichiura* (26.5%) and *A. lumbricoides* (23.2%), although hookworm infection was uncommon (0.2%). In 9.5% of cases, concurrent infection with *A. lumbricoides* and *T. trichiura* was seen. Severe STHs infections of any species found in 1.6% of subjects (15). Analyzing the impact of home water treatment and safe storage on the occurrence of STHs the findings indicated a lower risk of STHs infections and a decreased prevalence of STHs infections among children residing in homes with continuously treated water. Access to piped water has been linked to lower the prevalence of *A. lumbricoides* and *T. trichiura* infections (15).

A number of household respondents reporting using unimproved sanitation facilities or practicing open defecation was significantly higher at night than during the day. Many of the latrines of Kibera are not reachable by vehicles to remove feces, nor are they linked to the sewage system of the city. The findings indicated that children whose mother or caregiver dried their hands with a clean towel had a lower prevalence of STHs infections than children who did not dry their hands, dried their hands on clothing, or allowed them to air dry (15).

In Uganda, using the Expanded Program on Immunization (EPI) technique, a cross-sectional study was conducted among 562 PSAC in 6 counties in the Hoima area which revealed that the overall prevalence of STH was 26.5%. The most common infection was those caused by hookworm (18.5%), followed by *A.lumbricoides* (9.8%), and *T.trichiura* (0.5%). The prevalence of Soil transmitted helminths infection among PSAC in notably increased with age. Poor hygiene, inadequate sanitation and irregular deworming were associated with STHs infections among PSAC in the study area (31).

In Tanzania, a survey that was conducted in the rural ward of Kiwangwa, Bagamoyo district, showed that the majority of children (47.2%) revealed they got their household water from taps, 2.7% mentioned they used spring water and water from shallow wells, 9.2% declared

they got their water from rivers, and the remaining children (40.9%) reported they got their water from street vendors. Families with at least one source of water were shown to have a lower prevalence of soil-transmitted helminths than those whose water came from vendors. PSAC from households without hand washing facilities in the latrine had a higher prevalence of STHs (6.4%) than PSAC from households with such facilities (1.5%) (32).

These studies showed that there is an association between WASH and STHs infection among PSAC; however, there is scarce documentation on the matter in Tanzania, specifically Zanzibar. Therefore, the goal of this study is to contribute to filling such a gap and provide adequate information in order to improve WASH conditions so as to eliminate those STHs infections.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

West B district is one of the two new districts established in 2015 from the larger West district. The other district is West A. It is bordered to the north by the Zanzibar North Region, to the east by the Zanzibar Central/South Region, to the south by Kiwani Bay, and to the west by the Zanzibar Urban District. The district has a tropical climate with temperatures ranging between 20° and 40° centigrade. It also experiences a bimodal rainfall pattern, with a long rainy season (known as Masika in Swahili), lasting from March or April to May, and a short rainy season (known as Vuli in Swahili), which lasts from September or October to December each year. The district receives between 900 *mm* and 1,200 *mm* during the long rainy season, and 400 *mm* to 500 *mm* during the short rainy season. West B is divided into 7 constituencies, consisting of 14 wards and 34 shehias*. The district has a total area of 113.0 square kilometers. According to population and housing census of 2022 the district has a total population of 344,517 of which males are 163,539 and females are 180,978, and the population density of 3050/ square kilometers. West B district was selected as the study area because it is among the districts in Unguja with a history of high prevalence of STH, in which the overall number of infected people in 2021 was 2651 (11). WASH is considered as one of the effective strategies for combating infectious diseases including STHs. So far, in Zanzibar, there has been some initiatives to implement WASH activities in some districts by raising awareness on appropriate latrine constructions and behavioral change to optimize the use of these latrines and support materials. Also, preventive chemotherapy (PC), using MDA campaigns is an important tool for the control/elimination of STH. In Zanzibar, the Pharmacovigilance system is in place under the Zanzibar Food and Drugs Agency (ZFDA). The main function of ZFDA Pharmacovigilance Unit is collecting the various reports concerning the safety of Drugs. All programmes conducting MDA should follow the guidance of pharmacovigilance system through WHO protocol. The NTD Programme is working closely with ZFDA during all its MDAs whereby the pharmacovigilance officials are always part of the training team (14).

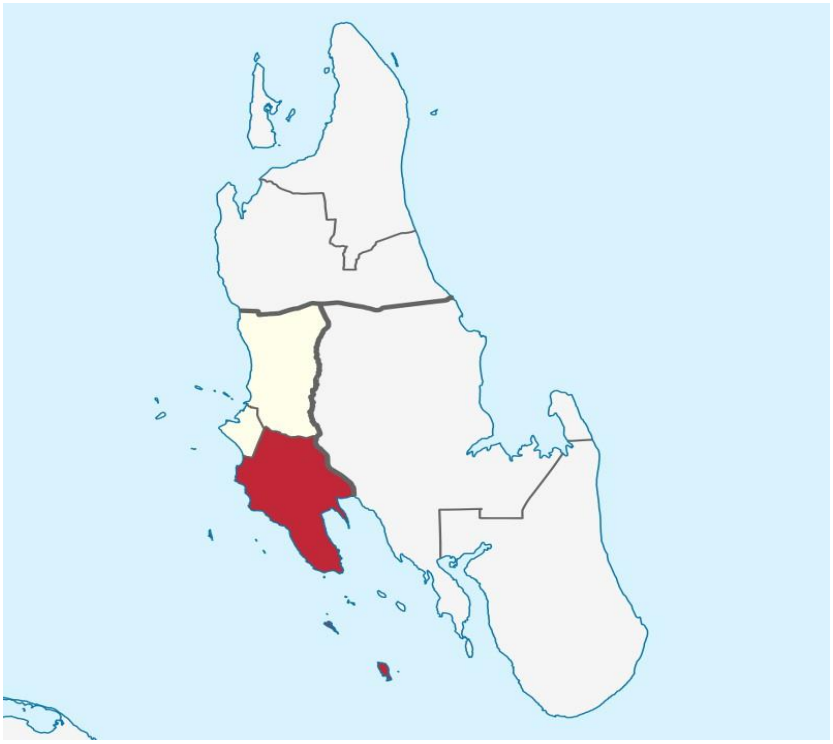


Figure 2 Map of Unguja Island which showed west B district (maroon color)

3.2 Study design

A community-based cross-sectional study to determine the prevalence of STHs infections and risk factors associated with persistent transmission among pre-school aged children was conducted from May 2024 to July 2024 at West B district in Unguja Island – Zanzibar.

3.3 Study population

The study involved children aged from 1 to 5 years living in the study area for the past 6 months. This group is the focus of investigation regarding factors associated with continued transmission of STHs infections.

3.4 Eligibility criteria

3.4.1 Inclusion criteria

Children aged from 1 to 5 years living in the study area in the past six months and whose parents or legal guardians signed the written consent were included in the study.

3.4.2 Exclusion criteria

Children who received anti-helminthic drug within one month prior to data collection, children having diarrhea at the time of stool collection or severe health conditions that might affect the

study results, children whose parents refused to sign a written consent, children aged 5 years but attending primary schools were excluded from the study.

3.5 Sample size

Sample size was calculated according to the formula for cross-sectional surveys.

$$N = \frac{Z^2 \text{ x } P(100 - p)}{d^2}$$

Whereby

N =required sample size

Z= normal standard deviation of 1.96 by using 95% Confidence interval

P= prevalence of STH

d= margin of error which is 5%

A prevalence of 29% will be used, as obtained from the study that was done at Unguja, Zanzibar (41).

$$N = \frac{1.96^2 \times 29\ (100 - 29)}{5^2}$$

N = 316

Assuming 10% non-response rate, adjusted sample was

N = (1/R×316) + 316

N = (10/100×316) + 316

N = 348

Therefore the sample size of preschool aged children was 348

3.5.1 Sample size estimation for parents

The number of parents was 348, which is comparable to pre-school aged children. These parents provided details about the demographics of the children, the sanitation and hygiene of the home, the uptake of preventive chemotherapy by the children, and the associated factors.

3.6 Sampling procedure

A three-stage random sampling technique was used. In the first stage, 4 wards were randomly selected from 14 wards. Random selection was done using a lottery system that involves writing the name of each ward on a separate piece of paper, putting it in one box, and thoroughly mixing it before sampling. Then blindly picking one piece of paper from the box, and the box was shaken again, and another piece of paper was selected till we got 4 wards.

At the second sampling stage, 4 shehias, one from each of the selected wards was randomly selected using lottery method as described above. The third stage involved the selection of households from each shehia by using proportional sampling, 348 samples of children and their mothers or caregivers was distributed according to the number of households in each shehia. Determining how many households from each shehia which should be recruited was the first step. This phase involved obtaining the number of households in each shehia and using the probability proportional to size formula to compute the contribution of each household to the study sample size from a selected shehia.

Number of house hold per each shehia =

$$\frac{\text{Total households from the shehia x Sample size required for the study}}{\text{Grand total number of households in the four shehias}}$$

To obtain a household, a central location was identified as a starting point, for this research the sheha's house was a starting point. The researcher spun a bottle to determine direction as used in previous research (17). Therefore, the first household to be chosen was the one nearest to Sheha's residence in the direction of the bottle. The next nearest household in the designated direction was chosen until we obtained the estimated sample size. Only one child was selected whenever more than one eligible child was found in the same designated household, and the selection was uniform, whereby an older child participated in the study.

3.7 Variables

3.7.1 Dependent variable:

The dependent variable is the outcome or response variable, and in this study the dependent variable was STH infection status.

3.7.2 Independent variables:

Independent variables are the exposure or predictor variables and in this study the independent variables for objectives were socio-demographic characteristics of mothers and caretakers, and their corresponding children, access to clean and safe water, availability, quality and use of toilet, fecal disposal practices, mothers and caretakers hand washing practices, nail trimming habit, level of knowledge of mothers and caretakers on STHs infections, and child level of uptake of PC, availability and access to healthcare facilities, availability of medications, and awareness of mothers or caretakers about deworming programs.

3.8 Data collection

3.8.1 The research team

This study involved the main researcher and four research assistants. The main researcher was responsible for training the assistants and supervising all steps involved in this study. The first group involved two field research assistants who were engaged in data collection exercises, including community sensitization, obtaining consent, administering instruments for stool collection, collecting samples from households, administering and collecting questionnaires in the selected study areas, and transportation to the selected location for processing and analysis. The second group involved two laboratory research assistants involved in the stool examination, analysis, and reporting of results.

3.8.2 Recruitment and training of research assistants

During a three-days training session, all research assistants gained knowledge about the research topic, objectives, and data collection strategies. This included preparing stool samples, using questionnaires, processing parasitological specimens, and analyzing and interpreting parasitological results. Research ethics and the role and duty of research assistants in the study were among the other topics covered in the training. The course also addressed additional aspects of communication and interpersonal skills. Role plays, brainstorming sessions, lectures, and demonstrations were all incorporated into the training process.

3.8.3 Data collection instruments

The structured questionnaire was utilized in this study to gather data. The two fundamental sections of the questionnaire were used to collect data. Section A provided socio-demographic information including; age, sex, marital status of mother or caretaker, occupation of mother or caretaker, mother or caretaker level of education, number of under five children, number of household members and section B to evaluate variables related to STHs transmission of the participants.

As a way to determine the prevalence and severity of STHs, stool samples were collected, processed, and screened for the presence or absence of eggs. The number of eggs in the sample was used to calculate the intensity of the infection. Demographic information about the participants, household water, sanitation, and hygiene conditions that are risk factors for STHs, as well as PC utilization and associated factors, were gathered through interviewing the

mother of the child and, for the children who were not being raised by their mothers the person taking care of the child were interviewed. Information on housing conditions that were used to determine the household level of income such as house building material, type of toilet, type of floor and number of household members as used in previous research (17).

3.8.4 Specific objective 1: To determine the prevalence and intensity of STHs infections among PSAC in West B district, Unguja-Zanzibar

Stool collection tools

Stool collection tools included plain paper, an applicator stick, and pre-labeled, dry, and wide-mouthed stool containers. A parent or caretaker who signed a consent form was required to provide only one stool sample by letting their child defecate on the plain paper that was provided in order to prevent contamination. They were oriented by investigator to provide first early morning sufficient stool specimen about 30-50 grams (up to a marked level of the container). They were also instructed to wear examination gloves and use an applicator stick to pick up a portion of the stool belonging to the child and transfer it to the container, cover it, and store it in a refrigerator or cool, safe place until the research Assistant arrives to collect them within two hours. The collected samples were labeled with the date and time of collection, placed in a cool box and transported to the laboratory at Mnazi Mmoja Referral Hospital for processing by the researcher assisted by two qualified and experienced laboratory technicians.

