PREVALENCE AND RISK FACTORS ASSOCIATED WITH URINARY SCHISTOSOMIASIS AMONG WOMEN OF REPRODUCTIVE AGE IN NYANDO SUB-COUNTY, KENYA

BY

OWINO VINCENT ONG'WEN

W64/33926/2019

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN TROPICAL AND INFECTIOUS DISEASES OF THE UNIVERSITY OF NAIROBI

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF MEDICAL MICROBIOLOGY

UNIVERSITY OF NAIROBI

SEPTEMBER, 2022

DECLARATION

Students' Declaration

The dissertation presented herein is my own work in its original score that lacks track of submission to any institution for any award of a degree or any similar study.

Owino Vincent Ong'wen
W64/33926/2019
Depart. of Medical Microbiology
University of Nairobi

Signature:  Date: 21/10/2022

Supervisors' Approval

Below is a list of supervisors with approval for this dissertation.

Prof. Walter Jaoko,
Dept. of Medical Microbiology,
University of Nairobi
Email: wjaoko@uonbi.ac.ke

Signature:  Date: 21/10/2022

Dr. David Odongo
Depart. of Biological Sciences
University of Nairobi
Email: david.odongo@uonbi.ac.ke

Signature:  Date: 21/10/2022

Dr. Sospeter Gatobu
Visiting Researcher/Lecturer
University of Nairobi
kaaigg@gmail.com

Signature:  Date 21/10/2022

ACKNOWLEDGEMENTS

I sincerely appreciate the university supervisors, Prof. Walter Jaoko, Dr. Sospeter Gatobu, and Dr. David Odongo, for sharing their knowledge, providing direction, inspiring me, and making significant contributions to the project. I would like to express my heartfelt gratitude to Mr. Samwel Onjore and his team at the Division of Vector Borne Diseases in Kisumu for providing the study with the necessary reagents, space for sample storage, lab testing equipment, and technical support. I would also like to express my gratitude to the field assistants for their dedication and assistance during the data collection procedure. I am appreciative that the study was approved by the University of Nairobi Ethics and Review Committee. I also value the help and encouragement my student colleagues have given me. Additionally, I would like to express my gratitude to each and every one of the study's participants for their cooperation, desire to contribute, and assistance when required, and for their cooperation and willingness to take part in the study.

DEDICATION

To my beloved ones and close friends, I dedicated this work.

ABSTRACT

Background: In underdeveloped nations, parasitic infections and the severe sequelae that follow are frequent. Schistosomiasis is endemic in Nyando Sub-County, and investigations conducted there have revealed high rates of infection in both children and adults. Children who attend school are particularly impacted in their age group. This study used a cross-sectional design to examine the prevalence of urinary schistosomiasis, potential co-infection with intestinal schistosomiasis, and whether there were symptoms suggesting probable female genital schistosomiasis among women living in Rabuor, Bwanda, and Nyamware sub-locations, all in Nyando Sub-County, Kenya, between the ages of 18 years and 49 years.

Methods: Simple random sampling was employed to obtain villages for sample collection. Households with women aged 18 to 49 years were registered in selected villages. Proportional sampling was used to obtain women from each selected village following registration of households. One woman was selected in every fourth household in each village until sample size of 345 was reached. Urine examination for the presence of *S. haematobium* was conducted by concentrating the urine by centrifuging, then examining under a microscope. The Kato Katz technique was used for screening faecal samples for *S.mansoni* and other geohelminths. Risk factors of urinary schistosomiasis transmission examined included: hygiene, age, education level and contact with possibly infested water.

Results: *S. haematobium* tests for all the ladies came out negative. The investigation discovered a mean intensity of 72 eggs per gram of feces and a prevalence rate for *S.mansoni* of 0.3%. *E. coli* (1.2%), *E. histolystica / E. dispar / E. moshkovskii* (4.1%), and mixed infections of *E. histolystica / E. dispar / E. moshkovskii*, *E. coli*, and *C. mesnili* (0.3%) were among the other parasites discovered in the feces. According to the study, there is no correlation between the risk factors and intestinal schistosomiasis (OR=1, 95% CI: 0.00 - 0.00). Participants also lacked knowledge of the causes, signs, modes of transmission, and various defenses against urinary and intestinal schistosomiasis.

Conclusion*:* Less commonly seen in the region are *S.mansoni* and *S.haematobium*. Additionally, there was no evidence of a probable co-infection between intestinal and urinary schistosomiasis. Low prevalence rates were associated with the National Deworming Programme run by the Kenyan government where deworming exercises are conducted in all schools. Such programmes

have helped with vector control among children thereby leading to reduction in longevity of the adult worms among the adults. However, there is need for continuous community education on health and regular screening should also be implemented to help champion for improved levels of awareness and better knowledge on the disease.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

CDC	Center for Disease Control
FGS	Female Genital Schistosomiasis
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
IAMAT	International Association for Medical Assistance to Travelers
STIs	Sexual Transmitted Infections
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Approximately 700 million individuals are at risk of residing in locations where schistosomiasis is endemic, whereas 218 million people now have the disease (WHO, 2022). Schistosomiasis is frequently caused by the *S.mansoni*, *S.hamatobium*, and *Schistosoma.japonicum* species. According to reports, the first two take place in Africa (Colley et al., 2014). In underdeveloped nations, parasitic infections and the severe sequelae that follow are frequent. Both *S. haematobium* and *S. mansoni* are listed as endemic in Kenya, particularly in irrigated areas, densely populated cities and suburbs near Lake Victoria, nearby wetlands, and the Kano plain (Homabay, Nyando, Bondo, Kisumu East, Kisumu West, Rachuonyo, and Suba districts in Nyanza Province) - (Kenya schistosomiasis/IAMAT);(Mwinzi et al., 2015; Nagi et al., 2014; Odiere et al., 2012; Woodhall et al., 2013).

According to statistics, more than 200 million individuals are infected with Schistosoma species, and at least 90% of those who require schistosomiasis treatment live in Africa (WHO, 2022). In rural areas, women who perform domestic tasks like farming and laundry must frequently come into contact with water sources for extended periods of time. These behaviors put these ladies at risk for developing schistosomiasis if water sources are infested (Garba et al., 2010). However, estimates of the prevalence and risk factors for urinary schistosomiasis and Female Genital Schistosomiasis among women of reproductive age are still underdiagnosed due to poor suspicion levels among healthcare professionals (WHO, 2015). The year 2009 saw the start of Kenya's national school-based deworming program (NSBDP), which treated students for helminthes that are transmitted through the soil (STHs). The NSBDP was expanded nationally in 2012. Since then, schoolchildren in endemic areas have received STH treatment for schistosomiasis. Co-administration of albendazole for STHs and praziquantel for schistosomiasis is coordinated by the national control team with assistance from county and sub-county levels. But in certain years, STHs have only been treated since praziquantel isn't available for the treatment of schistosomiasis (Ministry of Education et al., 2014; MOEST, 2014).

Human contact patterns with infested water, the existence of competent intermediate snail hosts, the availability of habitats that are suitable for snail hosts, contamination of freshwater

environments with stool/urine containing eggs with miracidium, and the diversity of human hosts and immunity can all be used to explain the substantial spatial variation in the transmission of schistosomes (Clennon et al., 2006). Schistosomiasis must be fine-scale mapped due to its very focused character. For prioritized deployment of limited control resources to groups which are at a higher risk, accurate knowledge of the infection's distribution is required. Programs to control neglected tropical diseases (NTDs) are expected to be run at the county level in Kenya as a result of the decentralization of health care delivery.

In this study, *S. haematobium* infection in females between the ages of 18 and 49 years in the Nyando Sub-County was specifically targeted, and co-infection with *S. mansoni* was also investigated. Given the lack of information in Kenya regarding urinary schistosomiasis in females of reproductive age, particularly in areas recording high risks for transmission of this disease, such as areas around irrigated farmlands and where fresh water is scarce, the study also sought to determine the prevalence and risk factors related to this disease in Rabuor, Bwanda, and Nyamware sub-locations, all in Nyando Sub-County, Kenya.

1.2 Problem statement

The World Health Organization (WHO) estimates that more than 200 million people are infected with Schistosoma species; in addition, 90% of individuals infected with schistosomiasis or in need of treatment live in Africa (WHO, 2022). In Kenya, there is little knowledge of urinary schistosomiasis affecting women of reproductive age, particularly in locations where the disease is more likely to spread, such as areas where irrigation farming and freshwater lake fishing are popular. In addition, domestic chores such as farming and laundry require most women engaged in such activities to be in contact with water sources thus predisposing them to schistosomiasis if water sources are infested with cercarie (Garba et al., 2010). Despite this, estimations for the prevalence and predictors for urinary schistosomiasis and FGS among women of reproductive age remain under-diagnosed as a result of health care providers' low level of suspicion (WHO, 2015).

Women of reproductive age in Rabuor, Bwanda and Nyamware all in Nyando Sub-County might be suffering from urinary schistosomiasis. Nyando sub-County being a region of mixed

schistosomiasis infection (IAMAT, 2019), it can be postulated that some of the women may be co-infected with *S.mansoni.*

1.3 Justification of the study

In Kenya, *S. haematobium* as well as *S. mansoni* are endemic, especially in irrigation areas as well as the urban and suburban locations with dense populations surrounding Lake Victoria including Homabay, Nyando, Bondo, Kisumu East, Kisumu West, Rachuonyo, and Suba Sub-Counties) – (Kenya schistosomiasis/IAMAT) (Mwinzi et al., 2015; Odiere et al., 2012). Studies of urinary schistosomiasis in Kenya have largely been on school going children and the few studies involving females of childbearing age (18 to 49 years) have mainly be conducted along the coastal region, for example the study by (Jeza et al., 2022). Thus, there is little data on prevalence of urinary schistosomiasis, risk factors associated with it, its effects on the female reproductive tract including female genital schistosomiasis (FGS), and even possible occurrence of an another infection with *S. mansoni* among women in the stated age group in schistosomiasis endemic regions surrounding Lake Victoria. Thus, this study aimed at adding an already exisiting piece of information concerning urinary schistosomiasis and raise awareness among the communities living in Nyando, Kenya, about the roles of their daily activities in their health. The study will also provide information that could guide in the assessment of already existing urinary schistosomiasis control activities.

1.4 Research questions

The following are major issues that were taken into account for this study:

1. What prevalence does urinary schistosomiasis among females aged 18 years to 49 years present in Rabuor, Bwanda as well as in Nyamware all in Nyando Sub-County, Kenya?
2. What is the intensity (calculated in terms of total eggs in urine analyzed for every 10 milliliters) of urinary schistosomiasis among infected females aged 18 years to 49 years in the study region?
3. Do women between 18 and 49 years suffering from urinary schistosomiasis within the study area also experience symptoms indicative of possible FGS?
4. What are the potential risk factors linked to urinary schistosomiasis among females aged 18 years to 49 years in the study area?

5. Are co-infections involving *Schistosoma haematobium* and *Schistosoma mansoni* present among women aged 18 years to 49 years within the study area?

1.5 Research Hypotheses

H_o – Women of reproductive ages aged 18 years to 49 years in Nyando Sub-County suffer neither urinary schistosomiasis nor soil transmitted infections.

1.6 Research Objectives

Different objectives guided this study as follows:

1.6.1 Broad Objective

The overall objective was to identify risk factors, prevalence, and severity related to urinary schistosomiasis, as well as any potential co-infection with intestinal schistosomiasis, in females aged 18 to 49 in Rabuor, Bwanda, and Nyamware.

1.6.2 Specific objectives

1. The first inquiry is to ascertain the prevalence of urinary schistosomiasis in women between the ages of 18 and 49 in the Kenyan communities of Rabuor, Bwanda, and Nyamware.
2. To evaluate the severity of urinary schistosomiasis among females in Rabuor, Bwanda, and Nyamware in Nyando Sub-County, Kenya.
3. To determine if women aged 18 years to 49 years in Rabuor, Bwanda and Nyamware suffering from urinary schistosomiasis are also experiencing symptoms indicative of possible FGS.
4. To identify the risk factors in women aged 18 years to 49 years for urinary schistosomiasis as well as female genital schistosomiasis in Rabuor, Bwanda and Nyamware in Nyando Sub-County, Kenya5. To determine if there is *S. haematobium* and *S. mansoni* co-infection among women aged 18 years to 49 years in Rabuor, Bwanda and Nyamware in Nyando Sub-County.
5. To determine if there is *Schistosoma haematobium* and *Schistosoma mansoni* co-infection among women aged 18 years to 49 years in Rabuor, Bwanda and Nyamware in Nyando sub-county

1.7 Significance of the study

Women in their reproductive ages who live in tropical areas are exposed to parasitic diseases and are particularly vulnerable to these infections. This study determined the risk factors, intensity and prevalence associated with urinary schistosomiasis and possible co-infection with intestinal

schistosomiasis in females aged 18 years to 49 years in Rabuor, Bwanda and Nyamware sub-locations all in Nyando Sub-county, Kenya. Findings from the study will build on the already exisiting knowledge on matters urinary schistosomiasis among women of reproductive age. The knowledge generated will raise awareness among the communities living in Nyando, Kenya, about the roles of their daily activities in their health.