Stool sample processing

Single stool specimen per child was processed using Formol-Ether concentration procedures and separated the eggs from fecal debris and unmask for visibility. A matchstick head amount of stool for each child was picked using applicator stick and mixed with 7mls formol-ether contained in a centrifuge tube and mixed by shaking for at least 30 seconds. The floating liquid on top of the sediment was filtered through a sieve into a second centrifuge tube. After adding 3ml of ethyl acetate, the sediment in the second tube was centrifuged at minimum speed 2500 revolution per minute for 5 minutes. The final sediment was then used for slide preparation and analyzed with microscope by experienced laboratory technicians. Positive samples were then further analyzed to quantify the intensity of the infection by using the Kato-Katz egg counting technique. The stool samples were processed to make one single Kato-

Katz-thick smear covered with cellophane soaked in glycerin and malachite green for 24 hours. Samples were then analyzed under microscope to quantify the intensity of the infection. We adhered to standard operating procedures as outlined in the WHO benchmark aid for the diagnosis of parasite illness for both the formal ether concentration test and Kato-Katz (42). The following supplies and equipment were used: new examination gloves, a sieve, a marker pen, distilled water, tissue paper, micro slide, detergent, safety bag, ethyl acetate, formalin, centrifuge tubes, and a centrifuge machine. Malachite green, news paper or glazed tile, cellophane tape, and Kato-set [a template with a hole, screen, nylon or plastic, and plastic spatula] (42). To recover live STH larvae, we adapted Baemann examination method as described by M. Eltantawy et al (8). Briefly, , about 5 g of feces was taken and placed in a cheesecloth envelope, and suspended below the water surface in a 250 ml beaker filled with tap water for at least 8 h (preferably 18-24 hours), enabling larvae to move into the water. The fecal packet and supernatant were removed, leaving approximately 15 ml of sediment, which was collected for identification of parasite larvae based on morphology by microscopic examination at the laboratory of the Mnazi Mmoja Referral Hospital (MMRH).

Detection of Helminths eggs

As a means to diagnose a parasitic infection, the eggs in the samples were detected using WHO benchmark tools. The criteria used for identification was manual descriptions of morphological characteristics (42).

Determination of the prevalence of STH

The prevalence of STHs was calculated as the ratio of the number of children who tested positive for any STH species to the total number of children who submitted complete data.

$$\text{Prevalence} = \frac{\text{Number of subjects testing positive}}{\text{Number of subjects investigated}} \times 100$$

Determination of intensity of infection

To examine the severity of infection, the number of eggs of each species were counted and converted into the number of eggs per gram of feces (EPG). EPG was calculated by multiplying egg count by conversion factor (41.7mg). According to the WHO categories of intensities as stated in the guidelines for the evaluation of soil-transmitted schistosomiasis and

helminthiasis at the community level, infections were classified as light, moderate, and heavy (43).

Table 1: WHO classes of intensity

	Intensity threshold Helminth Specie		
Helminth species	**Light**	**Moderate**	**Heavy**
A. Lumbricoides	1-4999epg	5000-49999epg	≥50000epg
T. trichiura	1-999epg	1000-9999epg	≥10000epg
Hookworms	1-1999epg	2000-3999epg	≥4000epg

Each arithmetic mean egg intensity of parasite was determined by dividing the total number of epg by the number of subjects under investigation.

$$\text{Arithmetic mean} = \Sigma \text{ epg} / n$$

3.8.5 Specific objective 2: To determine the level of community knowledge on STHs infections

The respondents were asked questions on cause, transmission, prevention, control and treatment of STHs infections, 1 point was assigned for each “correct” response provided by the participant, and 0 point for both “ I don’t know” and “incorrect” responses. The highest (total) score was 6 and a cumulative score of 0-2 was classified as poor, while 3-4 as moderate, and 5-6 as good.

3.8.6 Specific objective 3: To determine the proportion of PSAC that had received deworming during the six months prior to the beginning of the study in the West B district.

Mothers and caregivers were questioned if the child had STHs deworming drug during a routine clinic appointment for growth monitoring, as well as during a vitamin A supplementation and deworming campaign. In addition, the participants were asked if they attend any unprogrammed deworming. Furthermore, the questionnaire included questions asking mothers and caregivers if the child is receiving a deworming drug, as well as how they make sure their child swallows the drug.

3.8.7 Specific objective 4: To determine the association of WASH-related factors and STHs transmission

The respondents were asked about the main sources of domestic water that their households utilize, with the aim of determining the sources of household water. Water sources were classified as improved or unimproved based on WHO and UNICEF definitions in order to determine the quality of the water. In an effort to assess the quality of the drinking water, the respondents were also being asked on their methods of water preparation for drinking purpose.

In order to get information on sanitation, the respondents were questioned about whether or not household members have access to working toilet facilities. To verify responses of the respondents, the researcher conducted an observation. Criteria from WHO and UNICEF (2006) were used to classify observed toilet facilities into improved non-shared toilet facilities and other types of toilet facilities so as to assess the quality of the toilet facilities. To assess utilization, the researcher conducted on-site observation, looking for evidence of open defecation around the house compound, around the drop hole, on the latrine wall, and outside the latrine.

To obtain details on personal hygiene, the respondents were asked about the availability of places for hand washing and facilities. They were asked to describe their hand washing practices before preparing food, before feeding a child, after defecating, and after cleaning up a defecated child. If the respondent cleaned their hands with soap and water, their hand washing practice were considered proper; if not, it was considered improper.

The condition of the finger nails of the child and the mother were observed by the researcher in order to determine the nail trimming habit. Fingernails were classified into trimmed and untrimmed groups.

In the interest of ascertaining the practices of the mothers and caregivers regarding the disposal of child feces, respondents were questioned about what happens when the child needs to defecate as well as how they dispose of the waste. Based on WHO and UNICEF definitions (2006), the disposal of child fecal matter was divided into two categories: hygienic/safe and unhygienic/unsafe.

3.9 Validity and reliability issues

3.9.1 Validity and reliability of questionnaire

To improve validity, a questionnaire was created in advance during proposal development. A team of MUHAS experts, including the research supervisors, were consulted to provide feedback on the appropriateness of the questions for the target population and suitability for the research objectives. Prior to conducting the study, 10% of respondents with comparable characteristics were used to test the questionnaires. A Swahili version of the questionnaire was used for pretesting.

To increase reliability, the test-retest approach was employed to increase reliability, meaning that the same responder got the questionnaire twice at separate times. We looked at response consistency and computed the dependability coefficient. It was deemed dependable if the reliability coefficient is 0.89.

To ensure validity, the WHO benchmark standard for the diagnosis of parasitic illnesses were followed in order to maintain a high-quality study during the stool collection, processing, examination, and analysis phases in order to assure validity. The samples were collected and brought the same day to Parasitology laboratory at Mnazi Mmoja Referral Hospital to be examined by licensed technicians.

To ensure reliability, the specimens were examined by qualified professionals, and an observer was present for the specific prepared slide. A third observer was included, and his observation was the final one in cases where the two results were in disagreement.

3.10 Data analysis

Statistical Package for Social Sciences (SPSS) was used to enter, code, and clean the gathered data. We used proportion and frequency to summarize the data. Fisher's exact test was used to assess the relationship between the prevalence of STHs and sociodemographic factors. To determine the relationship between STHs transmission and WASH-related variables, fisher's exact test was also applied. Unadjusted Odds Ratios (UORs) and 95% confidence intervals (CIs) of each variable were calculated to see the strength and direction of the association without adjusting for other factors. All variables with a P-value less than 0.20 in the bivariate analysis were included in the multivariate analysis. Multivariate logistic regression analysis used to examine the independent effect of each risk factor on the outcome while controlled for

other variables. This was crucial to adjust for confounding variables and identified factors with an independent association with the outcome. The Adjusted Odds Ratios (AORs) and confidence intervals (CIs) were calculated to determine the strength and significance of each association. The probability of $P < 0.05$ was regarded as significant and Adjusted Odds Ratio (AOR) with confidence interval that did not cross 1 was considered statistically significant.

3.11 Ethical considerations

Before the beginning of the study, ethical clearance was obtained from the MUHAS Ethical Review Board (IRB). Permission was obtained at all administrative units involved in this study, from the district to the shehia levels where this study was conducted.

A consent document was obtained from parents or caretakers. Laboratory samples were only taken from those children whose parents or caretakers signed the consent papers. No other investigations were done on the sample except those needed for the study objectives described in the consent form. Code numbers were used instead of names and any information that was obtained during the study was kept confidential. After the completion of the study, a brief report was created and delivered to the District health officers so as to make sure that the affected children received the appropriate care.

CHAPTER FOUR

4.0 DATA ANALYSIS AND RESULTS

4.1 Overview of socio -demographic characteristics of the study population

The summary of the socio-demographic characteristics of the study population, i.e. pre-school aged children, mothers, and caretakers from four shehias (Mombasa, Kisauni, Meli NNE and Mwanakwerekwe) of west B district Unguja are provided in the following sections.

4.1.1 Socio - demographic characteristics of the Pre-school aged children

A total of 348 pre-school aged children participated in the study. The mean age was 33.95 months, (SD=11.500), majority of them 31.59% (111) being in the age group between 24-35 months. More than half (68.4%) were females. There were no significant differences in age ($p = 0.395$) and sex ($p = 0.331$) across residences. Details are summarized in Table 2.

Table 2: Socio-demographic characteristics of the Pre-school aged children (N=348)

Characteristics	Frequency	Percent
Child sex;		
Male	110	31.6
Female	238	68.4
Child age (months);		
12-23	99	28.6
24-35	111	31.9
36-47	90	25.6
48-59	48	13.8

4.1.2 Socio-demographic characteristics of mothers and caretakers

A total of 348 mothers and caretakers participated in the study with a mean age of 31.63 years, (SD=8.177), and they were all female (100.0%). Less than a half 43.4% (151) were in the age group 21-30 years, and more than half 63.5% (221) had attained secondary school level. The majority 62.1% (216) were public/private employees, while large number 79.0% (275) were married. Details are found in Table 3.

Table 3: Socio-demographic characteristics of mothers and caretakers (N=348)

Characteristics	Frequency	Percent
Age of mothers and caretakers (years)		
≤ 20	17	4.9
21-30	151	43.5
31-40	122	35
41-50	49	14
>50	9	2.6
Marital status;		
Not married	22	6.3
Married	275	79.0
Divorced	51	14.7
Education level of mothers and caretakers;		
Never attend school	18	5.2
Primary	79	22.7
Secondary	221	63.5
Tertiary	30	8.6
Occupation of mothers and caretakers;		
Public/private employee	216	62.1
Self-employee	64	18.4
Peasant	22	6.3
Housewife	46	13.2
Shehia;		
Mombasa	70	20.1
Kisauni	109	31.3
Meli nne	61	17.5
Mwanakwerekwe	108	31.0

4.2 Prevalence and intensity of Soil-Transmitted Helminths infections among Pre-school aged children

4.2.1 Prevalence of Soil-Transmitted Helminths

A total of 348 stool samples were analyzed, 5 stool samples were infected with at least one type of STHs. Two children aged 36-47 months had co-infection of *Trichuris trichiura* and *Ascaris lumbricoides*, one child had mixed infection of *Ascaris lumbricoides* and hookworm aged 36-47 months and two children aged 12-35 months had only *Ascaris lumbricoides* infections and they were all female, giving an overall prevalence of 1.4%. Parasite-specific infection prevalence was 0.57% (2/348) for co-infection of *Trichuris trichiura* and *Ascaris lumbricoides*, 0.29% (1/348) for co-infection of hookworm and *Ascaris lumbricoides*, and 0.57% (2/348) for *Ascaris lumbricoides* alone. *A. lumbricoides* infection was reported in all five cases. All infected children were residents of the same shehia (Kisauni). No significant difference by age group (P=0.395). Also, the prevalence of STHs infections did not differ by gender (P=0.331).

4.2.2 Intensity of Soil-transmitted Helminths

The overall intensity of STHs infections was light, and the arithmetic mean egg intensity of *Trichuris trichiura*, *Ascaris lumbricoides*, and Hookworms was 0.6epg, 1.1epg and 0.3epg respectively. Two children had mixed infection of *Trichuris trichiura* (92 and 120 epg) and *Ascaris lumbricoides* (72 and 102 epg) respectively, one child had co-infection with hookworm (108 epg) and *Ascaris lumbricoides* (96epg) and two children had *Ascaris lumbricoides* only (49 and 68 epg), three children aged 36-59 months were infected. Four mothers and caretakers of the infected children were aged 19-40 years and were married. Also, three out of five mothers and caretakers were employed with the level of education being from secondary to tertiary level.

4.2.3 Influence of socio-demographic factors of Pre-school aged children on Soil-Transmitted Helminthic infections

Across the age groups, the infection rate is quite low, with the highest in the 36-47 months group (3.4%). P-value (using Fisher's Exact Test) indicates that there is no statistically significant association between child age and STHs infections. Since the p-value is greater than 0.05, age does not seem to be significant factor in predicting infection in this dataset.

The sex of a child had no influence; no males were infected, while 2.1% of females were infected. However, the p-value of 0.331 shows that this difference in infection rates between males and females is not statistically significant. A p-value greater than 0.05 indicates that child sex is not a strong predictor of STHs infections in this dataset. Details are shown in Table 4.

Table 4: Influence of socio-demographic factors of Pre-school aged children on Soil-transmitted Helminths

Characteristics	Infected (%)	Not infected (%)	P value*
Child age (months);			
12-23	1 (1.0%)	98 (99.0%)	
24-35	1 (1.0%)	111 (99.0%)	0.395
36-47	3 (3.4%)	86 (96.6%)	
48-59	0 (0.0%)	48 (100.0%)	
Child sex;			
Male	0 (0.0%)	110 (100.0%)	0.331
Female	5 (2.1%)	233 (97.9%)	

*P value of Fisher's Exact Test

4.2.4 Influence of socio-demographic factors of mothers and caretakers on Soil-Transmitted Helminths infections

We tested for the association of socio-demographic factors of mothers and caretakers and STHs infections. No infections were reported in the age groups ≤20, 21-30, and >50 years, but a small percentage (3.3%) of those aged 31-40 were infected. The p-value of 0.163 indicates no significant association between age and infection status. Also, no infections were found among unmarried mothers and caretakers, though the married group showed a low infection rate (1.1%), while the divorced/widowed group had a slightly higher rate (4.0%). The p-value of 0.282 suggests no significant association between marital status and infection. Furthermore, infection rates were low across all education levels, with the highest being 5.6% among those who never attended school. The p-value of 0.409 indicates that education level does not significantly affect infection rates. The infection rate was notably higher among peasant workers (13.6%), whereas no infections were found in self-employed individuals or

housewives. Public/private employees had a very low infection rate (1.0%). The p-value of 0.007 indicates a significant association between occupation and infection status. Overall, while age, marital status, and education level showed no significant associations with STHs infections, occupation appears to have a meaningful impact, particularly highlighting the higher risk among peasant workers. Details are summarized in Table 5.

Table 5: Influence of socio-demographic factors of mothers and caretakers on Soil-Transmitted Helminths

Characteristics	Infected (%)	Not infected (%)	P value*
Age of mothers and caretakers			
≤20	0 (0.0%)	17 (100%)	
21-30	0 (0.0%)	151 (100.0%)	
31-40	4 (3.3%)	118 (96.7%)	0.163
41-50	1 (2.0%)	48 (98.0%)	
>50	0 (0.0%)	9 (100.0%)	
Marital status;			
Not married	0 (0.0%)	22 (100.0%)	
Married	3 (1.1%)	272 (99.0%)	0.282
Divorced/widow	2 (4.0%)	49 (96.0%)	
Level of education;			
Never attend school	1 (5.6%)	17 (94.4%)	
Primary	1 (1.3%)	78 (98.7%)	0.409
Secondary	3 (1.4%)	218 (98.6%)	
Tertiary	0 (0.0%)	30 (100.0%)	
Occupation;			
Public/private employee	2 (1.0%)	214 (99.0%)	**0.007**
Self-employee	0 (0.0%)	64 (100.0%)	
Peasant	3 (13.6%)	19 (86.4%)	
Housewife	0 (0.0%)	46 (100.0%)	

*P value of Fisher's Exact Test

4.3 Knowledge of mothers and caretakers on Soil-Transmitted Helminths Infections

The majority of mothers and caretakers knew that STHs infections is caused by worms 89.4% (311), transmitted by eating contaminated food or drinking contaminated water, and walking barefoot 89.9% (313). On the other hand, only few respondents did not know the causes of STHs infections 6.9% (24), or mode of transmission 5.2% (18). Majority of study respondents knew that STHs infections can be prevented by washing hands with water and soap 89.9% (313), controlled by participating in deworming programs regularly 89.7% (312), and can be

treated by medicines from the hospital 100.0% (348). In contrast, only few of respondents knew that STHs infections can be prevented by avoiding contact with infected person 3.2% (11).

4.3.1 Level of knowledge of mothers and caretakers about Soil-Transmitted Helminths infections

The score ranged from 0-6 based on total number of questions asked, respondents were asked questions on cause, transmission, prevention, control and treatment of STHs infections, 1 point was assigned for each "correct" response provided by the participant, and 0 point for both " I don't know" and "incorrect" responses. The highest (total) score was 6 and a cumulative score of 0-2 was classified as poor, while 3-4 as moderate, and 5-6 as good. Based on summation of correct answers, majority had good knowledge on STHs infections 89.4% (311), and 10.6% (37) had poor knowledge. According to the results obtained it showed that majority 311of mothers and caretakers had good knowledge on STHs and their children were not infected. While, mothers and caretakers of all infected children had poor knowledge, hence good knowledge is essential for the prevention and control of the infection. Details are presented in Table 6.

Table 6: Influence of community knowledge on Soil-Transmitted Helminths infections

Characteristics	Infected (%)	Not Infected (%)	P value*
Level of community knowledge on STH;			
Poor	5 (13.5%)	32 (86.5%)	**0.000**
Good	0 (0.0%)	311 (100.0%)	

*P value of Fisher's Exact Test

4.4 Proportions dewormed in the past six months before survey

In Zanzibar, children below five years are supposed to receive biannual vitamin A supplementation and deworming which are conducted every June and December each year. In both cases the approach used for deworming of PSAC is health facility-based approach where children health clinics are used to reach them. In the past six months at least two deworming campaigns were expected to occur. Summary of each delivery method is provided in specific subsections below.

4.4.1 Deworming at routine clinic visit

In this method, only children attending clinics are delivered with PC. In this study a total of 329 PSAC were attending clinics and all were eligible to receive at least one deworming during visit for growth monitoring. In this study all 100.0% (329) received PC for STHs prevention in the past six months during routine clinic visit. In this study all children given drugs swallowed the drugs (100.0%). When caretakers were asked about benefit of given drugs, majority responded that they treat worm infection 76.4% (266), followed by those who responded that they prevent worm infection 13.2% (46), and the remaining 10.3% (36) responded I do not know. Among 5.5% (19) caretakers whose children did not attend RCH clinics and did not receive deworming medication, when asked for the reason, 42.1% (8) responded that their children were not sick, followed by 31.6 (6) who responded that the long queue was prohibitive, and 26.3% (5) responded that there was no one to take the children.

4.4.2 Deworming campaign

Although deworming is carried out at RCH clinics, those who did not attend clinics were invited to receive deworming for STHs control. Among 348 children recruited in the study all were eligible for deworming during that campaign (above 12 months)

Caretakers were interviewed on history of deworming during the campaign that was supposed to be conducted in December 2023. Majority 92.0% (320) reported that the campaign did not take place in their area. Results show that no child was given preventive drugs for STHs control through this method.

4.4.3 Association of deworming during routine Reproductive and Child Health clinics and Soil-Transmitted Helminths infections

All 5 (p=0.000) infected children did not attend RCH clinics for the past six months; hence no deworming drug was given, when mothers and caretakers asked for the reason for non attendance to the clinics, four responded that the child was not sick while one said the queue was too long. When asked about the benefit of deworming drug, mothers and caretakers of all five infected children replied that they do not know (p=0.149).

4.4.4 Association of unprogrammed deworming and Soil-Transmitted Helminths infections

Mothers and caretakers were asked about unprogrammed deworming, where by majority 334 responded that they purchase the drug and give to the child, five (5) out of fourteen (14) mothers and caretakers, who did not buy deworming drugs for their children were infected with STHs (p=0.000). Moreover, when asked about the interval of PC, two (2) mothers and caretakers responded that they gave the drug once a year and three (3) mothers responded that, when suspect that the child is sick. And when asked when the last time to give PC to their children was, five (5) children who were given the drug in the past 5 and 6 months were infected with STHs.

4.5 Household water sources for domestic use and its quality

4.5.1 Main water source for domestic use

In the study area, the most common sources of water used for domestic purpose were piped water located inside the house 328 (94.2 %) followed by piped water outside the house 11 (3.2%), and public tap water 9(2.6%).

4.5.2 Quality and treatment of drinking water

When categorized into improved and unimproved water sources, it was found that all respondents (100.0%) were using improved water sources for domestic purpose. Among 348 surveyed households, only 42 (12.1%) of households reported that they boil water before drinking as the main method used to treat drinking water, while few 14(4.0%) reported to use bottled water to drink, while majority 292(83.9%) use tap water for drinking purpose. Details are shown on Table 7.

Table 7: Proportion of community main water source and its quality, and preparation for drinking purpose

Variable	Frequency	Percent
Main source of water in HH;		
Piped water inside the house	328	94.2
Piped water outside the house	11	3.2
Public tap water	9	2.6
Quality of water source;		

Improved	348	100.0
Unimproved	0	0.0
Preparation of drinking water;		
Boiling	42	12.1
Bottled water	14	4.0
Tap water	292	83.9

4.5.3 Association of community main water source and its quality, and preparation of drinking water and Soil-Transmitted Helminthic infections

The majority of the 328/348 respondents had piped water inside the house, and all 348 respondents use improved water for domestic purpose. Forty-two (42) households used boiling method as water treatment and fourteen (14) households used bottled water for drinking. Three (3) of the infected children drunk improved tap water without boiling, while two (2) of the infected children drunk improved tap water after the water was boiled. The results revealed that treating water and proper storage (all improved and unimproved) will reduce the burden of the infection and hence improve the quality of life. The details are presented in Table 8.

Table 8: Association of community main water source and its quality, and preparation of drinking water and Soil-Transmitted Helminths infections

Variables	Infected (%)	Not Infected (%)	P value*
Main water source in household;			
Piped water inside the house	5 (1.5%)	323 (98.5%)	1.000
Piped water outside the house	0 (0.0%)	11 (100.0%)	
Public tap water	0 (0.0%)	9 (100.0%)	
Quality of water source;			
Improved	5 (1.4%)	343 (98.6%)	0.184
Unimproved	0 (0.0%)	0 (0.0%)	
Preparation of drinking water;			
Boiling	2 (4.8%)	40 (95.2%)	
Bottled water	0 (0.0%)	14 (4.0%)	0.184
Tap water	3 (1.0%)	289 (83.9%)	

*P value of Fisher's Exact Test

4.6 Mothers and caretakers hand washing habit and fingernails trimming habit

4.6.1 Availability of hand washing facilities

High percentage 82.5% (287) of the households had a hand washing place. The majority of households had sink at the hand washing place during survey 74.1% (258). Of the 287 households with hand washing place, 34.2% (119) had water only and 48.3% (168) had water and soap available in the hand washing place at the time of the survey.

4.6.2 Mothers and caretakers hand washing habit

About half number 53.7% (187) of mothers and caretakers use water and soap to wash their hands before food preparation 10.3% (36) or by water only 43.4% (151). Majority wash their hands with water only 75.6% (263) before eating or feeding a child. About 56.0% (195) respondents wash their hands with water and soap after defecation.

4.6.3 Fingernails trimming habit

Majority of mothers and caretakers 94.3% (328) had their fingernails trimmed at the time of survey, only 5.7% (20) were found with untrimmed fingernails. Comparable to caretaker's fingernails, it was also observed that majority of the children 95.4% (332) had their fingernails trimmed at the time of survey, only 4.6% (16) were found with untrimmed nail.

4.6.4 Association of mothers and caretakers hand washing habit, and fingernails trimming habit and Soil-Transmitted Helminthic infections

More than half 74.1% (258) households had a sink as a hand washing place, while the rest had a tap with a bucket underneath for washing hands 8.3% (29) [four (4) of the infected children were in this group] and the households with no hand washing place 17.5% (61) [1 was infected] households. About half 34.2% (119) [four (4) of the infected children were in this group] used water only when washing hands, while 17.5% (61) [one (1) of the infected children was in this group)] had no cleansing agent. Majority 54.6% (190) households wash hands with water and soap during critical times, whereas 6.0% (21) [four (4) of the infected children were in this group] usually do not wash hands during critical moments. These results showed the association of hand washing habit of mothers and caretakers and STHs. Fingernail trimming habit in both mothers and children showed no association with STH ($p= 1.000$ and 0.211) respectively. The details are presented in Table 9.

Table 9: Association of mothers and caretakers hand washing habit and fingernails trimming habit and Soil-Transmitted Helminths infections

Variable	Infected (%)	Not infected (%)	P value*
Hand washing facility;			
Sink	0 (0.0%)	258 (100.0%)	
Tap with bucket	4 (13.8%)	25 (86.2%)	0.000
No place	1 (1.6%)	60 (98.4%)	
Cleansing agent at hand washing place;			
Water and soap	0 (0.0%)	168 (100.0%)	
Water only	4 (3.4%)	115 (96.6%)	**0.026**
Nothing	1 (1.6%)	60 (98.4%)	
Hand safety during critical times;			
Wash with water and soap	0 (0.0%)	190 (100.0%)	
Wash with water only	1 (0.7%)	136(99.3%)	**0.013**
Usually do not wash	4 (19.0%)	17 (81.0%)	
Mothers fingernails condition;			
Trimmed	5 (1.5%)	323 (98.5%)	1.000
Untrimmed	0 (0.0%)	20 (100.0%)	
Child fingernails condition;			
Trimmed	4 (1.2%)	328 (98.8%)	0.211
Untrimmed	1 (6.3%)	15 (93.7%)	

*P value of Fisher's Exact Test

4.7 Sanitation conditions of the household

4.7.1 Availability and type of toilet facility

All respondents 100.0% (348) mentioned the availability of toilet facilities inside their houses, majority of respondents 95.9% (334) use flush to piped sewer system, while minority 2.6% (9) use pit toilet with slab and 1.4% (%) use open pit toilet. Results are illustrated in Figure 3 below.