1.8 Scope of the study

The community-based study focused on women in Rabuor, Bwanda, and Nyamware who were between the ages of 18 and 49. Despite just 345 people agreeing to participate in the study, 427 people were chosen by simple random sampling from the population.

CHAPTER TWO

LITERATURE REVIEW

2.1 Schistosomiasis

In addition to affecting humans, *S. mansoni, S. japonicum, S. mekongi, and S.* malayensis also affect other mammals (Gordon, 2019). German physician Theodor Bilharz initially identified and described the schistosomiasis causal agent in 1851 while conducting an autopsy at Cairo's Qasr el-Ayni hospital (Weerakoon et al., 2018). Bilharz himself gave the new parasite the name Distomum haematobium, but in 1856 it was given the name Bilharzia haematobium in his honor. The genus Schistosoma was finally given a name by the International Commission on Zoological Nomenclature in 1858. Schistosome adult worms live for many years in human blood vessels. They escape the immune system and expel hundreds to thousands of eggs daily (Sastry & Bhat, 2018). Depending on the species, schistosoma eggs are excreted in the urine or feces. The miracidia that are released when the eggs hatch and hatch under the right circumstances swim and pierce the skin of the human host. A distinct granulomatous response mediated by the immune system is induced by trapped eggs which cause a variety of local and systemic pathological effects entailing cognitive impairment, anemia, stunted growth, and reduced strength, to effects on specific organs like dire hepatosplenomegaly, urogenital inflammation and scarring, together with portal hypertension and periportal fibrosis: in mansonian schistosomiasis there is cercarial dermatitis, katayama fever (found in all schistosomiasis), granuloma formation and fibrosis in liver, and fibrosis and thickening of intestinal walls (Sastry & Bhat, 2018)

2.2 Global prevalence of schistosomiasis

Schistosomiasis-related estimates of morbidity and mortality vary greatly. Around 779 million individuals worldwide were at risk of schistosomiasis by the middle of 2003 (WHO). Of this, 200 million individuals live in tropical and subtropical nations and are affected with schistosomiasis. By the middle of 2003, an estimated 207 million people were infected. About 20 million people with schistosomiasis are thought to acquire significant infections, compared to the 120 million expected to have the disease (Steinmann et al., 2006). In 76 countries and territories, schistosomiasis is an ongoing problem. A total of 67 countries and territories have reported active transmission, with 46 of these countries being in Africa. According to estimates, 97% of

the world's schistosomiasis transmission occurs in Africa, in part as a result of inadequate or non-existent health services, and poverty (Utzinger et al., 2009).

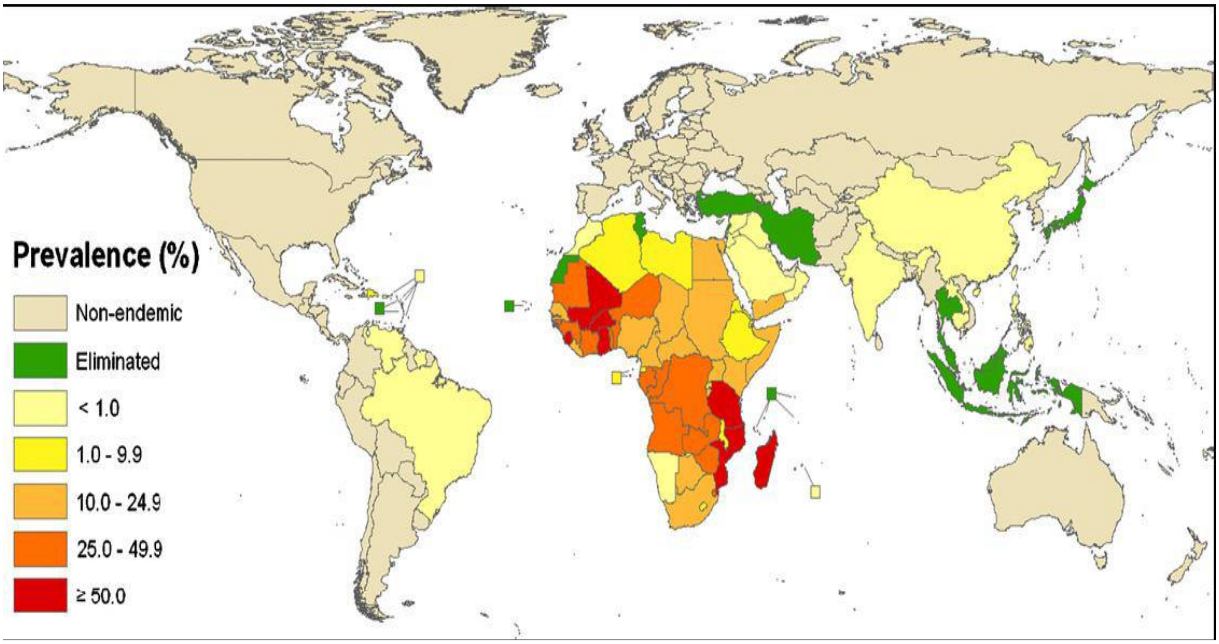


Figure 2.1 : Schistosomiasis statified globally. Source: (Steinmann et al., 2006)

2.3 *Schistosoma haematobium* and *Schistosoma mansoni* in Kenya

Both *S. haematobium* and *S. mansoni* are native to Kenya, particularly in irrigated and heavily populated urban and suburban regions along Lake Victoria, nearby marshes, and the Kano plain (Homabay, Nyando, Bondo, Kisumu East, Kisumu West, Rachuonyo, and Suba Sub-Counties in the Nyanza region). Additionally, there are dangers particularly in the districts of Kitui and Machakos; the Mombasa region on the Indian Ocean's coast; Lake Jipe and the surrounding regions of Taveta, Wundanyi, and Voi; towns of Garissa to Hola; Localized risk is present in Wajir and Wajir Bor as well as Kimilili (Kenya: Schistosomiasis/IAMAT) (Mwinzi et al., 2015; Odiere et al., 2012)

2.4 Morphology of schistosomes

Adult schistosomes are cylindrical; they are covered by a thick, tuberculated and syncytial tegument. The exception is *Schistosoma japonicum* that possess smooth tegument (Sastry & Bhat, 2018). All mature schistosomes lack a muscular throat, and the intestinal caeca come together to form a single canal behind the ventral sucker. Suckers are armed with delicate spines.

Schistosomes have separate sexes with female worms being slightly longer and slender than male worms. Male worms possess a gynaecophoric canal on the ventral side in which the female worm reposes (Figure 2). Schistosome eggs lack opercula and have projections that resemble spines. The prominent lateral spine of a *S. mansoni* egg contrasts with the prominent terminal spine of a *S. haematobium* egg. The fully embryonated eggs that are expelled in feces or urine hatch out right away, generating miracidia.

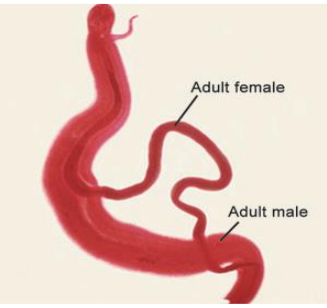


Figure 2.2: The female of an adult schistosome can be seen living in the male worm's gynaecophoric canal in the photograph. Source: (Sastry & Bhat, 2018)

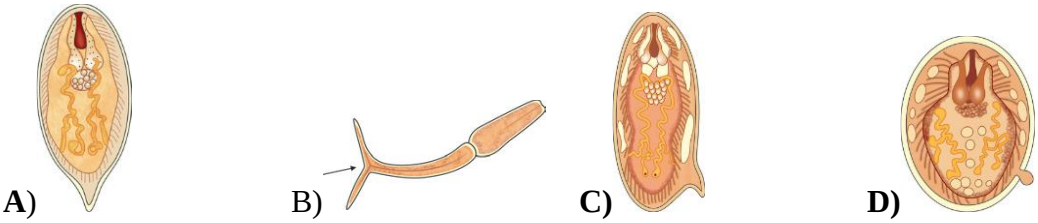


Figure 2.3: *Schistosoma* eggs and cercaria. (A) Egg of *S. haematobium* with a terminal spine, (B) Fork tailed cercaria (C) Egg of *S. mansoni* with a lateral spine (D) *Schistosoma japonicum* egg. Source: (Sastry & Bhat, 2018)

2.5 *Schistosoma mansoni* and *Schistosoma haematobium* Life Cycles

The definitive host is the human, whereas the intermediate hosts are freshwater snails from the genera *Bulinus* and *Biomphalaria* sp. for *S. haematobium* and *S. mansoni*, respectively. The infectious *S. haematobium* cercaria enters the definitive host through contact with the infected water and passes through the intact epidermis of the skin to transform into a larval schistosomulum. From there, it travels through the host dermal veins to the lungs and eventually enters the portal system through systemic circulation. It feeds and grows within liver sinusoids and develops into adult worms within approximately 5 to 6 weeks. Adult worms attain sexual

maturity and then pair with the female worm residing within the male gynaecophoric canal. Following that, they move from the portal system to the vesical and ureteric venous plexus, where the fertilized female worm lays her eggs. With the help of their terminal spines and lytic substance, the eggs can enter the venules and urinary mucosa. The fully embryonated eggs are passed in urine. Only in fresh water, at the right temperature, and under the right lighting conditions do mature schistosome eggs hatch. Miracidium, a ciliated, free-swimming larval stage, is released, and it must locate a proper intermediate host, such as a species of *Bulinus*, to continue its life cycle.

The only difference between *S. mansoni* life cycle and *S. haematobium* is the presence of the redial stage. The definitive host is a person; however, other vertebrate hosts, such as monkeys, chimps, and dogs, may serve as the reservoir and the definitive host. The intermediary hosts are *Biomphalaria*. Living in the mesenteric veins that drain the sigmoidorectal area is the adult worm. About 5 weeks pass during the prepatent period.

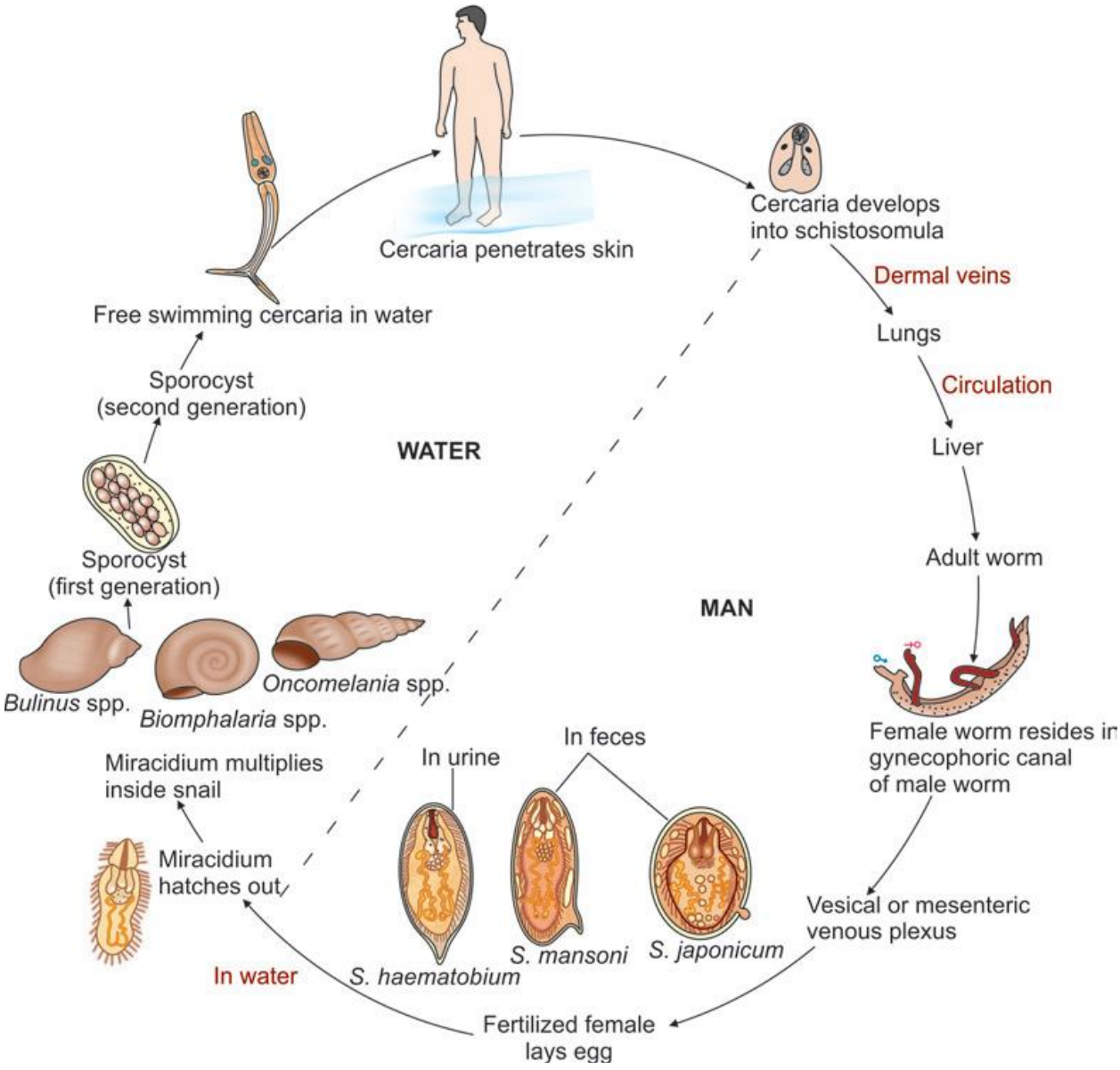


Figure 2.4: Schistosoma species life cycle.Source: Apurba Sankar Sastry and Sandhya Bhat K, 2014.

2.6 Epidemiology of *Schistosoma haematobium*

The geographic spread of human schistosomiasis is based on the location of the competent snail vector. Poor personal cleanliness, people's water contact behaviors, and the existence of snail vectors—which can only spawn in warm climates—are all factors that have been proven to be directly associated to the transmission of human schistosomiasis. Infection with *S. haematobium* is common throughout Africa, as well as in Madagascar, the West Indies, and the Arabian

Peninsula. It is disseminated by aquatic pulmonate snails of the species *Bulinus* that are affected. Schistosomiasis typically affects rural areas. Urban schistosomiasis, however, also exists and is a developing issue in many countries, especially in Africa (Steinmann et al., 2006).

2.7 Risk factors

The hosts, particularly children, are more susceptible to illness when there is poor hygiene and contact with contaminated water. According to a study conducted in Niger, up to 80% of women living in endemic areas disposed of their feces and urine in the home water sources they utilized (Garba et al., 2010). The eggs of this parasite, which are discharged in human urine and contaminate water sources or soil regions where sufficient sanitation is not followed, are what cause *Schistosoma haematobium*-induced urinary schistosomiasis. People who come into extended contact with fresh water contaminated with this parasite are infected by the infectious cercaria larva.

The disease primarily affects impoverished and rural people, especially those engaged in agriculture such as irrigated farming utilizing schistosome-infested water, and car washers. The disease also spreads to new places as a result of emigration to urban areas and population growth (Garba et al., 2010).

Women who perform domestic duties like washing clothing in contaminated water run the risk of contracting female genital schistosomiasis. Women under the age of 20 had the highest prevalence of *S. haematobium* infection, at 60%, while those over the age of 49 have the lowest incidence, at 29%. (Ndhlovu et al., 2007). This finding implies that getting older may decrease your risk of developing urinary schistosomiasis. Younger women are more likely than older women to come into extended contact with water contaminated with schistosomes, which may be the cause of the observed occurrence.

2.8 Pathology and morbidity due to urinary schistosomiasis

When cercariae invade the skin, it results in dermatitis at the site of penetration and then a localized cutaneous allergic pruritic papular lesion. Schistosomula migration to the lungs resulting in coughing and a moderate fever. Schistosomiasis can last for years without treatment, and chronic cases might result in anemia (Farid et al., 1968).Many infections, especially the light ones, are asymptomatic. Symptoms usually develop after approximately three to six months. Symptoms are brought on by the body's response to the eggs that have been deposited in different tissues, not by the worms themselves (Sastry & Bhat, 2014). Mucosal injury results from eggs getting into human urinary bladders. As a result, up to 80% of kids with *S. haematobium* infections experience symptoms like dysuria and hematuria. The most common symptom of urinary schistosomiasis is hematuria, and it has been estimated that infected people lose between 2.6 milliliters and 12.6 milliliters of blood every day (Farid et al., 1968). Around such released eggs, the soluble antigens that are released from them cause delayed hypersensitivity.Egg granulomas are then formed which vary in size and are composed of egg at the center which is surrounded by macrophages, lymphocytes, fibroblasts, and multinucleated giant cells (Sastry & Bhat, 2014). Several granulomas fuse to form larger nodules. The urinary mucosa covering the nodules shows glandular metaplasia i.e., cystitis glandularis. Fibrotic changes occur later in chronic stages and are visible as sandy patches on cystoscopy.

Deposition of eggs in ureter tissue is the primary cause of obstructive uropathy. About 20% to 25% of infected children may develop hydroureter and hydronephrosis as a result of the lower ends of the ureters becoming clogged by fibrosis. According to (Smith & Christie, 1986), hydronephrosis typically develops before hydroureter, and schistosomal hydronephrosis advances from progressive renal pelvic dilatation to medullary atrophy and subsequently to almost total effacement of the medulla before cortical atrophy.

In highly endemic areas, up to 89 percent of the population may have bladder lesions, and 44 percent may have severe bladder lesions (Hatz, 2001). The intestines, liver, spinal cord, or lungs are only a few of the body areas where the eggs may go via venous blood

2.9 The schistosomiasis burden

STH infections contribute significantly to the neglected tropical diseases (NTDs), accounting for more than 3.3 million disability-adjusted life years (DALYs) (Hay et al., 2017). After STH infections and dengue, schistosomiasis has the third-highest worldwide burden attributed to an NTD, causing over 1.8 million DALYs (Hay et al., 2017). The World Health Organization (WHO) has responded to these statistics by setting a goal to eradicate schistosomiasis and STH infection by the year 2030 in its vision agenda for health promotion. According to WHO estimates, more than 105.4 million persons were reported to have received treatment for schistosomiasis in 2019, out of a total of at least 236.6 million people who needed preventive treatment (WHO, 2022). At least 90% of persons in need of schistosomiasis therapy reside in tropical and subtropical regions of Africa, particularly in underprivileged areas without access to clean water and proper sanitary facilities. Women who perform household tasks in contaminated water, such as washing clothes, run the risk of developing female genital schistosomiasis (WHO, 2022).

Schistosomiasis-related mortality is primarily attributed to distinct symptoms that have developed several years after the initial infection. Due to this, it is challenging to diagnose them with infection. The global burden of disease initiative numbers, according to schistosomiasis morbidity experts, significantly underestimates the burden of the disease, and they need to be revised (Hay et al., 2017).

2.10 Schistosomiasis in women of childbearing age

Female urogenital schistosomiasis is a chronic condition that is typically contracted in childhood. *S. haematobium* is primarily to blame. Female urogenital schistosomiasis may impact up to 45 million females in Sub-Saharan Africa, according to WHO estimates. Adult *S. haematobium* live in blood arteries around the female genital tract and urinary bladder, where they lay eggs that invade nearby organ tissue.This most often induces chronic granulomatous inflammation in the following areas: the urinary bladder, ureters, vagina, and the cervix. Clinical picture of urogenital

schistosomiasis includes the following signs and symptoms: pain during coitus, nodules in the vulva, vaginal bleeding, lesions of cervix and vagina. Infertility is a long-term irreversible consequence.

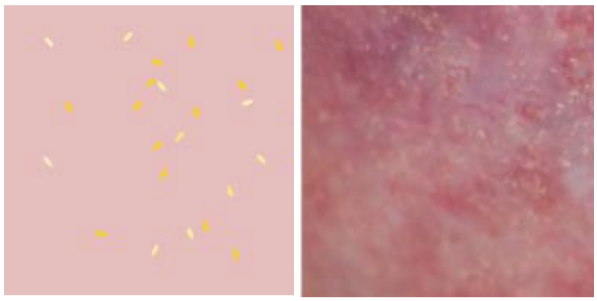
2.11 Schistosomiasis of the female genitalia

Up to 75% of girls in areas where urogenital schistosomiasis is endemic may have female genital schistosomiasis, according to the World Health Organization in 2009. The walls of the bladder can become impenetrable to the *S. haematobium* eggs. Ova may be deposited on vaginal tissue, which can result in calcification, persistent inflammation, and fibrous tissue. Sandy patches, granulomatous lesion regions containing Schistosoma ova, are pathognomonic for *S. haematobium* infection and can develop in the vaginal mucosa as well as the urinary bladder (Kjetland et al., 2005). According to Mduluza et al. (2003), females with genital *S. haematobium* infection have higher levels of Eosinophil Cationic Protein (ECP) in their vaginal washes, which suggests a higher risk of HIV infection.

These morbid effects are especially noticeable in populations that are already at risk, such as those whose diets are deficient in iron and/or minerals, or during times of increased nutritional and metabolic needs, such as during fast development following puberty and pregnancy (Olds, 2003)

A few complications are infertility, bleeding during exams, genital ulcers, abortion or ectopic pregnancies, tumors or swellings (of the vagina, vulva, or cervix), and involuntary urine in response to coughing, laughing, or other physical activity. By visually examining distinctive lesions on the cervix and vaginal walls, female genital schistosomiasis is identified. A digital camera or a colposcope can help with visualization (WHO).

A.



B.

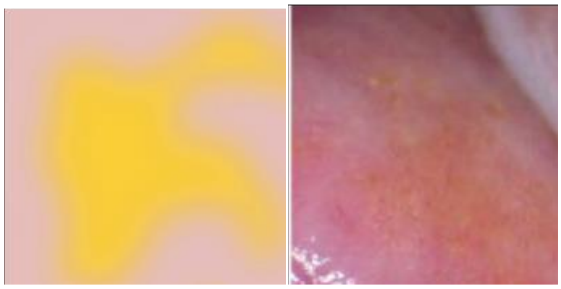


Figure 2.5: Two types of sand patches: (A) grainy sand and (B) homogenous yellow sand. World Health Organization, 2015, Female Genital Schistosomiasis: A Pocket Atlas for Clinical Healthcare Professionals

2.12 *Schistosoma mansoni*

Adult male and female *S.mansoni* parasites live in the mesenteric veins that drain the sigmoidorectal region in humans, causing intestinal schistosomiasis. *S. mansoni* infection is common in Africa, the Caribbean (West Indies), South America (Brazil and Argentina), Madagascar, and the Arabian Peninsula (Sastry & Bhat, 2014).

2.13 Knowledge gap

Females of reproductive age living in locations where *S. haematobium* is endemic continue to have a high prevalence of female genital schistosomiasis and have inadequate laboratory diagnoses, which is due to a lack of professional suspicion.

Evidence on risk factors, prevalence, and severity related to urinary schistosomiasis in Western Kenya, as well as potential co-infection with intestinal schistosomiasis in females of reproductive age, is currently scarce.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter attempts to address a variety of features of the target population, the sampling technique employed, the methods and processes used for data collection, and how data analysis was carried out.

3.2 Design of the Research

Cross sectional study design was used. It was conducted in Kenya's Nyando sub-county in the Rabuor, Bwanda, and Nyamware. According to (Kothari, 2004; Mayrent, 1987), this study design looks at the link between disease and other relevant variables as they are present in a specific population at a certain time or over a brief period of time. In this assessment, a cross sectional study may be helpful to comprehend the disease's burden on the target population in order to better plan and allocate healthcare resources (Kothari, 2004; Mayrent, 1987).

3.3 Area of Study Description

The longitude and latitude of Nyando Sub-County in relation to the equator are 33° 20' to 35° 20' east and 0° 20' to 0° 50' south, respectively. The area experiences temperatures of 20°C and 1000 mm of rainfall annually, respectively. The River Nyando and the River Obuso are the main drainage channels. Bwanda, Nyamware, and Rabuor were the three locations that were selected for the data collection in this study.Crop cultivation dominates Nyamware, which is located on the banks of Lake Victoria. Irrigation farming is the main method used due to low amounts of rainfall in the region. People also keep livestock due to the extensive pasture lands. The region experiences frequent flooding due to its flat terrain. Rabuor sub-location is located near the Nairobi-Kisumu highway. Inhabitants of Rabuor are traders; likewise, a few are engaged in agriculture under the Ahero irrigation scheme. In comparison to Nyamware sub-location which is located on Lake Victoria’s shores, Bwanda exists far from the Nairobi-Kisumu highway and there is less flooding there. Small-scale agriculture and trading are the main economic activities carried out by the people of Bwanda to make a living.. There is extensive pastureland as well as rivers and proximity to the lake in Nyamware. So many farmers from Rabuor and Bwanda graze their livestock in Nyamware as a result.The main economic activities for people living in the

Nyando sub-county are fishing, agriculture, agricultural products processing, the mining and natural resources processing and exchanging commodities in small-scale

3.4 Study population

With 77,121 males, 84,380 females, and 7 intersex individuals, Nyando Sub-County has a total population of 161,508 (Kenya National Bureau of Statistics, 2019). Women of childbearing age from three chosen sub-locations in Nyamware (North Nyamware and South Nyamware), Rabuor (Sub-location), and Bwanda (Upper Bwanda and Central Bwanda), all in Nyando Sub-County, made up the research population.

3.5 Inclusion criteria

1. All pregnant and non-pregnant, lactating, and non-lactating women (aged 18 years to 49 years) who consented to participate in this research and who had not been treated for schistosomiasis in the last one year prior to start of this study were included in this study.
2. Women who had lived in the research area for more than six months and were between the ages of 18 and 49 were included in the study.

3.6 Exclusion criteria

1. All pregnant and non-pregnant, lactating, and non-lactating women (aged 18 years to 49 years) who did not consent to participate in this research and who had been treated for schistosomiasis in the last one year prior to start of this study were exempted from this study.
2. Women who were sick and females who were not available at data collection time were excluded from study even if their age fell in the range of 18 years to 49 years.
3. All women of age 18 years to 49 years) who were having their menstrual period at data collection time were excluded in order to avoid their menstrual blood gaining entry into urine samples that would be collected to avoid confusing it with microhematuria due to schistosomiasis.