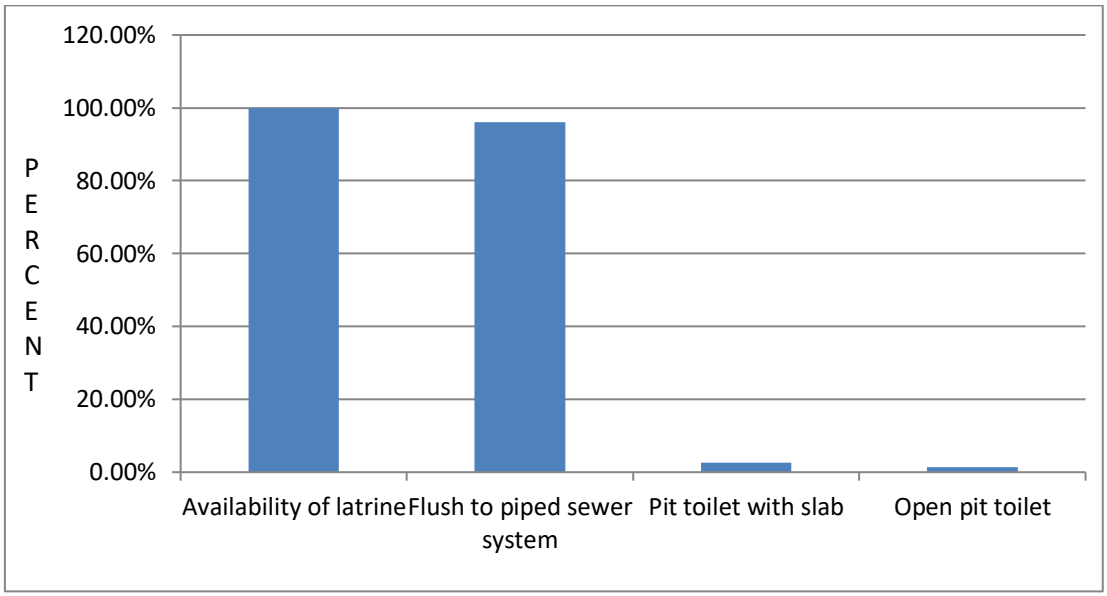


Figure 3: Commonly available latrines in the study area

4.7.2 Number of household members who share toilet facility, condition of toilet and place where child defeacate

All toilet facilities furnished with washable floor 100.0% (348). The number of household members who use the same toilet facility differ in each family, in which majority 76.1% (265) have 1-5 household members, followed by 20.9% (73) with 6-10 household members, and 2.9% (10) with 11+ household members who share the same toilet facility. When interrogated about what they do when the child need to defeacate, more than half of respondents 53.5% (221) mentioned that the child defeacate in pots, while the remaining number 36.5% (127) replied that the child defeacate in the diaper/nappy.

4.7.3 Child fecal matter disposal

Majority of mothers and caretakers responded that they dispose child fecal matter by throwing into the toilet facility 64.1% (223), while the remaining number 35.9% (125), they dispose by throwing into the garbage bin. Results are illustrated in Figure 4 below.

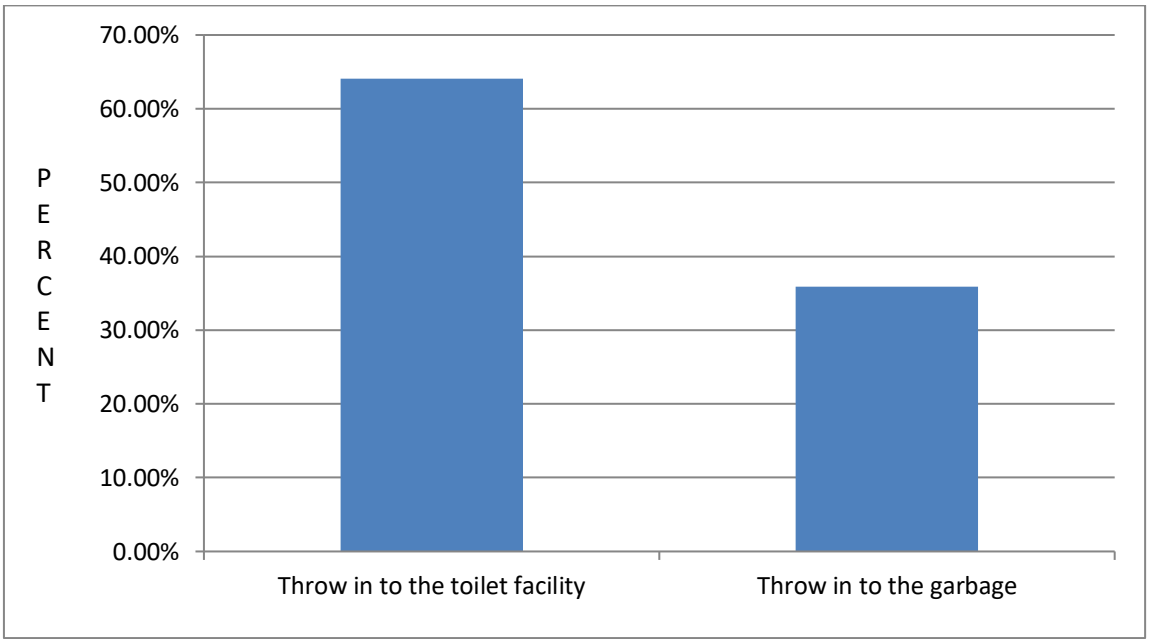


Figure 4: Methods used to dispose child faeces

4.7.4 Association of household sanitation facility, and sanitation practices among mothers and caretakers on Soil-Transmitted Helminths infections

When analyzing sanitation related factors, the presence and type of a toilet, number of household members who use the same toilet facility, as well as disposal of child fecal matter were not associated with the prevalence of STHs infections. All 5 (p=1.000) infected children were from 334 households that use flush toilets with a concrete floor with or without tiles (washable floor), and from 1-10 household members who use the same toilet facility. Disposal of child faeces was hygienic in those 5 (p=0.164) infected children. The details are presented in Table 10.

Table 10: Association of household sanitation facility and sanitation practices among mothers and caretakers and Soil-Transmitted Helminths infections

Variable	Infected (%)	Not Infected (%)	P value*
Type of toilet facility;			
Flush to piped sewer system	5 (1.5%)	329 (98.5%)	
Pit toilet with slab	0 (0.0%)	9 (100.0%)	1.000
Open pit toilet	0 (0.0%)	5 (100.0%)	
Condition of toilet facility;			
Floor is washable	5 (1.4%)	343 (98.6%)	
Floor is not washable	0 (0.0%)	0 (0.0%)	
Number of HH members who share toilet			
1-5	2 (0.8%)	263 (99.2%)	
6-10	3 (4.1%)	70 (95.9%)	0.142
11+	0 (0.0%0	10 (100.0%)	
Place where child defecate;			
Defecate on pot	4 (1.8%)	217 (98.2%)	0.656
Defecate in diaper/nappy	1 (0.8%)	126 (99.2%)	
Disposal of child fecal matter;			
Throw into the toilet facility	5 (2.2%)	218 (97.8%)	0.164
Throw into the garbage	0 (0.0%)	125 (100.0%)	

*P value of Fisher's Exact Test

4.8 Factors associated with Soil-Transmitted Helminths infections among Pre-school aged children

In bivariate regression analysis, factors such as marital status (p=0.119), family size (p=0.061), preparation of drinking water (p=0.156), and child fingernails condition (p=0.139), were associated with STHs infections at significance level of < 0.2. All the above factors were included in a multivariable analysis.

The multivariate logistic regression analysis confirmed that the only statistically significant factor is family size, with family size of more than five household members have an AOR of 0.117 (95% CI= 0.016-0.854, p=0.034) compared to those with 1-5 members. This suggests that larger families are less likely to be infected (about 88.3% lower odds). The p-value is 0.034, which is less than 0.05, indicating that this result is statistically significant. The confidence interval (0.016-0.854) does not cross 1; further supporting that larger family size is

significantly associated with lower likelihood of infection. On other hand, mothers and caretakers marital status, preparation of drinking water, and child fingernail condition showed that 3.497 times (95% CI= 0.517-23.638), 4.686 times (95% CI= 0.706-31.115), and 0.107 times (95% CI= 0.009-1.244) less likely to be infected with STH respectively. The details are summarized in Table 11and 12.

Table 11: Bivariate logistic regression analysis of infection status in relation to risk factors

Variables	UOR (95% CI)	P value
Age of mothers and caretakers (years);		
19-40	1	
41+	0.935 (0.103-8.507)	0.953
Marital status;		
Single	1	
Married	0.252 (0.045-1.422)	**0.119**
Occupation;		
Employed	1	
Unemployed	0.695 (0.345-1.401)	0.309
Level of education;		
Uneducated	1	
Educated	0.566 (0.093-3.442)	0.537
Family size;		
1-5	1	
>5	0.177 (0.029-1.080)	**0.061**
Preparation of drinking water;		
Treated water	1	
Untreated water	3.718 (0.606-22.795)	**0.156**
Hand washing facility;		
Have	1	
Do not have	0.848 (0.093-7.722)	0.844
Cleansing agent at hand washing place;		
Have	1	
Do not have	0.883 (0.097-8.033)	0.912
Hand safety before eating or feeding a child;		
Wash hands	1	
Do not wash	0.771 (0.085-6.992)	0.817
Place where child defecate;		
Defecate on the pot	1	
Defecate in the diaper/nappy	2.352 (0.260-21.273)	0.447

Age of child (months);		
12-35	1	
36-59	0.968 (0.897-1.045)	0.406
Child fingernails condition		
Trimmed	1	
Untrimmed	0.183 (0.019-1.738)	**0.139**

UOR= Unadjusted Odds Ratio

Table 12: Multivariate logistic regression analysis of infection status in relation to selected risk factors

Variable	**AOR (95% CI)**	**P value**
Marital status;		
Single	1	
Married	3.497 (0.517-23.638)	0.119
Family size;		
1-5	1	
>5	0.117 (0.016-0.854)	**0.034***
Preparation of drinking water;		
Treated	1	
Untreated	4.686 (0.706-31.115)	0.110
Child fingernails condition;		
Trimmed	1	
Untrimmed	0.107 (0.009-1.244)	0.074

*Significant factors with p-value < 0.05, AOR= Adjusted Odds Ratio

CHAPTER FIVE

5.0 DISCUSSION

5.1 Prevalence and intensity of Soil-Transmitted Helminthic infections among Pre-school aged children

In recent years, the MDA programs and other interventions in place in Zanzibar, including improvement of the water supply and health education, have led to a steady overall decline in STHs infections, especially from 2019 to 2021. This study was conducted in response to the need of acquiring new data on the prevalence (assessed on stool samples) and factors associated with the continued transmission of STHs infections (WASH related, knowledge and practice factors) in West B district after years of interventions in place.

The sustained low prevalence and low-intensity infections may imply that STH control programs have successfully reduced the burden among school-aged children. However, low-prevalence infections, even at minimal intensity, may still contribute to transmission, underscoring the need for continued, comprehensive intervention across all age groups.

Future studies might explore other transmission pathways, such as contaminated food or soil, as these could contribute to STH transmission despite the low prevalence and good sanitation practices observed in households.

The observed 1.4% prevalence is notably low compared to the previous study findings, like the 29% prevalence in Unguja Island (41). This suggests significant progress in infection control, likely due to interventions such as deworming, improved sanitation, and water supply, aligning with findings from other regions that report reduced infection rates following similar initiatives. The prevalence of STHs infections among PSAC in west B district was lower compared to that of 43.3%, 26.5% and 41,9% among PSAC at Hoima district in rural western Uganda (31), Ogun state in Nigeria (44) and at Huaphan province in Lao PDR (26) respectively. The difference in prevalence might be attributed to regional differences in climate, geography, and sanitation. These factors likely play a role in reducing STH transmission in Zanzibar and emphasize the success of focused health interventions in the area.

Low prevalence in STHs revealed by this study can be attributed to government initiatives to reduce STHs burden in the country. The government has conducted several deworming programs focused on preschool children, pregnant women and particularly the sustained national school-based deworming conducted in primary school children. Studies have proved that successful deworming of school aged children can reduce the total burden of disease due to intestinal worm infections to the whole community even in the absence of sanitation (45). In addition, low prevalence of STHs can also be attributed to unprogrammed deworming initiated by mothers and caretakers when children showed symptoms of STHs. Low prevalence of STHs reported in this study should not be ignored; it denotes continuity of STHs transmission in west B district and call for further efforts to increase coverage of deworming in PSAC because children left untreated are potential source of infection and reinfection in the community.

Species of soil transmitted helminths detected in this study were *Ascaris lumbricoides*, hook worms, and *Trichuris trichiura*. These findings are consistent with findings from a previous study conducted in Hoima district, rural western Uganda (31).

Regarding the intensity of STH, in this study all cases of STHs infections were found to be of low intensities, similar to findings of another recent study conducted in Gurage zone, Ethiopia (46). Finding of low intensity infections among all individuals who tested positive is in agreement with WHO findings which show that light intensity infection and, therefore, low morbidity is expected in areas with less than 20% prevalence of any soil-transmitted helminth infection (47). Findings from this study imply that, though the west B district has made progress to reduce STHs morbidity in SAC through sustained national school-based deworming, the presence of low prevalence of STHs infections among PSAC would conceivably be the source of continued transmission hence the need to sustain STHs control efforts across all age groups.

5.2 Influence of socio-demographic characteristics on Soil-Transmitted Helminths infections

In this study there was no association of infection with factors like age and sex of child, economic status, age of mothers and caretakers, and level of education. Lack of association might be due to low number of identified cases which could not show influence of those

factors on STHs distribution across various socio-demographic characteristics. Similar finding were reported in a study by Ummul-khair Mustafa conducted in Mkuranga, Tanzania (9). The results from this study showed that, children raised by public/private-employed parents had a higher infection risk, potentially due to less direct parental supervision, leading to increased exposure to contaminated environments. This contradicting with previous findings in Mkuranga, Tanzania (9), where children from self-employed caretakers had higher infection risk, perhaps due to more direct exposure to contamination in agricultural settings. The differences highlight how socioeconomic roles and care giving arrangements uniquely affect exposure risks across different contexts.