3.7 Sample size calculation

According to Yirenya-Tawiah et al. (2011), 25% of reproductive-age females in Ghana's endemic regions have urinary schistosomiasis.This was based on findings from their study on “A

survey of female genital schistosomiasis of the lower reproductive tract in the Volta basin of Ghana."

According to Kaiglová et al. (2020), 14.55% of females in Kwale County who are of reproductive age have urinary schistosomiasis. This was based on findings from their study on "Urinary schistosomiasis in patients of rural medical health centers in Kwale County, Kenya." Sample size for this study in Nyando sub-county, Kenya was obtained after assumption of approximated prevalence of 50%

Using COCHRANE formula

$$n = Z^2 \frac{p(1-p)}{e^2}$$

Cochrane formula was used for large populations to get a sample that was representative for proportions.

Where:

n = shows the sample size,

Z^2 = is the abscissa of a normal curve, which excludes a portion of the tails. (1-represent the level of confidence that was desired, e.g., 95%)

e = level of precision that is desired

p = approximate of an attribute's proportion that exists in the population.

The value of Z is located in the tables of statistics containing area under normal curve

n = $[(1.96)^2 \times 50 \times (100-50)] / (5)^2$

n = 384

Assuming a 10% non-response, then n = 384 ÷ 0.9 = 427

3.8 Sampling procedure

Simple random sampling was employed to obtain villages for sample collection. Households with women aged 18 to 49 years were registered in selected villages. Proportional sampling was used to obtain women from each selected village following registration of households. One woman was selected in every fourth household in each village until sample size was reached. With the aid of community health volunteers, Each participant's home was visited to gather their information. A total of 345 women in total were chosen at random to participate in the study.

3.9 Research instruments

Data on social demographics, risk factors for urinary and intestinal schistosomiasis, and signs and symptoms indicative of probable female genital schistosomiasis consisting of abnormal vaginal discharge, irregular menstrual cycles, genital itching, pelvic discomfort, and post-coital bleeding, was collected using a questionnaire in English, Kiswahili or Dholuo. Study participants were asked to choose the language they preferred to use. To guarantee that the original intent was preserved, the questionnaires and consent form were translated from English into Swahili and Dholuo before being converted back to English.Validity tests were done on questionnaires and consent form. The tools were pre-tested during pilot study in the study region

Urine samples to determine urinary schistosomiasis prevalence and intensity were collected using sterile plastic containers. Stool samples to examine for *S. mansoni* co-infection were collected using a leak-proof stool container. The stool containers used were dry and clean. It was ensured that urine, water, soil, or other material did not get into the stool container.

3.10 Procedure for data collection

Interviewers read the consent forms to eligible participants and obtained written consent from the willing participants. Participants were interviewed upon obtaining written consent. They were assured that all information obtained was to be keyed in the computers using only the research identification number. The data collected was kept confidential, and no unauthorized individuals had access to it.

The participants were requested to provide urine sample in sterile plastic containers after the interview. They were also requested to provide stool samples in a dry, clean, leak-proof stool container.

3.11 Parasitological data collection and testing

Cool boxes and microscope were borrowed from Division of Vector Borne Diseases (DVBD), Kisumu laboratories. Sterile plastic containers were used to collect urine specimen and labeled with identification number for the participant. The urine sample collected was mixed immediately with four drops of 10% formalin to prevent growth of bacteria and hatching of eggs. When blood that was visible was present, then two drops of the saponin was added in order to lyze red blood cells. Sterile stool plastic containers were used to collect stool specimen and marked with identification number of participants. The collected samples were then placed in cool boxes. After hours, the samples were delivered to the Division of Vector Borne Diseases (DVBD), Kisumu, for laboratory analysis. Utilizing concentration by centrifugation and microscopy, urine was examined for the presence of *S. haematobium*. Faecal samples were examined for *S.mansoni* and other geohelminths using the Kato Katz method. The lab procedures listed in appendix 10 were completed.

3.12 Laboratory quality assurance

The stools were taken to laboratory fresh without preservative since Kato Katz procedure was to be done on them. However, urine samples were preserved with formalin immediately after collection. Well trained and experienced laboratory technicians with expertise especially in parasitology and in addition under my supervision as a researcher were allowed to work on specimens. The researcher randomly selected and re-tested ten percent (10%) of the specimens to ascertain agreement with recorded results of presence or absence of schistosomes eggs by the technicians.

3.13 Variables

Dependent variables

1. Urinary schistosomiasis status.
2. Intensity of urinary schistosomiasis.
3. Female genital schistosomiasis (FGS).

Independent variables

1. Sanitation facility: i.e., those with toilet at home versus those without toilet at home.
2. Age in years.

3. Treatment history i.e., those who ever got treated for urinary schistosomiasis versus those who have never been treated for urinary schistosomiasis.
4. Water related activities i.e., a composite measure was developed and was used to get farming water related activities for all study participants engaged with farming versus domestic water related activities for those engaged with swimming, bathing and washing. Because study participants were likely to use same water source to bathe, differentiation of exposure to what type of water was not done but rather it was noted which water related activities predisposed participants to the disease.
5. Level of education i.e., lack of formal education from primary levels of education, and above
6. Awareness of symptoms, transmission, and treatment of urinary schistosomiasis was enquired. This variable was dichotomized into those who have knowledge and those who do not have knowledge.

3.14 Data management

Cleaning of the data was done after entry of data and this was done to correct for coding and data entry errors. The data was kept on both soft copies and hard copies. Both digital and physical copies of the data were stored. Stata version 14 was used for the analysis once the data had been imported into SPSS.The data was stored by principal investigator who was having access to it together with supervisors. All information obtained was keyed in the computers using only the research identification number. The data collected was kept confidential, and no unauthorized individuals had access to it.

3.15 Analyis of Data

The gathered information was cleaned, coded, and loaded into SPSS for additional analysis.. To determine the prevalence of urinary schistosomiasis, number of people with schistosome ova in urine was divided by the total number of persons who submitted urine sample .To determine the severity of urinary schistosomiasis, the median (inter-quartile range as a measure of dispersion) number of eggs per 10 ml of urine was reported, which satisfies specific objectives 1 and 2 respectively. Bivariate analysis using 2×2 tables was conducted, and statistical relationships were examined using the Chi-square (X2) test. This test was designed to determine whether a

discrepancy between observed and expected data was the result of chance or an association between the variables being investigated.

3.16 Ethical considerations

The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee gave its approval (application approval number P864/11/2021) for the conduct of this study. The local administration and community leaders were notified about this study to be conducted in their community. Meetings were held in the villages before the study period and conducted in both local languages of the people and in Swahili with the sole purpose of informing the villagers what the study entailed, objectives, as well as the implications and likewise to request for cooperation from them. People were informed that they might leave the study at any time without facing any repercussions. An individual was informed of this before enrolling in the study. Before beginning any data collection exercise, each participant's written informed consent was obtained. The study participant who was diagnosed with intestinal schistosomiasis was directed to the closest medical center for the most effective treatment.

CHAPTER FOUR

RESULTS

4.1 Rate of responses to surveys.

There were 345 participants in the study. All study participants gave their consent for the collection of urine and stool samples for the investigation and completed the questionnaire. Table 4.1 below provides a summary of the study's response rate.

Table 4.1: Rate of responses to surveys

Sub-County	**Administered**	**Completed**	**Percent**
Bwanda	152	105	69.1
Nyamware	105	96	91.4
Rabuor	170	144	84.7
Total	**427**	**345**	**80.8**

4.2 Sociodemographic details on the study's participants.

In total, 345 women between the ages of 18 and 49 who were at reproductive age were recruited for the study, which was conducted from April 2022 to July 2022 in three locations within Nyando Sub-County. Table 4.2 shows the distribution of the sociodemographic details of the study participants. Participants from Bwanda were 105 (30.4 %), 96 (27.8 %) were from Nyamware while 144 (41.7 %) participants were from Rabuor. Of the survey participants, 129 (37.4%) of the study participants stated that they had been residents in their villages for 11-20 years, 105 (30.4 %) participants stated they had been residents in their villages for 5-10 years, while 72 (20.8 %) stated that they had resided in their villages for over 20 years. Only 39 (11.3%) study participants stated they had been residents of their villages for less than 5 years. The participants ages were categorized into 18-28 years (40.3%; n=139), 29-39 years (43.2%; n=149) and 40-49 years (16.5%; n=57). The median age was 31.4 years with 8.4 years as the standard deviation. The minimum age was 18, the median age was 31, and the highest age was 49. It was discovered that study participants had lived in the study location for an average of 14.2 years, with a standard deviation of 8.0 years.

Table 4.2: Sociodemographic details on the study's participants

Variable	Frequency (n=345)	Percent (%)
Study area		
Bwanda	105	30.4
Nyamware	96	27.8
Rabuor	144	41.7
Years of residence		
Less than 5	39	11.3
5-10	105	30.4
11-20	129	37.4
Over 20	72	20.9
Age		
18-28	139	40.3
29-39	149	43.2
40-49	57	16.5
Marital status		
Married	290	84.1
Not married	55	15.9
Level of education		
None	2	0.6
Primary	211	61.2
Secondary	116	33.6
College	16	4.6
Occupation		
Student	49	14.2
Housewife	115	33.3
Petty business	130	37.7
Farmer	49	14.2
Other	2	0.6

4.3 Prevalence for urinary and intestinal schistosomiasis

Intestinal schistosomiasis was reported to have a prevalence rate of 0.3% and a mean intensity of 72 eggs per gram of feces, while urinary schistosomiasis had a prevalence rate of 0%. Farmers between the ages of 18 and 28 in Rabuor were found to have a high prevalence and severity of *S.mansoni* infection. The infected study participant had no prior exposure to female genital schistosomiasis and was unaware of urinary schistosomiasis. She also had no medical history of urinary schistosomiasis. Only 4 study participants were found with *E.coli*, 14 were found with *E.histolytica / E. dispar / E. moshkovskii*, 4 were found with *Pus cells*, 1 participant was found with both *E.coli and E.histolytica / E. dispar / E. moshkovskii* and 1 participant was found with *E.coli, E.histolytica / E. dispar / E. moshkovskii* and *C.mesnili.*

Table 4.3*: S.mansoni* and *S.haematobium* findings in urine and stools.

Variable	**Frequency**	**Percent (%)**
Urinary schistosomiasis		
Negative	345	100.0
Positive	0	0
Intestinal schistosomiasis		
Negative	344	99.7
Positive	1	0.3
Other observations		
No observations	321	93.0
E.coli	4	1.2
E.histolytica / E. dispar / E. moshkovskii	14	4.1
Pus cells	4	1.2
E. histolytica / E. dispar / E. moshkovskii , E.coli, C.mesnili	1	0.3
E.histolytica / E. dispar / E. moshkovskii, E.coli	1	0.3

4.3.1 Intensity of intestinal schistosomiasis

Three eggs were counted in order to determine the severity of the infection, as can be seen in the image below, figure 2.6. A factor of 24 i.e 3 x 24 = 72 was used to compute the number of eggs per 1g of feces, with 24 serving as the WHO-recommended factor for Kato Katz calculations of intensities (24 x 41.7mg = 1g).According to the WHO, the degree of infection was categorized as light (1–100 EPG), moderate (10–400 EPG), and heavy (> 400 EPG). 72 EPG was categorized as having a light intensity based on our findings. The microscopic image has been displayed below.

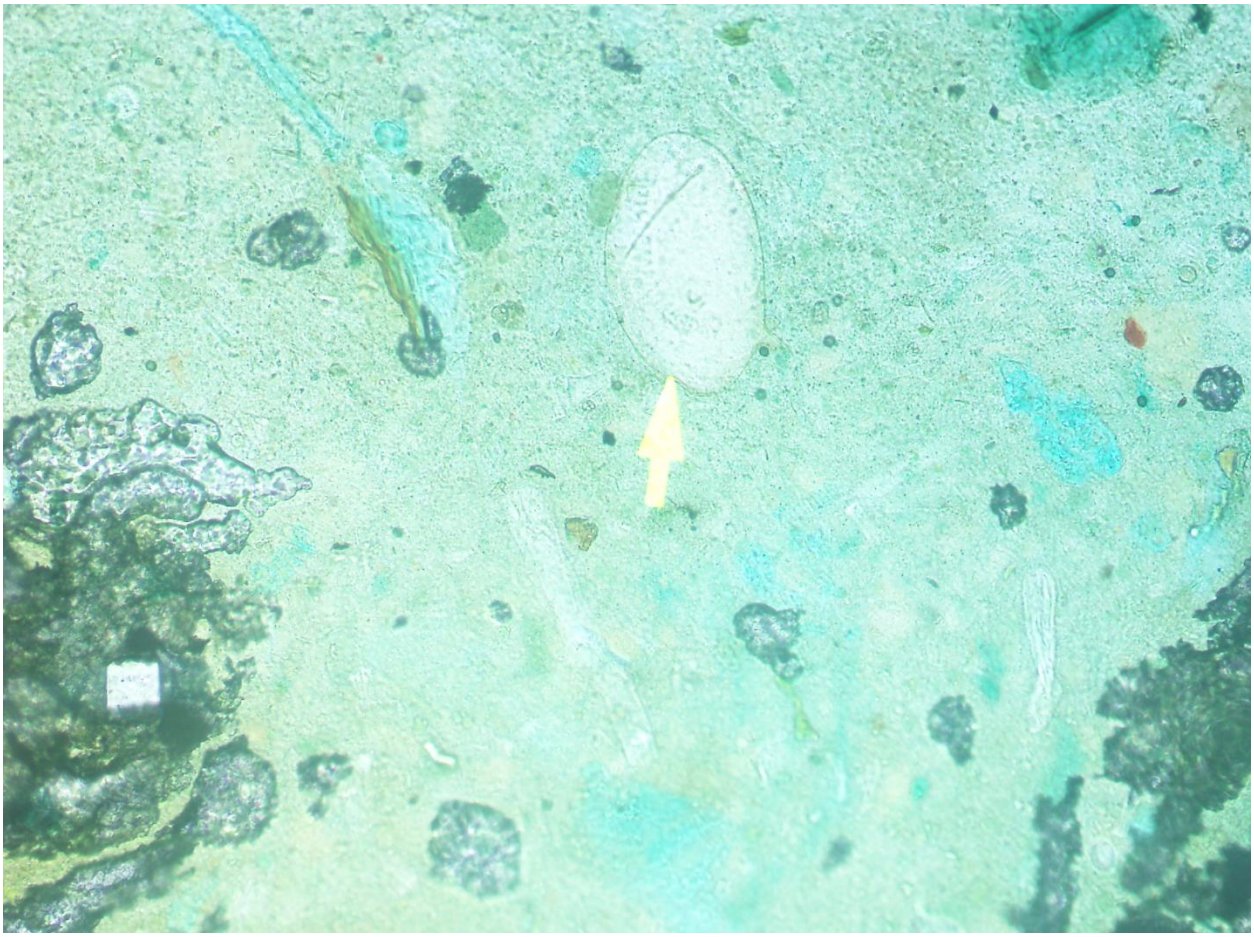


Fig 2.6: Microscopic image of *S.mansoni*

4.4 Possible co-infection with intestinal schistosomiasis

Possible co-infection with intestinal schistosomiasis could not be established because there was no prevalence of urinary schistosomiasis among the study participants. The study found only one case of intestinal schistosomiasis. The study participant who tested positive for intestinal schistosomiasis had no prior knowledge of urinary schistosomiasis, had access to a latrine within

the homestead and had no history of diagnosis with urinary schistosomiasis. The study came to the conclusion that among the individuals there was no correlation between urine and intestinal schistosomiasis in terms of co-infection.

4.5 Presence of *S.mansoni* and *S.haematobium* by socio-demographic characteristics of study participants.

Of the 345 study participants, only one participant from Rabuor tested positive. The respondent who tested positive for *S.mansoni* was of the age group 18 – 28, married, had attained primary education and was a farmer. The respondent came from a home with a latrine, had never heard of urinary schistosomiasis or female genital schistosomiasis before. The respondent however was not sure whether she had suffered from female genital schistosomiasis in the past.

Urinary schistosomiasis was not detected in any of the study participants' urine samples. It was impossible to determine which socio-demographic and socio-economic features of the respondents were potential risk factors for infection with female genital schistosomiasis, urinary schistosomiasis, or intestinal schistosomiasis.

Table 4.4: A bivariate analysis of the sociodemographic characteristics of research participants and the presence of *S.mansoni* and *S.haematobium*

Variable	Negative	Positive	P-value	χ^2
Study area				
Bwanda	105	0	0.497	1.3999
Nyamware	96	0		
Rabuor	143	1		
Age				
18-28	138	1	0.476	1.4863
29-39	149	0		
40-49	57	0		
Occupation				
Student	49	0	0.195	6.0584
Housewife	115	0		
Petty Business	130	0		
Farmer	48	1		
Others	2	0		
Latrine ownership				
Yes	318	1	0.775	0.0817
No	26	0		
Knowledge of urinary schistosomiasis				
Yes	94	0	0.54	0.3756
No	250	1		
Diagnosed with urinary schistosomiasis				
Yes	10	0	0.863	0.0299
No	344	1		
History of female genital schistosomiasis				
Yes	6	0	0.655	0.8474
No	152	0		
Don't know	186	1		

4.6 Risk factors associated with urinary schistosomiasis and intestinal schistosomiasis

Water source

Of the study participants, 27.54% (n = 95) depended on tap water as their source of water, 51.74% (n = 178) depended on deep well, 25.22% (n = 87) depended on ponds, 22.03% (n = 76) depended on shallow wells, 40.87% (n = 141) depended on rivers while 5.8% (n = 20) depended on lake as a water source. The association between the use of water from a deep well and getting infected with the infection could not be established. Figure 4.1 below displays the Distribution of Domestic Water Source among households within Bwanda, Nyamware and Rabuor.

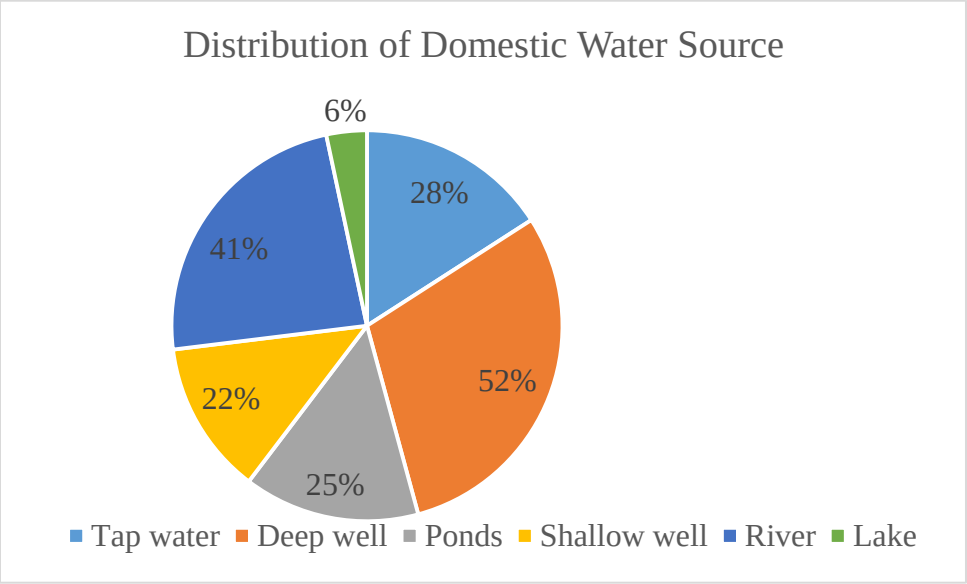


Figure 4.1: Distribution of Domestic Water Source

Hygiene

Latrines were owned by 92.46% (n=319) of the study participants. Of the 1.74% (n=26) without latrines in their homes, 46.15% (n=12) used their neighbours toilet while 53.85% (n=14) mentioned that they urinate in nearby bushes. Also 67.54% (n=233) mentioned that a latrine was present around their bathing areas, 31.30% (n=108) mentioned that latrines were present around places of fetching water. Only 3.19% (n=11) mentioned that latrines were present around their farm lands while 3.77% (n=13) mentioned that latrines were present around the fishing areas. Furthermore, 2.32% (n=8) mentioned that latrines were present in the swimming areas while 40.58% (n=140) mentioned that latrines were present around the washing areas.

On the other hand, 49.86% (n=172) mentioned urinating in nearby bushes when conducting chores or other economic activities. Also, 6.98% (n=24) mentioned urinating around water source while 47.25% (n=163) mentioned urinating in nearby latrines.

Occupation

Only 14.20% (n=49) of the study participants were farmers. This was a clear indication that a majority of the women within Nyando Sub-County do not get into contact with possibly infested water from rice farms within the region. Furthemore, 14.20% (n=49) were students, 33.33% (n=115) were housewives and 37.68% (n=130) were engaged in small businesses as a means of livelihoods.

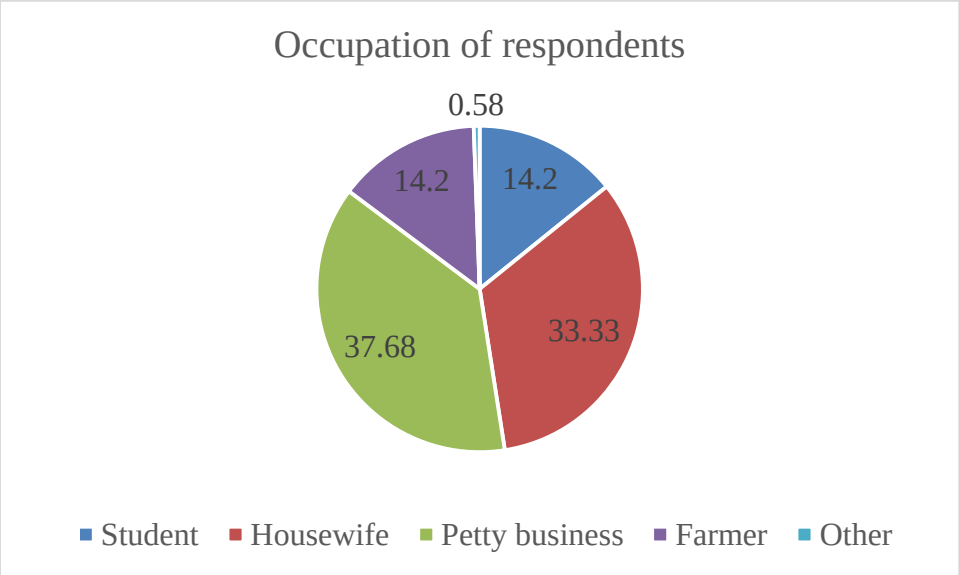


Figure 4.2: Occupation of respondents

4.7 Knowledge of the respondent regarding the causes, modes of transmission, signs, and treatments for intestinal and urinary schistosomiasis.

A total of 27.25% (n = 94) of the study participants, had heard of urinary schistosomiasis. Of these, 2.9% (n=10) had been diagnosed with urinary schistosomiasis in the past. Another 86.2% (n = 81) believed that urinary schistosomiasis can be cured. Also 53.2% (n=50) mentioned sexual intercourse as a mode of transmission of urinary schistosomiasis, 74.5% (n=70) mentioned getting into contact with infested water while 53.2% (n=50) mentioned eating infected foodstuffs. On the other hand, 3.2% (n=3) mentioned coughing as a symptom of urinary

schistosomiasis, 68.1% (n=64) mentioned itching, 8.5% (n=8) mentioned headaches, 21.3% (n=20) mentioned fever, 66.7% (n=62) mentioned blood in urine, 80.9% (n=76) mentioned blood in faeces while 70.2% (n=66) mentioned diarrhoea. A majority of the respondents i.e. 82.1% (n=78) mentioned swallowing tablest as a form of treatement for urinary schistosmias, 71.3% (n=67) mentioned injection, 11.7% (n=11) mentioned surgery while 9.6% (n=9) mentioned traditional medicine.

Among the activities that may lead to acquiring urinary schistosomiasis, 43.2% (n=41) mentioned swimming, 23.2% (n=23) mentioned farming, 34.7% (n=33) mentioned fetching water, 29.5% (n=28) mentioned washing utensils, 36.8% (n=35) mentioned bathing, while 37.9% (n=36) mentioned fishing.

Only 22.6% (n=78) had heard of female genital schistosomiasis with 41.0% (n=32) stating that they had heard of it from the health facilities in the area, 32.1% (n=25) mentioned schools, 48.7% (n=38) mentioned friends as the source of information on female genital schistosomiasis. 76.9% (n=60) mentioned the radio, 10.3% (n=8) mentioned newspapers, 1.3% (n=1) mentioned leaflets while 23.08% (n=18) mentioned the television.

Among the study participants, 57.7% (n=199) mentioned that they had suffered from vaginal itching in the past, 8.7% (n=30) mentioned profuse vaginal discharge, 19.4% (n=67) mentioned post coital bleeding and 40% (n=138) mentioned having experienced irregular menstrual cycles. All the study partcipants had suffered from abdominal pains.

Table 4.5: Knowledge of the respondent regarding the causes, modes of transmission, signs, and treatments for schistosomiasis.

Variable	Frequency	Percent
Ever heard of urinary schistosomiasis		
Yes	94	27.3
Ever diagnosed of urinary schistosomiasis		
Yes	10	2.9
Transmission of urinary schistosomiasis		
Sexual intercourse	50	53.2
Contacting infested water	70	74.5
Eating infected foodstuffs	50	53.2
Symptoms of urinary schistosomiasis		
Coughing	3	3.2
Itching	64	68.1
Headache	8	8.5
Fever	20	21.3
Blood in urine	62	66.7
Blood in faeces	76	80.9
Diarrhoea	66	70.2
Can urinary schistosomiasis be cured		
Yes	81	86.2
Forms of treatment of urinary schistosomiasis		
Swallowing tablets	78	82.1
Injection	67	71.3
Surgery	11	11.7
Traditional medicine	9	9.6
Activities that may lead to acquiring urinary schistosomiasis		
Swimming	41	43.2
Farming	23	23.2

Fetching water	33	34.7
Washing utensils	28	29.5
Bathing	35	36.8
Sexual intercourse	48	50.5
Fishing	36	37.9
Heard of female genital schistosomiasis		
Yes	78	22.6
Source of information on female genital schistosomiasis		
Health facility	32	41.0
School	25	32.1
Friend	38	48.7
Radio	60	76.9
Newspaper	8	10.3
Leaflets	1	1.3
Television	18	23.1
Symptoms suffered		
Vaginal itching	199	57.7
Profuse vaginal discharge	30	8.7
Abdominal pain	345	100
Post coital bleeding	67	19.4
Irregular menstrual cycles	138	40

CHAPTER FIVE

RECOMMENDATIONS, DISCUSSION, AND SUMMARY OF FINDINGS

5.1 Summary of findings

The research's conclusions are presented in this section. The goal of the study was to ascertain the prevalence of and risk factors for urinary schistosomiasis as well as any potential co-infection with intestinal schistosomiasis and FGS.