In this study, high knowledge about STHs among caretakers is linked to lower infection rates, consistent with findings from the previous study conducted in Busega district, Tanzania by Revocatus JL Mang'ara (48), this emphasizes the role of education in reducing transmission. However, it contradicting another previous study conducted in Muleba district in Tanzania (13), where low knowledge was common, suggesting that education on STHs may vary significantly by region and influence outcomes.

5.3 Level of knowledge of mothers and caretakers about Soil-Transmitted Helminths infections

In this study the level of knowledge of mothers and caretakers was high compared to those with poor knowledge about STHs infections. Mothers and caretakers with low level of knowledge about cause, mode of transmission, prevention and treatment of STHs were associated with increased infection compared to those with high level of knowledge, consistent with findings from the previous study conducted in Busega district, Tanzania by Revocatus JL Mang'ara (48), but contradicting another previous study conducted in Muleba district in Tanzania [Franco Zacharia *et al*., 2023] (13), which showed that the majority of participants had poor knowledge regarding the transmission and prevention of STHs infections.

5.4 Proportion dewormed in the past six months

By 2020, in endemic countries the goal was to increase their anthelminthic coverage to 75% in both PSAC and SAC, so as to achieve disease-eradication in certain circumstances (7). In this study, the reported uptake of deworming was positive, with 329 children received treatment

during routine clinic visits in the past six months. This suggests that existing public health initiatives are effectively reaching a significant number of children, which aligns with global health targets aimed at reducing the burden of STHs. However, the cancellation of a planned deworming campaign in December 2023 due to a lack of drugs raises concerns about the sustainability and continuity of these interventions. Regular deworming is critical for maintaining low prevalence rates and preventing the resurgence of infections. This interruption in drug supply highlights vulnerability in public health planning and resource allocation, which could impact progress toward disease control and elimination.

5.5 Availability and quality of toilet facility

The overall availability of toilet facility in the study area was 100% and the floors were washable, while the majority of respondents 334(95.9%) were using flush to piped sewer system, consistent with the findings observed in Muleba district Tanzania (Franco Zacharia *et al*., 2023), which reported high coverage of sanitation facilities 99.3%, while majority 90.0% meet the required standard (13). Such consistency about the availability of latrines between the two regions suggests that initiatives to improve sanitation infrastructure in Tanzania are achieving success, contributing to lower risks of Soil-transmitted Helminths (STHs) infections. These sanitation practices likely play a significant role in reducing transmission pathways for STHs by minimizing soil and water contamination through effective waste disposal. The finding supports the effectiveness of sustained government and community efforts in enhancing sanitation, which is crucial in STHs control. The high sanitation coverage observed could also indicate that, in addition to deworming, public health interventions emphasizing infrastructure improvements are pivotal in maintaining low prevalence rates. This may provide a model for other regions with lower sanitation coverage aiming to replicate these results in STH reduction.

5.6 Household main water sources for domestic use and its quality

The findings from this study indicated that all respondents (100.0%) used improved water sources**,** primarily piped water, for domestic purposes. This high level of access to improved water sources is a positive indicator of sanitation infrastructure and public health efforts in the area. However, despite having access to improved water, only 12.1% of households reported treating their drinking water by boiling, while a significant 83.9% consumed tap water without

treatment. This discrepancy raises important public health concerns. While access to improved water sources is crucial, the lack of treatment for drinking water suggests a potential risk for waterborne diseases, including Soil-transmitted Helminths (STHs). The practice of drinking untreated tap water, despite its classification as an improved source, may leave households vulnerable to fecal contamination, which can facilitate the transmission of STHs. The comparison with the Kiwangwa rural ward study (32) revealed similar patterns, where 61.7% of respondents also reported drinking untreated water, with a smaller portion 26.1% boiling their water. This consistency across studies emphasizes the need for greater awareness and education regarding water treatment practices, even when improved sources are available.

5.7 Mothers and caretakers hand washing habit, fingernails trimming habit and disposal of faeces of child

The findings from this study indicate that a significant 82.5% of households had designated hand washing facilities, primarily sinks (74.1%). This high prevalence of hand washing places is a positive aspect of hygiene practices in the community. However, only 48.3% of these households had water and soap available at the hand washing places during the survey, which is critical for effective hand hygiene. Moreover, the study found that 47.8% of respondents reported washing their hands at key times, such as before food preparation, before eating, or feeding a child, and after defecation. This aligns with findings from a similar study in Kiwangwa rural ward (32), where 40.9% of respondents practiced hand washing before eating, after eating, and after using the toilet.

While these percentages indicate a reasonable level of awareness and practice regarding hand hygiene, the availability of soap and water is a key factor in determining the effectiveness of these practices. The relatively low availability of soap suggests that even when hand washing facilities are present, the absence of soap can limit the effectiveness of hand hygiene efforts.

Improving access to soap and promoting its use in conjunction with hand washing can significantly enhance hygiene practices and reduce the transmission of Soil-transmitted Helminths (STHs). Public health interventions should focus on not only ensuring the availability of hand washing facilities but also on providing resources and education to encourage regular hand washing with soap, particularly in high-risk scenarios such as before meals and after using the toilet.

In this study, the low percentage of faecal matter disposal into the toilets compared to the previous study done by Ummul-khair Mustafa (9), suggests a potential gap in consistent sanitation practices. Disposing of feces in the garbage bin poses a risk for environmental contamination, which can contribute to the transmission of Soil-transmitted Helminths (STHs). This discrepancy may highlight differences in public health education or access to sanitation facilities between regions or indicate cultural or logistical factors affecting waste disposal practices. Improving awareness and access to proper faecal disposal methods could further reduce transmission risks. Encouraging universal toilet disposal for child feces, for instance, might reduce the potential for contamination and align more closely with best practices for STHs prevention. This finding suggests an opportunity to strengthen education on sanitation practices as part of broader public health efforts to control STHs infections.

5.8 Influence of WASH conditions on Soil-Transmitted Helminths

5.8.1 Influence of water on Soil-Transmitted Helminths

Use of contaminated drinking water is one of the factors that facilitate transmission of STHs (47) specifically, use of unimproved drinking water is significantly associated with increased odds of infection of orally-ingested species such as *A. lumbricoides*, and *T. trichiura* (49). This study found no significant association between STHs and water quality or sanitation, which may be due to the small number of cases or confounding factors like hand hygiene and food safety practices. This diverges from studies in Togo (50) and Nigeria (51), where unimproved water sources correlated with high infection risk. Here, the data suggest that while water quality is important, other hygiene behaviors such as food handling and hand washing may contribute more significantly to prevention of infection. The results from this current study show that, hand washing habits and trimmed nails was not significantly associated with lower infection rates, likely due to the overall low infection prevalence. While hand washing is typically linked to reduced STHs transmission, this finding may indicate that merely having access to hand washing facilities or the habit itself is not enough; adherence to effective hand washing practices (like duration, use of running water and soap) is critical (51).

5.8.2 Influence of mothers and caretakers hygienic practice on Soil-Transmitted Helminths

Hands contaminated by faecal matter play a major role in facilitating transmission of gastrointestinal diseases including STHs. Hand washing with water and soap is emphasized for removing germs and dirt harbored in various parts of the hands. Study carried out in Nigeria reported variation in STHs infections among those washing hand with water alone (10.3% *A. lumbricoides*, 2.1% hookworms), with water and soap (1% *A. lumbricoides*) and those not washing hand at all (27.8% *A. lumbricoides* and 10.3% hookworm) (44). Findings from the current study show that, there was no association between hand washing habit and STHs. Lack of association between hand washing habit with water and soap or water alone and STHs infections is due to several factors, first, it is due to a small number of infected cases in addition to other factors such as finding of infected cases among those washing hands with soap may be due to failure to adhere to key components of effective hand washing such as use of running water, mechanical action, washing entire hand, proper drying method and adequate time (30 seconds) (44).

5.8.3 Influence of sanitation on Soil-Transmitted Helminths

Household sanitation condition is one of the major factors that facilitate STHs transmission; more precise, unimproved sanitation is significantly associated with increased odds of infection of skin-penetrators such as hookworms (49). Findings from the current study did not find any association between STHs and sanitation conditions. Findings from this study are justifiable, first lack of association is due to small number of infected cases and besides infection might have been acquired due to other risk factors which were not investigated in this study such as walking barefoot, playing with soils, accidental or intentional eating of soil, eating vegetables not properly cooked and eating fruits not properly washed or unpeeled

5.9 Limitations

Only single stool specimen was analyzed and might cause underestimation of STHs prevalence because of variation in eggs excretion over time.

The small number of STHs infections made it difficult to assess associations of STHs with socio-economic status, water, sanitation and hygienic conditions.

No interview was done during the study of health officers, hence missed health information on the implementation of deworming program for PSAC and the associated factors.

Information on the deworming history of the child was obtained through mothers and caretakers self-reporting which might have caused recall bias. Nevertheless, we believe that they were able to recall because drug for STHs is the only drug administered in tablet form at clinic visits and campaigns.

Lastly, the study was cross-sectional design which captures data at a single point in time, making it difficult to establish cause-and-effect relationship. Without longitudinal data, researchers cannot determine whether an exposure led to an outcome or vice versa.

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CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

There is STHs continued transmission in the study area with prevalence of 1.4%. The occupation of mothers and caretakers, family size, preparation of drinking water, hand washing habit and place of child faecal matter disposal are the factors associated with STHs transmission.

This study demonstrated that STHs is still a public health problem to PSAC even after several rounds of MDA. This calls for continued effort towards annual MDA, community wide treatment, and continue with bi-annual treatment plans for effective control of morbidities associated with STHs. Hence, more research is needed to understand the causes of persistent transmission of STHs infection in the selected area and other parts of the district, and the low prevalence of STHs obtained from the study need to be kept under surveillance by regular screening.

6.2 Recommendation

Health education should be given to mothers and caretakers on water, personal hygiene and sanitation. The good practices of WASH should be promoted, as well as promotion of deworming. The importance of treating water (both improved and unimproved) for domestic use and the proper way to dispose fecal matter of the child should be included in Community health care education.

The infected PSAC may serve as a source of reinfection and continued transmission of STHs in the community; hence, there is a need to find the best prevention and treatment strategies to eliminate STHs

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APPENDICES

Appendix I: Consent Form – English version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES -
DIRECTORATE OF RESEARCH & PUBLICATION

Consent to take part in this research

Greetings! My name is Hafidh Ali Khamis, and I am from Muhimbili University of Health and Allied Sciences (MUHAS) in Dar es Salaam, I am currently conducting research to determine the prevalence of soil-transmitted helminth infections, uptake of preventive chemotherapy, and factors associated with the transmission of soil-transmitted helminth infections among preschool-aged children in West B district, Unguja Zanzibar.

Aim of the study

The aim of this study is to gather data on the prevalence and intensity of soil-transmitted helminths infections, uptake of preventive chemotherapy, and associated factors among preschool-aged children in West B district, Unguja Zanzibar. You are being requested to take part in this study because you have important information and experience that could be valuable to the study,

What to expect during participation

- To give details about your socio-demographic status and personal hygiene.
- To give details regarding the child's demographic status, uptake of preventive chemotherapy, and the associated factors.
- To give details about the socioeconomic status of the household, water access for the home, and sanitation and hygiene issues.
- To provide your child's stool sample for the diagnosis of soil-transmitted helminth infections.

Confidentiality

I guarantee the confidentiality of any information pertaining to you, the child, and the living conditions. Access to the information will be restricted to those involved in the research project. We promise not to record any personally identifiable information in any of our records.

Benefits

If you concur to take part in this study, there may be direct or indirect benefits to you and your child.

Direct benefit

If your child is found to be infected, you will be directed to a health facility for timely and appropriate treatment.

Indirect benefit

Your involvement in this research will help in estimating the extent of soil-transmitted helminth infection in this community, assessing the uptake of preventative chemotherapy for soil-transmitted helminth control among preschool-aged children, and identifying variables influencing program execution. The proper authorities will receive the information in order to assess the efficacy of the current program and, if necessary, create alternative programs.

The right to drop out or refuse to answer some questions

Participation in this research is entirely voluntary. Even though you have provided your consent to participate in the study, you are free to withdraw at any moment and without any harm. There will be no consequences or loss of benefits if you choose not to participate in the study or withdraw from it. You might feel uneasy answering some of the researcher's questions; you may choose not to respond to them for any reason, and you don’t have to explain why.

In case of injury

We do not expect that your participation in this study will cause any harm to you or your family.

Payment

For providing stool samples and other information as asked by the researcher, there will be no payment. But rest assured, I really value your participation.

Who to contact

In case you have any inquiries concerning this research, kindly reach out to:

Hafidh Ali Khamis, (**Principal researcher**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number +255778480847/ +255750603421)

You can also contact my supervisors:

Dr R. Njau, (**Supervisor**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number +255786017755/+255754007755)

Dr D. Gasarasi, (**Supervisor**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number +255715301849)

Are you willing to take part in this study and respond to questions?

Participant decision ……

I …….have read and comprehended the information contained in this form. My inquiries have received a response. I consent to participate in this research.

Participant's signature ……..

Witness' signature (if participant can't read/write) ……

Researcher / assistant's signature …….

Date ……..

Appendix II: Fomu ya ridhaa – Kwa Kiswahili

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI KURUGENZI YA UTAFITI NA MACHAPISHO

Idhini ya kushiriki katika utafiti huu

Salamu! Naitwa Hafidh Ali Khamis, ninatoka katika chuo kikuu cha afya na sayansi shirikishi cha Muhimbili, kilichopo jijini Dar es salaam. Kwa sasa ninafanya utafiti ili kubaini kiwango cha kuenea kwa maambukizi ya magonjwa ya minyoo inayosambazwa kwa njia ya udongo, matumizi ya dawa za kukinga minyoo, na sababu zinazohusiana na uambukizaji wa minyoo inayosambazwa kwa njia ya udongo miongoni mwa watoto wenye umri kati ya miezi 12 mpaka 59 ndani ya Wilaya ya Magharibi B, Unguja Zanzibar.

Lengo la utafiti

Lengo la utafiti huu ni kukusanya data juu ya kiwango cha maambukizi na ukubwa wa maambukizo ya minyoo inayosambazwa kwa njia ya udongo, matumizi ya dawa za kukinga minyoo, na sababu zinazohusiana na uambukizaji wa minyoo inayosambazwa kwa njia ya udongo miongoni mwa watoto wenye umri kati ya miezi 12 mpaka 59 ndani ya Wilaya ya Magharibi B, Unguja Zanzibar. Unaombwa kushiriki katika utafiti huu kwa sababu una taarifa muhimu na uzoefu ambao unaweza kuwa muhimu kwa utafiti.

Nini cha kutarajia wakati wa kushiriki

- Kutoa maelezo kuhusu hali yako ya kijamii na kidemografia, na usafi wa kibinafsi.
- Kutoa maelezo kuhusu hali ya kidemografia ya mtoto, matumizi ya dawa za kukinga minyoo, na sababu nyengine mbali mbali zinazopelekea mtoto kupata maambukizo ya minyoo.
- Kutoa maelezo kuhusu hali ya kijamii na kiuchumi ya nyumbani, upatikanaji wa maji kwa ajili ya matumizi ya nyumbani, na hali ya miundombinu ya kuhifadhi kinyesi cha binaadamu na usafi wa mazingira na binafsi.
- Kutoa sampuli ya kinyesi cha mtoto wako kwa utambuzi wa maambukizo ya minyoo

inayosambazwa kwa njia ya udongo.

Usiri

Ninakuhakikishia usiri wa taarifa zozote zinazokuhusu wewe, mtoto na hali ya maisha. Upatikanaji wa taarifa utawekwa tu kwa wale wanaohusika katika mradi wa utafiti. Tunaahidi kutorekodi taarifa zozote zinazoweza kumtambulisha mtu binafsi katika rekodi zetu zozote.

Faida

Ukikubali kushiriki katika utafiti huu, kunaweza kuwa na manufaa ya moja kwa moja au yasiyo ya moja kwa moja kwako na kwa mtoto wako.

Manufaa ya moja kwa moja

Iwapo mtoto wako atagundulika kuwa ameambukizwa minyoo, utaelekezwa kwenye kituo cha afya kwa matibabu mwafaka na ya wakati.

Manufaa yasiyo ya moja kwa moja

Kushiriki kwako katika utafiti huu kutasaidia katika kukadiria kiwango cha maambukizi ya minyoo yanayosambazwa kwa njia ya udongo katika jamii hii, kutathmini utumiaji wa dawa za kukinga maambukizi ya minyoo hiyo miongoni mwa watoto kuanzia miezi 12 mpaka miezi 59, na kutambua sababu zinazoathiri utekelezaji wa programu. Mamlaka husika zitapelekewa taarifa ili kutathmini ufanisi wa programu ya sasa na, ikiwa ni lazima, kuunda programu mbadala.

Haki ya kuacha au kukataa kujibu baadhi ya maswali

Kushiriki katika utafiti huu ni hiari kabisa. Ingawa umetoa idhini ya kushiriki, uko huru kujiondoa wakati wowote na bila madhara yoyote. Hakutakuwa na adhabu au hasara ya manufaa ikiwa utachagua kutoshiriki na kujiondoa katika utafiti. Unaweza kujisikia vibaya kujibu baadhi ya maswali; unaruhusiwa kutokujibu kwa sababu yoyote, na huna haja ya kueleza kwa nini.

Katika kesi ya kuumia

Hatutarajii kwamba ushiriki wako katika utafiti huu utasababisha madhara yoyote kwako au kwa familia yako.

Malipo

Kwa kutoa sampuli za kinyesi na taarifa nyingine kama ilivyoulizwa na mtafiti, hakutakuwa na malipo. Lakini uwe na uhakika, ninathamini sana ushiriki wako.

Watu wa kuwasiliana nao

Iwapo una maswali yoyote kuhusu utafiti huu, tafadhali wasiliana na:

Hafidh Ali Khamis, (**Mtafiti mkuu**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number +255778480847/+255750603421)

Unaweza pia kuwasiliana na wasimamizi wangu wa utafiti huu:

Dr R. Njau, (**Msimamizi wa utafiti**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number+255786017755/+255754007755).

Dr D. Gasarasi, (**Msimamizi wa utafiti**), Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Phone number +255715301849).

Je, uko tayari kushiriki katika utafiti huu na kujibu maswali?

Uamuzi wa mshiriki ……

Mimi …….nimesoma na kuelewa taarifa zilizomo katika fomu hii. Maswali yangu yamepata majibu. Ninakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki …….

Sahihi ya shahidi (ikiwa mshiriki hawezi kusoma/kuandika) ……..

Sahihi ya Mtafiti / msaidizi …….

Tarehe …….

Appendix III: Questionnaire- English version

FACTORS ASSOCIATED WITH THE TRANSMISSION OF SOIL-TRANSMITTED HELMINTH INFECTIONS SURVEY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES - DIRECTORATE OF RESEARCH & PUBLICATIONS

ADMINISTRATIVE DETAILS:

QUESTIONNAIRE ID NUMBER…… DISTRICT……

WARD……

SHEHIA……HOUSE NUMBER……

NAME OF SHEHA…….

NAME OF THE INTERVIEWER……..

DATE OF INTERVIEW……..…..

Greetings,

My name is Hafidh Ali Khamis, and I am working on this survey with the goals of assessing factors associated with the transmission of soil-transmitted helminths among preschool-aged children in West B district, Unguja Zanzibar. We are requesting your participation in this study because we believe your specific experiences and knowledge will be valuable to the research.

Ask the questions to the respondent (mother or caretaker) and circle the appropriate letter.

SOCIODEMOGRAPHIC INFORMATION OF MOTHER OR CARETAKER

1	**How old are you? (in years)**	
2	**What is your marital status?**	**a) Single** **b) Married** **c) Cohabiting** **d) Divorced** **e) Widow** **f) Separated**
3	**What is your level of education?**	**a) Never attended school** **b) Primary school** **c) Secondary school** **d) College level** **e) Adult education**
4	**What is your employment status?**	**a) House wife** **b) Peasant** **c) Self employed** **d) Public employee** **e) Private employee** **f) Others (specify)…….**
5	**What is your relationship with this child?**	**a) Parent** **b) Caretaker**
6	**How many people live in your household?**	
7	**How many children aged below five years live in your household?**	**……**

EVALUATE THE HOUSING CONDITION AND CIRCLE WHERE APPROPRIATE

8	**What kind of wall material is used in your home?**	**a) Grass/trunks/bamboo** **b) Poles with mud** **c) Sun-dried bricks/mud brick** **d) Baked bricks** **e) Cement blocks** **f) Other (specify)……**
9	**What is the roof of your house made of?**	**a) Grass/palm leaf** **b) Galvanized steel** **c) Concrete** **d) Other (specify)…….……**
10	**What is the floor of your house made of?**	**a) Earth/sand** **b) Cement** **c) Concrete** **d) Tiles** **e) Carpet** **f) Other……..**

HOUSEHOLD WATER CONDITION

11	**What is the main source of water in your household?**	**a) Piped into dwelling/ yard/plot** **b) Piped somewhere else** **c) Public tap/standpipe** **d) Tube well or borehole** **e) Protected well** **f) Unprotected well** **g) Protected spring** **h) Unprotected spring** **i) Bottled water**

		j) Rainwater **k) Surface water (river /dam/ lake/ pond/ stream/canal/ irrigation channel)**
12	**How do you prepare drinking water**	**a) Boiling** **b) Chlorinate** **c) Filtering** **d) Nothing** **e) Other (specify)……..**

MOTHER OR CAREGIVER AND CHILD HYGENIC CONDITIONS (OBSERVE AND TICK WHERE APPROPRIATE)

13	**Do you have a hand washing place where household members use to wash hands? If the answer is no skip to question 17**	**a) Sink** **b) Tippy tap** **c) Bucket with tap** **d) No place**
14	**Do you have cleansing agent in the hand washing place?**	**a) Water and soap** **b) Water only** **c) Nothing** **d) Other material (specify)…….……..**
15	**How do you ensure safety of your hands before preparing food?**	**a) I wash with water and soap** **b) I wash with water only** **c) I usually don't wash**
16	**How do you ensure safety of your hands before eating or feeding a child?**	**a) I wash with water and soap** **b) I wash with water only** **c) Sometimes I don't wash** **d) Other means (specify)……..**
17	**How do you ensure safety of your hands**	**a) I wash with water and soap**

	after defecation?	**b) I wash with water only** **c) I don't wash** **d) Other means (specify)…….**
18	**Observe condition of mother/caretakers finger nails**	**a) Trimmed** **b) Untrimmed**
19	**Observe child finger nails**	**a) Trimmed** **b) Untrimmed**

SANITATION CONDITIONS OF THE HOUSEHOLD (OBSERVE AND TICK WHERE APPROPRIATE)

20	**Where is your toilet facility located? If the answer is no skip to question 26.**	**a) Toilet facility present** **b) No toilet facility**
21	**What type of toilet facility do you use?**	**a) Flush to piped sewer system** **b) Flush to septic tank** **c) Flush to pit toilet facility** **d) Ventilated improved pit toilet facility** **e) Pit toilet facility with slab (washable)** **f) Pit toilet facility without slab/open pit** **g) Bush/bucket/field**
22	**What is the condition of toilet facility floor?**	**a) The floor is washable and in good condition** **b) The floor is not washable or the floor is in bad condition**
23	**Do you share toilet facility with other household members?**	**a) Yes** **b) No**
24	**How many household members use toilet**	

	facility?	**……**
25	**Is the toilet facility appropriately used by household members? Observe if there is no stool around the house, outside drop hole, on the toilet facility floor and latrine wall. Tick where appropriate.**	**a) Yes** **b) No**
26	**What do you do when a child want to defecate?**	**a) Defecate in the toilet facility** **b) Defecate on pot** **c) Defecate on the ground** **d) Defecate in the diaper/nappy**
27	**After the child defecate, what is done to dispose stool of the child?**	**a) Rinse/throw into the toilet facility** **b) Throw into garbage** **c) Burry in the soil** **d) Throw into bush/field**
28	**How do you ensure safety of your hands after cleaning a defecated child?**	**a) I wash with water and soap** **b) I wash with water only** **c) I don't wash** **d) Other means (specify)……..**

LEVEL OF KNOWLEDGE OF MOTHER AND CAREGIVER ON TRANSMSSION, PREVENTION, AND TREATMENT OF STH INFECTIONS

29	**What is the cause of soil-transmitted helminthic infections?**	**a) Witchcraft** **b) Mosquito** **c) Worm** **d) Bacteria** **e) I don't know**
30	**Which of the following ways may lead to soil-transmitted helminthic infections?**	**a) Eating contaminated food or drinking contaminated water/walking barefoot**

		b) Swimming/bathing/washing in infested water **c) Sexual intercourse** **d) Contact with infected person** **e) I don't know**
31	**How can you prevent yourself from getting soil-transmitted helminthic infections?**	**a) Wash hands with water and soap** **b) Avoid swimming/bathing/washing in the lake** **c) Avoid unprotected sexual intercourse with infected person** **d) Avoid contact with infected person** **e) I don't know**
32	**Which ways can be used to control soil-transmitted helminthic infections?**	**a) Participating in deworming programs regularly** **b) Use condoms during sexual intercourse** **c) Use of mosquito repellents** **d) Habitat modification of snails** **e) I don't know**
33	**How much of the medication should be taken and how often?**	**a) 1 tablet every 6 months** **b) 2 tablets every 6 months** **c) 1 tablet every 12 months** **d) 2 tablets every 12 months** **e) I don't know**
34	**Which way can be used to treat soil-transmitted helminthic infections?**	**a) Traditional medicine** **b) Hospital medicine**

		c) I don't know

DEMOGRAPHIC INFORMATIONS OF THE CHILD

35	**Date of birth**	**Date…… Month……. Year……** **Age in months…….**
36	**Sex**	**a) Male** **b) Female**