5.2 Discussion of the results

5.2.1 *S.mansoni* and *S.haematobium* prevalence and intensity

Data from this study demonstrated that there was 0% prevalence of urinary schistosomiasis, low prevalence of intestinal schistosomiasis of 0.3% and and mean intensity was 72 eggs per gram of stool among women of their reproductive ages aged 18 years to 49 years in Nyando Sub-County, an association that has also been shown by other researchers (Spigelman, 2010). The presence of a disorder known as schistosomiasis without eggs may be to blame for the low prevalence of *S.mansoni* in the research area. According to (Spigelman, 2010), the presence of a positive test for microhaematuria or micromansoni could be a sign of infection in situations where no ova are discovered during investigations but there is a high index of clinical suspicion of schistosomal infection, typically based upon an epidemiological history of exposures. This could be attributed to a number of factors, such as the simplicity of modern medicine, which has clarified many challenging diagnostic situations. Additionally, treatment was frequently initiated solely on the basis of suspicion, a practice that is only acceptable when all other attempts to make a parasitological diagnosis have failed (Spigelman, 2010).

Given that intestinal schistosomiasis and urinary schistosomiasis are most experienced in children (Mutsaka-Makuvaza et al., 2019), this study consisting of 18 year olds to 49 year olds in Nyando, an adult population, could explain the case for low prevalence given that at this age women tend to take precautionary measures when it comes to hygiene practices.

According to Spigelman (2010), people in endemic areas whose employment involves contact with infected water cannot always avoid doing so (e.g. fishing, rice farming). Since Nyando Sub-County is a rice-growing area, there have been several cases of urinary and intestinal schistosomiasis documented there in the past (Adoka et al., 2014). But during the investigation,

the researcher saw that the majority of farmers were using safety precautions when working on the rice pads. The majority of farmers were protecting themselves from *S.mansoni and S.haematobium* by wearing gumboots and gloves. In some locations within the settlements, the rice pads are also found.

Government roll-out programmes such as the National School-Based Deworming program (NSBDP) aiming to treat all children at risk for intestinal worms and schistosomiasis (Jones, 2015), could also lead to the study findings. The number of eggs excreted from infected people reaching water containing the intermediate snail host(s) was significantly reduced, with 92.46% of the study population owning latrines within their homes; this was reliant on health education, the provision and use of adequate sanitary facilities, and specific anti-schistosomal chemotherapy, such as praziquantel in Nyando Sub-County. As a result of these programs' assistance in controlling parasites in children, the lifespan of adult worms has decreased in adults.

5.2.2 Knowledge of the respondent regarding the cause, symptoms, and preventative strategies for intestinal and urinary schistosomiasis.

If residents in the affected area are appropriately informed and good awareness is created about healthy living through enhancement of appropriate options for preventing the disease outbreak, then schistomiasis control and management in Kenya can become sustainable. The study's findings indicate that most participants are not knowledgeable about the disease's cause, symptoms, transmission, or preventative measures. Only 27.33% (n=94) and 22.61% (n=-78) of respondents had previously heard of female genital schistosomiasis, respectively. This was consistent with research results from Sady et al. (2015). Maseko et al. (2018), on the other hand, found that just 35.35% of survey participants in Swaziland had heard of schistosomiasis, indicating moderate knowledge of the condition there. This may be explained by the fact that there has never been comprehensive research on schistosomiasis in the field of health, and as a result, health education as a control approach has not been implemented in Swaziland.

According to Ukwandu et al. (2004), similar results were also attained in Nigeria. According to Sady et al. (2015), their research region had active schistosomiasis control at the time of the study, which contrasted with our study's findings, which showed low levels of knowledge despite the national deworming program implemented by the Kenyan government.More than half of

people with prior knowledge of urinary schistosomiasis, according to the study, learned about it from the radio. Similar findings were made by Dawaki et al. in 2015, which may be evidence of the nation's contribution to illness control. According to Sady et al. (2015), the health center was mentioned by 41.03% of the study population and was the primary source of information for the majority of those with prior knowledge. When asked about their prior awareness of the symptoms of urinary schistosomiasis, 66.72% of those who did so noted blood in the urine, while 80.85% mentioned blood in the feces. This was comparable to the findings from Swaziland (Maseko et al., 2018), where 74% of respondents identified haematuria as a symptom of urinary schistosomiasis. Only 68% and 39.8%, respectively, of participants in other studies conducted in Yemen (Sady et al., 2015) and Cameroon (Sama et al., 2007), acknowledged haematuria as a symptom of the condition.

A total of 74.47% of respondents identified interaction with schistosomiasis-infested water as a method of transmission. A minimum of one mechanism of transmission was stated by each responder who had prior knowledge of urinary schistosomiasis. On the other hand, only 49.8% of the respondents, according to (Sady et al., 2015), indicated at least one mechanism of transmission. Most high risk behaviors for schistosomiasis were associated with water contact activity, despite the fact that the majority of respondents acknowledged the importance of water bodies in the disease's transmission. The following has been noted by (Abo-Madyan et al., 2004; Maseko et al., 2018). People may have little alternative but to use the accessible sources of water because Nyando Sub-County settlements lack pipe-borne water. The total eradication of the illness may be hampered by this, and it may also show that awareness alone does not always lead to behavioral adjustments, which frequently take a lot of time to assure adherence to healthier habits (Asaolu & Ofoezie, 2003). Additionally, the majority of responders showed understanding of the available treatments for urinary schistosomiasis. This is due to the fact that 82.11% mentioned using pills, 71.28% mentioned injections, and 9.57% mentioned using traditional medicine.

Our study found no correlation between age, gender, place of residence, occupation, and history of infection, and knowledge of urinary schistosomiasis. This might be as a result of the small sample size (n=94) we used for the knowledge assessment. Additionally, earlier research (Kabatereine et al., 2014; Kitalile, 2012) found no connection between educational attainment

and knowledge of schistosomiasis. Contrarily, it was reported by (Dawaki et al., 2015; Sady et al., 2015) that age, educational attainment, and past infection history were strongly linked with knowledge. The majority of participants were unaware of the FGS symptoms. However, among those with knowledge, 22.61%, a majority of who mentioned vaginal itching, mentioned some of its symptoms, including vaginal discharge, abdominal pains, post-coital bleeding, and irregular menstrual periods. The majority of respondents in their study indicated vaginal discharge, stomach and pelvic pain, dysuria, frequent urination, and inflammation of the cervix, endometrium, and/or fallopian tubes (Mazigo et al 2022).

A total of 86.17% (n=81) of the 94 study participants with prior knowledge of urinary schistosomiasis said that it could be treated after someone became infected. Less than half of respondents in Yemen (Sady et al., 2015) thought urinary schistosomiasis could be prevented and treated

5.3 Conclusions

This study reveals that the prevalence rate for urinary and intestinal schistosomiasis was low in Nyando Sub-County despite being an endemic region for schistosomiasis. Additionally, the study's findings indicate that the study population had a moderate *S.mansoni* infection. The absence of eggs in schistosomiasis or government-sponsored initiatives may be cited for the low prevalence and light intensity. A noteworthy finding of this study is that the majority of the people did not have a sufficient understanding of schistosomiasis. The effort to entirely eradicate the disease may face difficult obstacles as a result of this.

5.4 Recommendations

To increase the degree of understanding of the illness and to ensure an efficient and long-lasting control of the diseases, there is need for intense and ongoing community-based health education. A portable water supply is also urgently needed for the villages with few taps and those in need, as this might greatly reduce the number of times people contacted the water. Additionally, the availability of pit latrines in places where there are commercial operations may lower the likelihood of urinating in fresh water. Additionally, as was the case in North-West Uganda, if these measures are not incorporated into the control tactics, there is a risk that the populace may develop a negative attitude toward control initiatives (Parker et al., 2008).

To determine the reason for the area's low prevalence rate and to devise measures to ensure it stays low, a follow-up research must be carried out in Nyando Sub-County.

It is important to continue monitoring the prevalence of schistosomiasis in Nyando Sub-County in order to integrate more potent public health interventions and enhance the quality of the current healthcare system in the region.

5.5 Study Limitations

Symptoms are used to be indicative of possible female genital schistosomiasis but are non-specific. Definitive diagnosis of FGS requires visualization of urogenital tract with digital camera or colposcope. Characterization of urogenital lesions if present was likewise very important together with tissue biopsy for histological examination by pathologist. STIs and FGS present with similar symptoms. Visualization techniques like colposcope or microscopy are important in differentiating STIs and FGS. This study did not use visualization techniques to diagnose FGS. However, questions on symptoms indicative of possible FGS were asked and recorded. Under-reporting or over-reporting may have happened in this study because some infections are asymptomatic or are due to sexually transmitted infections with similar clinical presentation. Likewise, it can’t be reported for sure what damage has been caused in these women since there was no examination and no other investigations such as X-rays and ultrasound done during the study.

Recall bias influenced responses to questions about urinary schistosomiasis, potentially affecting female genital schistosomiasis: the brief recall period that was used to refer to the most recent infection helped to reduce recall bias.

REFERENCES

Abo-Madyan, A. A., Morsy, T. A., & Motawea, S. M. (2004). Efficacy of myrrh in the treatment of schistosomiasis (haematobium and mansoni) in Ezbet El-Bakly, Tamyia Center, El-Fayoum Governorate, Egypt. *Journal of the Egyptian Society of Parasitology*, 34(2), 423-446.

Adoka, S., Anyona, D., Abuom, P., Dida, G., Karanja, D., Vulule, J., Ofulla, A. (2014). Community perceptions of schistosomiasis transmission, prevalence and control in relation to aquatic habitats in the Lake Victoria basin of Kenya. *East African medical journal*, 91(7), 232-244.

Asaolu, S., & Ofoezie, I. (2003). The role of health education and sanitation in the control of helminth infections. *Acta tropica*, 86(2-3), 283-294.

Clennon, J. A., Mungai, P. L., Muchiri, E. M., King, C. H., & Kitron, U. (2006). Spatial and temporal variations in local transmission of Schistosoma haematobium in Msambweni, Kenya. *The American journal of tropical medicine and hygiene*, 75(6), 1034-1041.

Colley, D. G., Bustinduy, A. L., Secor, W. E., & King, C. H. (2014). Human schistosomiasis. *The Lancet*, 383(9936), 2253-2264.

Dawaki, S., Al-Mekhlafi, H. M., Ithoi, I., Ibrahim, J., Abdulsalam, A. M., Ahmed, A., Atroosh, W. M. (2015). The menace of schistosomiasis in Nigeria: knowledge, attitude, and practices regarding schistosomiasis among rural communities in Kano state. *PLoS One*, 10(11), e0143667.

Farid, Bassily, S., Schulert, A. R., Zeind, A. S., McConnell, E., & Abdel Wahab, M. F. (1968). Urinary blood loss in Schistosoma haematobium infection in Egyptian farmers. *Trans R Soc Trop Med Hyg*, 62(4), 496-500. https://doi.org/10.1016/0035-9203(68)90132-6

Garba, A., Barkire, N., Djibo, A., Lamine, M. S., Sofo, B., Gouvras, A. N., Fenwick, A. (2010). Schistosomiasis in infants and preschool-aged children: Infection in a single Schistosoma haematobium and a mixed S. haematobium-S. mansoni foci of Niger. *Acta Trop*, 115(3), 212-219. https://doi.org/10.1016/j.actatropica.2010.03.005

Gordon, J. A. (2019). NIMH Supports evidence-based treatments for Schizophrenia: A response to Torrey et al. *J Clin Psychiatry*, 80(1). https://doi.org/10.4088/JCP.18com12597a

Gryseels, B. (1991). The epidemiology of schistosomiasis in Burundi and its consequences for control. *Trans R Soc Trop Med Hyg*, 85(5), 626-633. https://doi.org/10.1016/0035-9203(91)90371-5

Hatz, C. F. (2001). The use of ultrasound in schistosomiasis. *Adv Parasitol*, 48, 225-284. https://doi.org/10.1016/s0065-308x(01)48007-9

Hay, S. I., Abajobir, A. A., Abate, K. H., Abbafati, C., Abbas, K. M., Abd-Allah, F., Abera, S. F. (2017). Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 390(10100), 1260-1344.

Jeza, V. T., Mutuku, F., Kaduka, L., Mwandawiro, C., Masaku, J., Okoyo, C., Kihara, J. H. (2022). Schistosomiasis, soil transmitted helminthiasis, and malaria co-infections among women of reproductive age in rural communities of Kwale County, coastal Kenya. *BMC public health*, 22(1), 1-15.