INFORMATION ON CLINIC ATTENDANCE AND DEWORMING DRUGS ADMINISTERED DURING CLINIC

37	**Does the child attend RCH clinics? If the answer is no skip to question 45**	**a) Yes** **b) No**
38	**Does the child have RCH card? Request the card and tick where appropriate**	**a) Yes** **b) No** **c) Other document (specify)……**
39	**What is the name of the RCH clinic?**	
40	**Was the child given deworming drug? If the answer is no skip to question 44**	**a) Yes** **b) No**
41	**Did the child utilize the drug? If the answer is no skip to question 43**	**a) Yes** **b) No**
42	**Do you think the given drug has any benefit?**	**a) It prevents worm infection** **b) It cures worm infection** **c) Make the child healthy** **d) Other benefit……**
43	**Why the child didn't utilize the given drug?**	**a) I don't know the benefit** **b) Afraid of side effect** **c) Not at risk of disease**

		d) Child is not sick **e) Drugs are not working** **f) Other reason (specify)……**
44	**Why the child was not given drug?**	**a) Drugs finished/no drugs** **b) Not at risk of disease** **c) Child is not sick** **d) Afraid of side effects** **e) Drugs are not working** **f) Other reason (specify)……..**
45	**Why the child is not attending clinic?**	**a) Child is healthy** **b) Long distance** **c) No one to take the child** **d) Long queue** **e) Child attend preschool** **f) Other reason (specify)……**

VITAMIN A SUPPLEMENT AND DEWORMING CAMPAIGN INFORMATION

46	**Did any Vitamin A supplementation and deworming campaign take place in your area in the past six months before this survey? If the answer is no skip to question 50**	**a) Yes** **b) No** **c) Not sure**
47	**Where that campaign took place?**	**a) Health facility** **b) Temporary clinic** **c) Other place (specify)……**
48	**How did you know about the occurrence of that campaign?**	**a) Relative/friend/neighbor** **b) Health officer** **c) Village officer/religious head**

		d) Mass media
49	**Did you take the child to that campaign? If the answer is no skip to question 55**	**a) Yes** **b) No**
50	**Was the child given drug in that campaign? If the answer is no skip to question 54**	**a) Yes** **b) No**
51	**Did the child utilize the given drug? If the answer is no skip to question 53**	**a) Yes** **b) No**
52	**Do you think the drug has any benefit?**	**a) It prevents worm infection** **b) It cures worm infection** **c) Make the child healthy** **d) Other benefit (specify).....**
53	**Why the child didn't utilize the given drug?**	**a) I don't know the benefit** **b) Afraid of side effect** **c) Not at risk of disease** **d) Child is not sick** **e) Drugs are not working** **f) Other reason (specify)…….**
54	**Why the child was not given the drug?**	**a) Drugs finished/no drugs** **b) Not at risk of disease** **c) Child is not sick** **d) Afraid of side effects** **e) Drugs are not working** **f) Other reason (specify)……..**
55	**Why you didn't take the child to that campaign?**	**a) No one to take the child** **b) Child was not present**

c) **Afraid of side effects**
d) **Child is not sick**
e) **Father/parents refused**
f) **Child attend preschool**
g) **Long distance**
h) **Other reason (specify)…….**

UNPROGRAMMED DEWORMING INFORMATION

56 **What do you do to ensure the child get preventive chemotherapy?**
a) **I buy and give drug**
b) **I don't give drug**

57 **After how long do you give the child drug?**
a) **Once a year**
b) **Every six months**
c) **When I suspect the child is infected**

58 **When was the last time to give drug?**

Thank you for your participation, do you have any question

Appendix IV: Dodoso la utafiti – Kwa Kiswahili

DOSOSO LA UTAFITI WA MINYOO TUMBO

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA UTAFITI NA MACHAPISHO

MAELEZO YA UTAWALA:

DODOSO NAMBARI…..…….……. WILAYA……..……

WADI…….……

SHEHIA……...…. NAMBARI YA NYUMBA……

JINA LA SHEHA……..

JINA LA ANAEHOJI……

TAREHE YA MAHOJIANO……..…….

Habari,

Jina langu ni Hafidh Ali Khamis, na ninafanyia kazi utafiti huu kwa malengo ya kuchunguza mambo yanayohusiana na uenezaji wa minyoo inayosambazwa kwa njia ya mchanga miongoni mwa watoto wenye umri chini ya miaka 5 katika wilaya ya Magharibi B, Unguja Zanzibar. Tunaomba ushiriki wako katika utafiti huu kwa sababu tunaamini uzoefu na maarifa yako mahususi yatakuwa muhimu kwa utafiti huu.

Muulize swali mama au mlezi wa mtoto kasha zungushia jibu lililo sahihi upate wa kulia

TAARIFA ZA KIJAMII NA KIDEMOGRAFIA ZA MAMA AU MLEZI WA MTOTO

1 Una miaka mingapi?

2 Ni ipi hali yako ya ndoa?

a) Sijaolewa
b) Nimeolewa
c) Tunaishi pamoja
d) Tumeachana
e) Mjane
f) Tumetengana

3 Kiwango chako cha elimu ni kipi?

a) Sikusoma
b) Elimu ya msingi
c) Elimu ya sekondari
d) Elimu ya juu
e) Elimu ya watu wazima

4 Unafanya shughuli gani ili kupata kipato?

a) Mama wa nyumbani
b) Mkulima mdogo
c) Nimejiajiri mwenyewe?mfanya biashara
d) Mtumishi wa umma
e) Mfanyakazi wa taasisi binafsi
f) Nyengine (Itaje) ……..…….

5 Una uhusiano gani na huyu mtoto?

a) Mzazi
b) Mlezi

6 Ni watu wangapi wanaishi katika nyumba hii? ……..

7 Ni watoto wangapi walio chini ya umri wa miaka 5 wanaishi humu ndani? …….

TATHMINI HALI YA NYUMBA NA ZUNGUSHIA DUARA PALE INAPOFAA

8 Ni aina gani ya nyenzo za ukuta zilizotumiwa nyumbani kwako?

a) Nyasi/ vigogo/ mianzi
b) Fito zenye matope
c) Matofali yaliyokaushwa kwa jua/matofali ya udongo
d) Matofali ya kuokwa
e) Vitalu vya saruji
f) Nyingine (taja)……..

9 Paa la nyumba yako limetengenezwa kwa kutumia nini?

a) Nyasi/jani la mitende
b) Mabati ya kuezeka kwenye nyumba
c) Zege
d) Nyingine (taja) ……

10 Je! Sakafu ya nyumba yako imetengenezwa na nini?

a) Udongo
b) Saruji
c) Zege
d) Vigae
e) Zulia
f) Nyingine…..……...

HALI YA MAJI KATIKA KAYA (NYUMBA MNAYOISHI)

11 Je, chanzo kikuu cha maji katika kaya yako ni kipi?

a) Bomba limeingizwa ndani ya nyumba /yadi/kiwanja
b) Bomba lipo mahali pengine
c) Bomba la umma/bomba la kusimama
d) Kisima kirefu
e) Kisima cha kuchimbwa kwa mkono (kinachotunzwa)

f) **Kisima cha kuchimbwa kwa mkono (kisichotunzwa)**
g) **Chemchem iliyohifadhiwa**
h) **Chemchem isiyohifadhiwa**
i) **Maji ya chupa**
j) **Maji ya mvua**
k) **Maji ya juu ya ardhi (mto / bwawa /ziwa/dimbwi/mfereji/ mfereji wa umwagiliaji).**

12 Unatayarishaje maji ya kunywa?

a) **Kuchemka**
b) **Klorini**
c) **Kuchuja**
d) **Sifanyi chochote**
e) **Nyingine (taja)……**

HALI YA USAFI YA MAMA AU MLEZI NA MTOTO (TAZAMA NA UWEKE ALAMA SEHEMU INAYOFAA)

13 Je, una sehemu ya kunawia mikono ambapo wanakaya hutumia kunawa mikono? Kama jibu ni hapana ruka mpaka swali la 17

a) **Kuna sinki la kunawia mikono**
b) **Kuna kibuyu chirizi**
c) **Kuna ndoo yenye koki**
d) **Hakuna sehemu ya kunawia mikono**

14 Je! Kuna vifaa vya kusafisha mikono kwenye sehemu ya kunawia mikono?

a) **Kuna Maji na sabuni**
b) **Kuna Maji pekee**
c) **Hakuna kitu chochote**
d) **Vifaa vingine (taja)……**

15 Je, unahakikishaje usalama wa mikono yako kabla ya kuandaa chakula?

a) **Naosha kwa maji na sabuni**
b) **Naosha kwa maji pekee**

		c) Kwa kawaida huwa sioshi
16	**Je, unahakikishaje usalama wa mikono yako na ya mtoto kabla ya kula au kumlisha mtoto?**	**a) Naosha kwa maji na sabuni** **b) Naosha kwa maji pekee** **c) Wakati mwingine sioshi** **d) Njia zingine (taja)……..**
17	**Je, unahakikishaje usalama wa mikono yako baada ya kujisaidia haja kubwa?**	**a) Naosha kwa maji na sabuni** **b) Naosha kwa maji pekee** **c) Sioshi** **d) Njia zingine (taja)……**
18	**Angalia hali ya kucha za vidole vya mama/mlezi**	**a) Kucha zimepunguzwa (fupi)** **b) Kucha hazijapunguzwa (ndefu)**
19	**Angalia kucha za vidole vya mtoto**	**a) Kucha zimepunguzwa (fupi)** **b) Kucha hazijapunguzwa (ndefu)**

MATUMIZI YA CHOO KATIKA KAYA

20	**Choo chako kinapatikana wapi? Kama jibu ni hakuna ruka swali la 26.**	**a) Choo kipo** **b) Hakuna choo**
21	**Je, unatumia choo cha aina gani?**	**a) Choo cha maji kilichounganishwa na mtaro wa maji machafu** **b) Choo cha maji kilichounganshwa na tanki la maji machafu nje** **c) Choo cha maji kilichounganishwa na shimo la choo** **d) Choo cha shimo Chenye bomba la kutolea hewa** **e) Choo cha shimo chenye mfuniko** **f) Choo cha shimo kisicho na mfuniko**

		g) Kichaka/ndoo/porini
22	**Je, sakafu ya choo iko katika hali gani?**	**a) Choo kina sakafu inayosafishika na ipo kwenye hali nzuri** **b) Choo hakina sakafu ya kusafishika au hali ya sakafu ni mbaya**
23	**Je, unatumia choo na wanakaya wengine?**	**a) Ndio** **b) Hapana**
24	**Je, wanakaya wangapi wanatumia choo?**	
25	**Je, choo kinatumiwa ipasavyo na wanakaya? Angalia kama hakuna kinyesi ndani ya nyumba, kando ya tundu la choo, kwenye sakafu ya choo na ukuta wa choo. (Weka alama inapofaa).**	**a) Ndio** **b) Hapana**
26	**Unafanya nini mtoto anapotaka kujisaidia haja kubwa?**	**a) Hujisaidia/nampeleka chooni** **b) Nampanga kwenye poti** **c) Hujisaidia/nampanga ardhini**
27	**Baada ya mtoto kujisaidia haja kubwa, nini kinafanywa ili kutupa kinyesi cha mtoto?**	**a) Namsuuza/natupa kwenye choo** **b) Natupa kwenye takataka** **c) Nachimba shimo na kufukia** **d) Natupa msituni/shambani**
28	**Baada ya mtoto kujisaidia, unahakikishaje usafi wa mikono yako na ya mtoto?**	**a) Naosha mikono yangu/ yake kwa maji na sabuni** **b) Naosha mikono yangu/yake kwa maji pekee** **c) Sioshi mikono** **d) Njia zingine (taja)…….……**

KIWANGO CHA MAARIFA YA MAMA NA MLEZI JUU YA MAAMBUKIZO, KINGA NA TIBA YA MAGONJWA YA MINYOO

29 Je, minyoo inasababishwa na nini?

a) Uchawi
b) Mbu
c) Mnyoo
d) Bakeria
e) Sijui

30 Ni ipi kati ya njia zifuatazo husabaisha maambukizi ya minyoo?

a) Kula chakula au kunywa maji yaliyochafuliwa na vidudu vya minyoo/kutembea bila viatu
b) Kuogelea/kuoga/kufua kwenye maji yalishambuliwa na vidudu
c) Kujamiiana
d) Kugusana na mtu alieambukizwa
e) Sijui

31 Je, unawezaje kujikinga na minyoo?

a) Nawa mikono kwa maji na sabuni
b) Epuka kuogelea/kuoga/kufua ziwani
c) Epuka kujamiiana bila kinga na mtu aliyeambukizwa
d) Epuka kugusana na mtu aliyeambukizwa
e) Sijui

32 Je, ni njia gani zinaweza kutumika kudhibiti maambukizi ya minyoo?

a) Kushiriki katika programu za dawa za minyoo mara kwa mara
b) Tumia kondomu wakati wa kujamiiana
c) Matumizi ya dawa za kuua mbu
d) Marekebisho ya makazi ya konokono

		e) Sijui
33	**Ni kiasi gani cha dawa kinapaswa kumezwa na mara ngapi?**	**a) Kidonge kimoja kila baada ya miezi 6** **b) Vidonge viwili kila baada ya miezi 6** **c) Kidonge kimoja kila baada ya miezi 12** **d) Vidonge viwili kila baada ya miezi 12** **e) Sijui**
34	**Njia gani inaweza kutumika kutibu maambukizi ya minyoo?**	**a) Dawa asilia** **b) Dawa za hospitali** **c) Sijui**

TAARIFA ZA KIDEMOGAFIA ZA MTOTO

35	**Mtoto wako amezaliwa tarehe ngapi?**	**Tarehe.....…Mwezi…..…Mwaka……** **Umri wa mtoto (miezi).....**
36	**Mtoto wako ana jinsia gani?**	

TAARIFA ZA MAHUDHURIO YA KLINIKI NA DAWA ZA MINYOO ZINAZOTOLEWA WAKATI WA KLINIKI

37	**Je, mtoto anahudhuria kliniki za RCH? Kama jibu ni hapana ruka mpaka swali la 45**	**a) Ndio** **b) Hapana**
38	**Je, mtoto ana kadi/daftari la kliniki? Omba kuona na uweke alama inapofaa**	**a) Kadi/daftari analo** **b) Kadi/daftari hana** **c) Ana hati nyengine**
39	**Anahudhuria kliniki gani? (Taja jina)**	
40	**Je, mtoto alipewa dawa ya minyoo? Kama jibu ni hapana ruka mpaka swali la 44**	**a) Ndio** **b) Hapana**
41	**Mtoto alitumia dawa hiyo? Kama jibu ni hapana ruka mpaka swali la 43**	**a) Ndio** **b) Hapana**

42 Je, unafikiri dawa iliyotolewa ina faida yoyote?

a) **Huzuia maambukizi ya minyoo**
b) **Hutibu maambukizi ya minyoo**
c) **humfanya mtoto awe na afya njema**
d) **Faida nyingine……**

43 Kwa nini mtoto hakutumia dawa hiyo?

a) **Sifahamu faida zake**
b) **Nilihofia madhara**
c) **Hayuko kwenye hatari ya kupata minyoo**
d) **Mtoto si mgonjwa**
e) **Dawa hazifanyi kazi**
f) **Sababu nyingine (taja)……..**

44 Kwa nini mtoto hakupewa dawa?

a) **Dawa ziliisha/hazikuwepo**
b) **Hayuko kwenye hatari ya kupata minyoo**
c) **Mtoto si mgonjwa**
d) **Nilihofia madhara**
e) **Dawa hazifanyi kazi**
f) **Sababu nyingine (taja)…….....**

45 Kwa nini mtoto hahudhurii kliniki?

a) **Mtoto anaendelea vizuri (ana afya)**
b) **Umbali mrefu**
c) **Hakuna mtu wakumpeleka**
d) **Foleni kubwa**
e) **Anaenda shule**
f) **Sababu nyingine (taja)…….**

TAARIFA KUHUSU KAMPENI ZA MATONE YA VITAMINI A NA DAWA ZA KUKINGA MINYOO

46	**Je, kuna kampeni yoyote ya matone ya vitamini A na dawa za minyoo ilifanyika katika eneo lako katika kipindi cha miezi sita kabla ya utafiti huu? Kama jibu ni hapana ruka mpaka swali la 50**	**a) Ndio** **b) Hapana** **c) Sina uhakika**
47	**Kampeni hiyo ilifanyika wapi?**	**a) Kituo cha afya** **b) Kliniki ya muda** **c) Mahali pengine (taja)……**
48	**Je, ulifahamu vipi kuhusu uwepo wa hiyo kampeni?**	**a) Ndugu / rafiki/ jirani** **b) Mhudumu wa afya** **c) Kiongozi wa kijiji au kiongozi wa dini** **d) Chombo cha habari**
49	**Je ulimpeleka mtoto kwenye hiyo kampeni? Kama jibu ni hapana ruka mpaka swali la 55**	**a) Ndio** **b) Hapana**
50	**Je mtoto alipewa dawa ya minyoo kwenye hiyo kampeni ilyopita? kama hapana ruka mpaka swali la 54**	**a) Ndio** **b) Hapana**
51	**Je, mtoto alitumia dawa aliyopewa? Kama jibu ni hapana ruka swali la 53**	**a) Ndio** **b) Hapana**
52	**Je, unafikiri dawa hiyo ina faida yoyote?**	**a) Huzuia maambukizi ya minyoo** **b) Hutibu maambukizi ya minyoo** **c) humfanya mtoto awe na afya njema** **d) Faida nyingine……..**
53	**Kwa nini mtoto hakutumia dawa hiyo?**	**a) Sifahamu faida zake**

b) Nilihofia madhara
c) Hayuko kwenye hatari ya kupata minyoo
d) Mtoto si mgonjwa
e) Dawa hazifanyi kazi
f) Sababu nyingine (taja)……..

54 Kwa nini mtoto hakupewa dawa?

a) Dawa ziliisha/hazikuwepo
b) Hayuko kwenye hatari ya kupata minyoo
c) Mtoto si mgonjwa
d) Nilihofia madhara
e) Dawa hazifanyi kazi
f) Sababu nyingine (taja)…….....

55 Kwa nini hukumpeleka mtoto kwenye kampeni hiyo?

a) Hakukuwa na mtu wa kumpeleka
b) Mtoto hakuwepo
c) Nilihofia madhara
d) Mtoto si mgonjwa
e) Baba yake /wazazi wake walikataa
f) Anaenda shule
g) Umbali mrefu
h) **Sababu nyingine (taja)….....**

TAARIFA ZA MATUMIZI YA DAWA ZA MINYOO KWA WATOTO KUANZIA MIEZI 12 MPAKA MIEZI 59 NJE YA MFUMO WA KLINIKI AU KAMPENI

56 Unafanya nini ili kuhakikisha mtoto anapata dawa ya kuzuia minyoo?

a) Huwa nanunua nakumpa dawa ya minyoo
b) Huwa simpi dawa ya minyoo

57 Unampa dawa ya minyoo kila baada ya muda gani

a) Mara moja kwa mwaka
b) Kila baada ya miezi sita
c) Kila baada ya miezi mitatu
d) Ninaposhuku kuwa mtoto ameambukizwa minyoo

58 Mara ya mwisho ulimpa lini dawa ya minyoo?

Asante kwa kushiriki utafiti huu, je una swali lolote?

Appendix V: Ethical clearance approval letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATIONS

Ref. No.DA.282/298/01.C/2189 Date: 22/04/2024

MUHAS-REC-04-2024-2189
HAFIDH ALI KHAMIS
SHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PREVALENCE OF SOIL-TRANSMITTED HELMINTHIC INFECTIONS AND FACTORS ASSOCIATED WITH PERSISTENT TRANSMISSION AMONG PRE-SCHOOL AGED CHILDREN IN WEST B DISTRICT, UNGUJA ZANZIBAR

Reference is made to the above heading,

I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 22/04/2024
EXPIRATION DATE OF APPROVAL: 22/04/2025

STUDY DESCRIPTION:
Purpose:
The purpose of this community based quantitative cross-sectional study is to determine the prevalence of soil-transmitted helminthic infections and factors associated with persistent transmission among PSAC in West B district, Unguja-Zanzibar.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015577.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Nahya Salim Masoud,
Chairperson, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations
Box 65001

Appendix VI: Introduction letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.861/2022 06th May, 2024

District Commissioner,
The Second Vice Presedent of Zanzibar,
P.O.Box 239
ZANZIBAR.

Re: INTRODUCTION LETTER OF HAFIDH ALI KHAMIS

The bearer of this letter is Hafidh Ali Khamis (HD/MUH/T.861/2022), a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc.Tropical Disease Control.

As part of his studies he intends to do a study titled: **"Prevalence Of Soil-Transmitted Helminthic Infections And Factors Associated With Persistent Transmission Among Pre-School Aged Children In West B District,Unguja Zanzibar.** The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c.c. Hafidh Ali Khamis

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix VII: Ethical clearance in Zanzibar

REVOLUTIONARY GOVERNMENT OF ZANZIBAR

Ministry of Health,
P. O. Box 236,
Street: Mnazi Mmoja - Zanzibar
Tel: +255-24-2231614
Email: info@mohz.go.tz
Website: www.mohz.go.tz

Zanzibar Health Research Institute,
87 Barabara ya Binguni
P. O. Box 236
Website: www.zahri.go.tz
Postcode: 72208, Binguni
Street: Binguni – Zanzibar
Tel: +255(0) 776 264 880
Email: zahrec@zahri.go.tz

Ref: NO. ZAHREC/02/ST/JUNE/2024/114 — 26th June, 2024

Hafidh Ali Khamis,
Student Researcher,
MUHAS.

RE: ETHICAL CLEARANCE FOR CONDUCTING HEALTH RESEARCH IN ZANZIBAR

This is to certify that the research protocol titled **"Prevalence Of Soil-Transmitted Helminthic Infections and Factors Associated with Persistent Transmission among Pre-School Aged Children in West B District, Unguja Zanzibar"** was received and reviewed on the 25th of June, 2024.

We would like to inform you that your proposal has been **"Approved"** for implementation.

Sites of Research: West B District Unguja-Zanzibar.

The Principal Investigator has to:

i. Submit your progress report and a final report upon completion of Research.
ii. Seek permission for Publication of results from ZAHREC.
iii. Submit Copies of the final Publications to ZAHREC.
iv. Seek approval for any changes made to the approved protocol prior to their implementation

Any researcher who deviates or fails to comply with these conditions shall be guilty of an offense and shall be liable for **Six months: 26/06/2024 -25/12/2024**

Thanks in advance,

ZANZIBAR HEALTH RESEARCH INSTITUTE * P.O. Box 236, ZANZIBAR * 01 JUL 2024

Dr Mayassa S. Ally,
ACTING CHAIR- HRCC,
ZANZIBAR HEALTH RESEARCH INSTITUTE,
BINGUNI,
ZANZIBAR.

Amour S. Mohamed,
DIRECTOR GENERAL,
MINISTRY OF HEALTH,
ZANZIBAR.

Appendix VIII: Research permit

REVOLUTIONARY GOVERNMENT OF ZANZIBAR

SECRETARY
ZANZIBAR RESEARCH COMMITEE
P. O. Box 2321 - MAZIZINI, ZANZIBAR
Tel: 024 2231869
Fax: 024 2231742



RESEARCH/FILMING PERMIT

(This Permit is only Applicable in Zanzibar for duration specified)

SECTION

Ref: 200171117624520836337 3

Name	HAFIDH ALI KHAMIS
Gender	M
Date and Place of Birth	12-07-1982 - KIKWAJUNI BONDENI, ZANZIBAR
Nationality	TANZANIAN
Data Collection Duration	03 Month(s)
Research Tittle	PREVALENCE OF SOIL - TRANSMITTED HELMINTHIC INFLECTIONS AND FACTORS ASSOCIATED WITH PERSISTANCE TRANSMISSION AMONG PRE - SCHOOL AGED CHILDREN IN WEST B DISTRICT, UNGUJA ZANZIBAR
Date of Issue	24-06-2024
Valid until	24-09-2024

FULL ADDRESS OF SPONSOR

Name of the Authorizing Officer	BAKARI K. MAKAME
Signature and Seal	
Institution	Office of the Chief Government Statistician
Address	P. O. Box 2321, Zanzibar
Printed Date	24-06-2024

Appendix IX: Barua ya ruhusa

OR/WMGH "B"/UTF.13.8VOL.IX/ **27 Juni, 2024**

SHEHA,
SHEHIA YA KIJITOUPELE,CHUKWANI,K/SAMAKI,M/KWEREKWE,
WILAYA YA MAGHARIBI 'B'
UNGUJA.

KUH: RUHUSA YA KUFANYA UTAFITI

Kwa heshima, naomba uhusike na mada ya hapo juu.

Napenda kukujulisha kuwa Serikali ya Mapinduzi ya Zanzibar imemruhusu **Nd. Hafidh Ali Khamis** mwanafunzi kutoKA **Chuo Kikuu cha Afya na Sayansi Shirikishi, Muhimbili anaesomea Shahada ya Uzamili katika fani ya Udhibiti wa Maradhi ya Kitropiki Helminthic Infections anda Factors Associated with Persistent Transmission Among Pre School Aged Chikdren in West 'B' District, Unguja Zanzibar."** Utafiti huo utafanyika kwenye Wilaya ya Magharibi 'B' Unguja kuanzia tarehe **24/6/2024** mpaka **24/9/2024.** Tunaomba asaidiwe ili aweze kukamilisha utafiti huo.

Kwa nakla ya barua hii unaombwa umpokee mtafiti huyo na kumpa mashirikiano ili aweze kufanikisha utafiti huo.

Nataraji mashirikiano mema.

Ahsante,

Sahim Haroun Haji

(SAHIM H. HAJI)
/MKUU WA WILAYA YA MAGHARIBI'B',
UNGUJA

Nakla: 1. Nd. Hafidh Ali Khamis (0778 480847)
2. Mratibu shughuli za Serikali, W/Magharibi'B'

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File name:	Hafidh_dissertation.docx
File size:	255.94K
Page count:	79
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Character count:	99,001
Submission date:	06-Aug-2024 11:24AM (UTC+0300)
Submission ID:	2428082031



PREVALENCE OF SOIL-TRANSMITTED HELMINTHIC INFECTIONS AND FACTORS ASSOCIATED WITH PERSISTENT TRANSMISSION AMONG PRE-SCHOOL AGED CHILDREN IN WEST B DISTRICT, UNGUJA ZANZIBAR

Hafidh A Khamis
Msc. TDC

Master of Science in Tropical Diseases Control Dissertation
Muhimbili University of Health and Allied Sciences

August, 2024

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