Jones, I. (2015). The history of schistosomiasis in Kenya. https://schisto.stanford.edu/pdf/Kenya.pdf

Kabatereine, N., Fleming, F., Thuo, W., Tinkitina, B., Tukahebwa, E. M., & Fenwick, A. (2014). Community perceptions, attitude, practices and treatment seeking behaviour for schistosomiasis in L. Victoria islands in Uganda. *BMC research notes*, 7(1), 1-11.

Kaiglová, A., Changoma, M., Špajdelová, J., Jakubcová, D., & Bírová, K. (2020). Urinary schistosomosis in patients of rural medical health centers in Kwale county, Kenya. *Helminthologia*, 57(1), 19-27.

Kenya National Bureau of Statistics. (2019). 2019 Kenya population and housing census. Kenya National Bureau of Statistics.

Kitalile, J. (2012). Urinary schistosomiasis: knowledge, attitude and practices among school children in Mtera dam area, Mpwapwa district By Jane Michael Muhimbili University of Health and Allied Sciences].

Kjetland, E. F., Ndhlovu, P. D., Mduluza, T., Gomo, E., Gwanzura, L., Mason, P. R., Gundersen, S. G. (2005). Simple clinical manifestations of genital Schistosoma haematobium infection in rural Zimbabwean women. *Am J Trop Med Hyg*, 72(3), 311-319. https://www.ncbi.nlm.nih.gov/pubmed/15772328

Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.

Maseko, T. S., Mkhonta, N. R., Masuku, S. K., Dlamini, S. V., & Fan, C.-K. (2018). Schistosomiasis knowledge, attitude, practices, and associated factors among primary school children in the Siphofaneni area in the Lowveld of Swaziland. *Journal of microbiology, immunology and infection*, 51(1), 103-109.

Mayrent, S., Hennekens CH & Buring JE. (1987). Hennekens CH, Buring JE. Epidemiology in medicine. In: Lippincott Williams & Wilkins. Philadelphia, PA, USA.

Mazigo, H. D., Samson, A., Lambert, V. J., Kosia, A. L., Ngoma, D. D., Murphy, R., & Matungwa, D. J. (2022). "Female genital schistosomiasis is a sexually transmitted disease": Gaps in healthcare workers' knowledge about female genital schistosomiasis in Tanzania. *PLOS Global Public Health*, 2(3), e0000059.

Mduluza, T., Ndhlovu, P., Midzi, N., Scott, J., Mutapi, F., Mary, C., Woolhouse, M. (2003). Contrasting cellular responses in Schistosoma haematobium infected and exposed individuals from areas of high and low transmission in Zimbabwe. *Immunology letters*, 88(3), 249-256.

Ministry of Education, S., Technology, & Ministry of Health, K. (2014). Kenya National School-Based Deworming Programme. Year 1 (2012–2013) Results. In: Ministry of Education, Science and Technology and Ministry of Health Nairobi

MOEST, M. (2014). National School-Based Deworming Programme Year 2 (2013-2014) Report. In.

Mutsaka-Makuvaza, M. J., Matsena-Zingoni, Z., Katsidzira, A., Tshuma, C., Chin'ombe, N., Zhou, X. N., . . . Midzi, N. (2019). Urogenital schistosomiasis and risk factors of infection in mothers and preschool children in an endemic district in Zimbabwe. *Parasit Vectors*, 12(1), 427. https://doi.org/10.1186/s13071-019-3667-5

Mwinzi, P. N., Muchiri, G., Wiegand, R. E., Omedo, M., Abudho, B., Karanja, D. M., Secor, W. E. (2015). Predictive value of school-aged children's schistosomiasis prevalence and egg intensity for other age groups in western Kenya. *The American journal of tropical medicine and hygiene*, 93(6), 1311.

Nagi, S., Chadeka, E. A., Sunahara, T., Mutungi, F., Justin, Y. K. D., Kaneko, S., Hashizume, M. (2014). Risk factors and spatial distribution of Schistosoma mansoni infection among primary school children in Mbita District, Western Kenya. *PLoS neglected tropical diseases*, 8(7), e2991.

Ndhlovu, P. D., Mduluza, T., Kjetland, E. F., Midzi, N., Nyanga, L., Gundersen, S. G., Gomo, E. (2007). Prevalence of urinary schistosomiasis and HIV in females living in a rural community of Zimbabwe: does age matter? *Trans R Soc Trop Med Hyg*, 101(5), 433-438. https://doi.org/10.1016/j.trstmh.2006.08.008

Odiere, M. R., Rawago, F. O., Ombok, M., Secor, W. E., Karanja, D., Mwinzi, P. N., Won, K. (2012). High prevalence of schistosomiasis in Mbita and its adjacent islands of Lake Victoria, western Kenya. *Parasit Vectors*, 5(1), 1-8.

Olds, G. R. (2003). Administration of praziquantel to pregnant and lactating women. *Acta Trop*, 86(2-3), 185-195. https://doi.org/10.1016/s0001-706x(03)00033-0

Parker, M., Allen, T., & Hastings, J. (2008). Resisting control of neglected tropical diseases: dilemmas in the mass treatment of schistosomiasis and soil-transmitted helminths in north-west Uganda. *Journal of biosocial science*, 40(2), 161-181.

Sady, H., Al-Mekhlafi, H. M., Atroosh, W. M., Al-Delaimy, A. K., Nasr, N. A., Dawaki, S., Chua, K. H. (2015). Knowledge, attitude, and practices towards schistosomiasis among rural population in Yemen. *Parasit Vectors*, 8(1), 1-13.

Sama, M. T., Oyono, E., & Ratard, R. (2007). High risk behaviours and schistosomiasis infection in Kumba, South-West Province, Cameroon. *International Journal of Environmental Research and Public Health*, 4(2), 101-105.

Sastry, A. S., & Bhat, S. (2018). *Essentials of medical parasitology*. Jp Medical Ltd.

Smith, J. H., & Christie, J. D. (1986). The pathobiology of Schistosoma haematobium infection in humans. *Hum Pathol*, 17(4), 333-345. https://doi.org/10.1016/s0046-8177(86)80456-7

Spigelman, M. (2010). Manson's Tropical Diseases, 22nd edition: Expert Consult - Online and Print Gordon C. Cook, Alimuddin I. Zumla, editors. WB Saunders Elsevier Ltd, London, 2009. 1800 pp., hardback, ISBN: 978-1-4160-4470-3 (£145.00). International edition for sale in developing countries: ISBN 978-1-4160-4471-0 (£34.00). *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 104(5), 376-376. https://doi.org/10.1016/j.trstmh.2009.09.003

Steinmann, P., Keiser, J., Bos, R., Tanner, M., & Utzinger, J. (2006). Schistosomiasis and water resources development: systematic review, meta-analysis, and estimates of people at risk. *Lancet Infect Dis*, 6(7), 411-425. https://doi.org/10.1016/S1473-3099(06)70521-7

Ukwandu, N. C. D., & Nmorsi, O. (2004). The perception, beliefs and practices toward genitourinary schistosomiasis by inhabitants of selected endemic areas (Edo/Delta States) in south-eastern Nigeria. *Rev Inst Med Trop Sao Paulo*, 46, 209-216.

Utzinger, J., Raso, G., Brooker, S., De Savigny, D., Tanner, M., Ornbjerg, N., N'Goran E, K. (2009). Schistosomiasis and neglected tropical diseases: towards integrated and sustainable control and a word of caution. *Parasitology*, 136(13), 1859-1874. https://doi.org/10.1017/S0031182009991600

Weerakoon, K. G., Gordon, C. A., & McManus, D. P. (2018). DNA diagnostics for schistosomiasis control. *Tropical medicine and infectious disease*, 3(3), 81.

WHO. (2015). *Female genital schistosomiasis: A pocket atlas for clinical health-care professionals*. https://www.who.int/publications/i/item/9789241509299

WHO. (2022a). *Schistosomiasis.* https://www.who.int/news-room/fact-sheets/detail/schistosomiasis

WHO. (2022b). *Schistosomiasis and soil-transmitted helminthiases: progress report, 2020*. https://www.who.int/publications/i/item/who-wer9648-585-595

Woodhall, D. M., Wiegand, R. E., Wellman, M., Matey, E., Abudho, B., Karanja, D. M., Secor, W. E. (2013). Use of geospatial modeling to predict Schistosoma mansoni prevalence in Nyanza Province, Kenya. *PLoS One*, 8(8), e71635.

Yirenya-Tawiah, D., Amoah, C., Apea-Kubi, K. A., Dade, M., Ackumey, M., Annang, T., Bosompem, K. M. (2011). A survey of female genital schistosomiasis of the lower reproductive tract in the volta basin of Ghana. *Ghana Med J*, 45(1), 16-21. https://doi.org/10.4314/gmj.v45i1.68917

APPENDICES

APPENDIX I: ESTIMATED BUDGET AND BUDGET JUSTIFICATION

Item/activity	**Cost (Kshs)**
Study costs (KNH/ERC)	2000
Printing, binding, and stationery	4000
Laboratory tests	220000
Research assistants	30000
Gloves, poly pots, urine and stool containers	20000
Miscellaneous	24000
Total	**300000**

Source of funds: The study was funded by personal savings and family members funding.

APPENDIX II: WORK PLAN

A Gantt chart showing the time frame versus activities

Time	**April 2021**	**May-August 2021**	**September-October 2021**	**November-December 2021**	**January-February 2022**
Writing concept paper					
Writing proposal					
Ethical approval					
Data collection					
Data management and analysis					
Project report writing					
Review of the report by the supervwasor					
Report presentation					

APPENDIX III: FORM OF INFORMED CONSENT (ENGLISH VERSION)

ID NO …….

Acceptance of interview participationGreetings! I'm Owino Vincent Ong'wen and I'm conducting this project work with the objective of learning about how common schistosomiasis of the urinary system is common in women in Rabuor, Bwanda and Nyamware and likewise possible co-infection with intestinal schistosomiasis. The study will also find out how severe the problem is, what makes someone get it, and the effects it has on the affected women.

Study purpose and participation

The study's goal is to learn more about schistosomiasis, which affects the urinary system and its effects on the reproductive system of women who are residents of Nyando sub-county in the selected sub-locations. It is likewise intended to investigate if there was co-infection with intestinal schistosomiasis. As part of a University of Nairobi degree program, I will use the data from this investigation to write a report. If you agree to take part in this study, you will be asked to answer some questions and give some urine and feces for testing. Don't be hesitant because there were no RIGHT or WRONG responses in this interview.

Confidentiality

Only the study identification number will be used to enter all data into computers. No unauthorized parties will have access to the data, which will be kept private.

Risks

We reassure you that participating in this study won't have any negative effects on you.Withdrawal rights and alternatives

Whether or not you choose to participate in this study is entirely up to you. You have the right to decline the study at any moment, even if you have previously given your consent. You won't face any penalties for declining to take part in the study or leaving early, and you won't lose any benefits to which you are legally entitled.

Benefits

The knowledge gathered from this study may benefit you directly as an individual but also benefit others indirectly. The direct benefit to you is that if you are found to have a problem

caused by schistosomiasis, you will be referred to a clinic that will be able to assist you get treatment. Others may indirectly benefit from this study since information you provide will help us in understanding as well as knowing the magnitude of urinary schistosomiasis in women in Nyando sub-county who are in the ages where they are able to give birth. The information will be made available to people who plan healthcare programmes to help them address the problem of urinary schistosomiasis among this group of women.

Contact Person

Contact the study coordinator or the principal investigator, Owino Vincent Ong'wen, a student at the University of Nairobi Medical Microbiology Department, at P.O. BOX 30197-00100, Nairobi, if you have any concerns regarding this study (Mobile number: 0710819411). If you have any queries regarding your rights as a study participant, you can get in touch with the Chair of the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee by calling (254-020) 2726300-9 Ext. 44355.I give my permission to be part of this study: Yes……. No…….

I put forward my commitment to share my contact information e.g. phone contact number for following up: Yes……

Participant's name…….

Participant's signature ……. Date ……...

Agreement of researcher

I certify that the participant had the chance to inquire about the study, and that I responded to each query truthfully and to the best of my ability. I hereby certify that the Participant has read, understood, and deliberately given consent.Signature of researcher……Date …….

You can contact the following in case of any inquiries regarding the research:

Researchers' contact:

Owino Vincent Ong'wen

University of Nairobi

Department of Medical Microbiology

owinovincent2012@gmail.com

+254710819411

Supervwasors' Contact:

Prof Walter Jaoko

Department of Medical Microbiology

University of Nairobi

Email: wjaoko@uonbi.ac.ke

0727555254

Dr. David Odongo

Department of Biological Sciences

University of Nairobi

Email: david.odongo@uonbi.ac.ke

0722984090/0733074965

The secretariat

KNH-UoN ERC

Tel. (254-020) 2726300-9 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

APPENDIX IV: QUESTIONNAIRE (English version)

(To be filled by the interviewer)

Hello. I am Owino Vincent Ong'wen. I am a University of Nairobi student. I'm doing research in your area to see how widespread urinary schistosomiasis is in women aged 18 years to 45 years and possible co-infection with intestinal schistosomiasis (an illness caused by parasitic worm, one of them is called *Schistosoma mansoni*. The adult worms live in mesenteric veins draining sigmoidorectal region and the worm releases eggs which are excreted in the stool of infected person). The findings of this study will aid in the development of the most effective methods for controlling and treating this disease. At the end of the interview, I will ask you to supply some urine and stool for additional research. I will ask you questions about intestinal and urinary schistosomiasis. If I discover you have the infection, I will direct you to a nearby medical center so you can receive treatment. I promise that the data you give will be kept completely confidential and examined, and any information that can be connected back to the participant will be removed. Because the data obtained will be merged with data from other participants, I ask that you be honest in your replies.

PART A: Demographic Data

1. Identification number (ID. NO) ……
2. Village……
3. Hamlet……
4. How old are you? ..... (Years) What is your date, month, and year of birth …….
5. Marital status: Married ……. Not married ……
6. What is the greatest level of schooling you have attained? (Put a tick)
    i. None ……
    ii. Primary ……
    iii. Secondary ……
    iv. College ……
    v. Post-secondary (specify)…….
7. How long have you been a resident of this village? …… (Years)

8. What occupation are you in?
    i. Student ……
    ii. Housewife ……...
    iii. Petty business …….
    iv. Others (specify) ……...

9. What water source do you depend on for domestic use (i.e. water uses common in everyday life to a household, which entails washing of items, drinking to quench thirst, bathing body, waste disposal at home, cooling and heating, domestic animals use, and gardening and landscape irrigation at home)?
    i. Tap water ……... …… (1) YES (2) NO
    ii. Deep well ……..... (1) YES (2) NO
    iii. Ponds …….……. (1) YES (2) NO
    iv. Shallow well ….....……... (1) YES (2) NO
    v. River ……... (1) YES (2) NO
    vi. Lake ……. (1) YES (2) NO
10. Which water source did you depend on for domestic use during your childhood (from birth to 17 years of age)?
    i. Tap water …… (1) YES (2) NO
    ii. Deep well …….....(1) YES (2) NO
    iii. Ponds …….……. (1) YES (2) NO
    iv. Shallow well …..... …… (1) YES (2) NO
    v. River …… (1) YES (2) NO
    vi. Lake ……. (1) YES (2) NO
11. What activity brings you to the water source?
    i. Agricultural activities ……... (1) YES (2) NO
    ii. Fetching water ……. (1) YES (2) NO
    iii. Fishing ……. (1) YES (2) NO
    iv. Washing …… (1) YES (2) NO
    v. Swimming ……. (1) YES (2) NO
    vi. Others (please mention them) ……

PART B: Risk Factors for Schistosomiasis (Put a tick)

12. I'm going to start by asking you some questions regarding urinary schistosomiasis, a parasitic infection brought on by the Schistosoma haematobium parasite. These parasites live in the blood vessels around the infected person's bladder and release eggs that are expelled in the infected person's urine.Have you ever heard of urinary schistosomiasis?

    (1) YES

    (2) NO

If yes proceed to question number 13 but if no, then move to question number 18.

13. How does one acquire it?

    i. Through sexual intercourse ……. (1) YES (2) NO
    ii. Contacting infested water ……. (1) YES (2) NO
    iii. Eating infested foodstuffs ……. (1) YES (2) NO

14. Which symptoms do you think are related to urinary schistosomiasis in Nyando?

    i. Coughing …… … (1) YES (2) NO
    ii. Itching ……. (1) YES (2) NO
    iii. Headache …… (1) YES (2) NO
    iv. Fever…… (1) YES (2) NO
    v. Stomach ache ……..…… (1) YES (2) NO
    vi. Urine in blood…… (1) YES (2) NO
    vii. Blood in faces ……. (1) YES (2) NO
    viii. Diarrhea…… (1) YES (2) NO

15. Can someone with urinary schistosomiasis be cured?

    (1) YES

    (2) NO

16. If NO then in that case, please proceed on to question number 17.How can it be treated?

i. By swallowing tablets …… (1) YES (2) NO
ii. By injection ……. (1) YES (2) NO
iii. By being operated…… (1) YES (2) NO
iv. By traditional medicine …… (1) YES (2) NO
v. Others (please mention them) ……
vi. I don't know ……

17. Which activities can make you acquire the infection?

i. Swimming ……. ……. (1) YES (2) NO
ii. Farming …… (1) YES (2) NO
iii. Fetching water ……. (1) YES (2) NO
iv. Washing utensils ……. (1) YES (2) NO
v. Bathing ……. (1) YES (2) NO
vi. Sexual intercourse ……. (1) YES (2) NO
vii. Fishing ……. (1) YES (2) NO

18. Does your home place have a latrine?

(1) YES
(2) NO

19. If no, where do you urinate?

i. At the neighbor's toilet …… (1) YES (2) NO
ii. In the bush ……..... (1) YES (2) NO

20. Is there any latrine around the areas you conduct these activities?

i. Bathing ……. (1) YES (2) NO
ii. Fetching water ……. ……. (1) YES (2) NO
iii. Farming …… …… (1) YES (2) NO
iv. Fishing ……. (1) YES (2) NO
v. Swimming ……. …… (1) YES (2) NO
vi. Washing clothes …… (1) YES (2) NO

21. Where do you urinate during the above activities?

i. In the nearby bush ……. …… (1) YES (2) NO

ii. Around the water source ……. (1) YES (2) NO

iii. There is a toilet …… (1) YES (2) NO

Now I will ask you questions regarding your treatment history with urinary schistosomiasis

22. Have you ever been diagnosed to be suffering from urinary schistosomiasis?

(1) YES …… (2) NO……

If the answer is no, then move to part C. If the answer is yes, then when did you suffer?

i. Now ……..…… (1) YES (2) NO

ii. A month ago ……..…… (1) YES (2) NO

iii. More than 3 months ago but less than six months ……. (1) YES (2) NO

iv. More than six months ago ……. (1) YES (2) NO

v. A year ago …… (1) YES (2) NO

vi. More than a year ago …… (1) YES (2) NO

23. Which symptoms did you have?

i. Blood in urine ……..……. …. (1) YES (2) NO

ii. Blood in feces ……..…… (1) YES (2) NO

iii. Fever ……..……..… (1) YES (2) NO

iv. Headache ……...……. (1) YES (2) NO

v. Stomachache ……...……. (1) YES (2) NO

24. Did you get investigated in the health facility?

(1) YES

(2) NO

25. Did you get treated?

(1) YES

(2) NO

26. If yes, where did you go for treatment …….

27. What medication did you get if you can remember…….

28. Where did you get that medication?

i. At the health facility ……..… (1) YES (2) NO
ii. At the local herbalist …… (1) YES (2) NO
iii. From a friend/neighbor ……. (1) YES (2) NO
iv. Others (specify) ……..... (1) YES (2) NO

PART C: (Circle the Correct Answer)

Now I will ask you questions on urinary schistosomiasis in the female reproductive tract (female genital schistosomiasis). Remember, the answers you provide are confidential.

29. Have you ever heard of genital schistosomiasis in women (Female Genital Schistosomiasis)?

(1) YES
(2) NO

If your feedback is No go to question number 31.

30. If yes, where did you get such information?

i. At the health facility …….....(1) YES (2) NO
ii. At school ……..……..(1) YES (2) NO
iii. From a friend ……..……(1) YES (2) NO
iv. Radio ……..……(1) YES (2) NO
v. Newspaper ……..……(1) YES (2) NO
vi. Leaflets ……..(1) YES (2) NO
vii. Television ……...(1) YES (2) NO
viii. Others (specify) ……..(1) YES (2) NO

31. Have you ever suffered female genital schistosomiasis?

(1) YES

(2) NO

(3) I DON'T KNOW

i. Have any of the following symptoms ever happened to you?Vaginal itching …… (1) YES (2) NO

ii. Profuse vaginal discharge …… (1) YES (2) NO

iii. Abdominal pain …… (1) YES (2) NO

iv. Post coital bleeding ……..…. (1) YES (2) NO

v. Irregular menstrual cycles ……. (1) YES (2) NO

32. Did you go for treatment after suffering those symptoms? If the answer is no, end here.

(1) YES

(2) NO

33. What diseases were you diagnosed with? …….

34. Which medication did you get? ……..

35. Did the symptoms disappear after that medication?

(1) YES

(2) NO

36. Kindly assist with phone number for ease of follow-up …….

APPENDIX V: INFORMED CONSENT FORM (SWAHILI VERSION)

NAMBARI YA UTAMBULISHO……..

Ridhaa ya ushiriki katika utafiti

Habari! Kwa majina ni: Owino Vincent Ong'wen, ni mwanafunzi katika Chuo Kikuu cha Nairobi. Ninafanya utafiti kuhusu kiwango cha Kichocho cha mkojo na matokeo yake katika afya ya uzazi kwa wanawake wenye umri wa miaka kumi na nane hadi arubaini na tisa. Utafiti huu unafanyika katika kata ya Kisumu kata ndogo ya Nyando.

Umuhimu wa utafiti huu na Ushiriki

Matokeo ya utafiti huu yatasaidia pakubwa sana haswa kuelewa kiwango cha tatizo hili na hata kujua viashiria vyake katika eneo hili.

Ushiriki unahusisha mambo mawili. Ya kwanza ni kukubali kujiunga na utafiti huu kwa hiari. Lingine ni kujibu maswali kama yalivyo katika dodoso la utafiti huu.

Usiri

Taarifa zote utakazo jaza katika dodoso ni siri. Jina lako halitaingizwa katika kompyuta isipokuwa namba ya dodoso tu pekee yake.

Uwezekano wa kutokea jambo la hatari

Mimi kama mtafiti sitarajii kama kuna jambo lolote baya ambayo linaweza kutokea kwa kushiriki katika uafiti huu.

Haki ya kujitoa na mambo mbadala

Ushiriki wako kwenye utafiti huu ni wa hiari. Hivyo unayo haki ya kujibu au pia kutojibu swali lolote katika dodoso utapewa. Kukataa kujibu swali lolote kwenye dodoso hakuna adhabu yoyote utapewa wala haupotezi pia haki zako kama mshiriki kwenye utafiti na hata katika kupata huduma za afya kama wanawake wengine pia.

Faida kwa mshiriki

Endapo utakubali kushiriki katika utafiti huu basi unaweza ukapata faida aina mbili ambavyo ni ya moja kwa moja au pia isiyo ya moja kwa moja. Faida ya moja kwa moja ni ya kwamba

unaweza ukapata msaada kwa matatizo yatakayojulikana wakati wa uatafiti huu. Iwapo utakuwa na swali au vile vile tatizo basi unashauriwa kumweleza mtafiti ambaye ukitaka atakupeleka moja kwa moja katika kituo cha afya kwa ajili ya msaada zaidi. Faida isiyo ya moja kwa moja, ni kwamba majibu yako yatakuwa mchango mkubwa katika matokeo ya jumla ya utafiti huu kwanza kwa kujua ukubwa wa tatizo hili; pili, ambayo yanatarajiwa kuleta mapendekezo yatakayosaidia kupunguza tatizo hili kwa wanawake wenye umri wa miaka kumi na nane hadi arubaini na tisa katika eneo hili.

Mawasiliano

Endapo uwe na swali lolote kuhusu utafiti huu tafadhali hakikisha umewasiliana na mtafiti mkuu Owino Vincent Ong'wen kupitia nambari ya simu 0710819411 au mwenyekiti wa Kenyatta National Hospital-University of Nairobi Ethics and Research Committee kwenye nambari ya simu (254-020) 2726300-9 Ext 44355

Nimekubali kushiriki kwenye utafiti huu: Ndio ……... Laa …….

Nimekubali kupeana maelezo ya Mawasiliano kwa mfano nambari ya simu kwa minajili ya kufuatilia: Ndio……

Jina la mshiriki kwenye utafiti …… Tarehe ……...

Sahihi ya mshiriki kwenye utafiti ……Tarehe …….

Ahadi ya mfanya utafiti

Nadhibitishi ya kwamba mshiriki kwenye utafiti huu amepewa nafasi ili aulize maswali kuhusu utafiti huu na maswali zake zote zimejibiwa kikamilifu kulingana na ustadi wangu. Nadhibitisha ya kwamba mshiriki kwenye utafiti huu ameelewa na amepeana kibali kushiriki kwenye utafiti huu

Sahihi ya mfanya utafiti ……. Tarehe …….

Unaweza wasiliana na mfanya utafiti:

Owino Vincent Ong'wen

University of Nairobi

Department of Medical Microbiology

owinovincent2012@gmail.com

+254710819411

Wasimamizi:

Prof Walter Jaoko

Department of Medical Microbiology

University of Nairobi

Email: wjaoko@uonbi.ac.ke

0727555254

Dr. David Odongo

Department of Biological Sciences

University of Nairobi

Email: david.odongo@uonbi.ac.ke

0722984090/0733074965

The secretariat

KNH-UoN ERC

Tel. (254-020) 2726300-9 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

APPENDIX VI: QUESTIONNAIRE (Kiswahili version)

Habari. Mimi ni Owino Vincent Ong'wen, mwanafunzi kwenye chuo kikuu cha Nairobi. Katika masomo yangu natakiwa kufanya utafiti wa kisayansi. Lengo la utafiti wangu ni kutaka kufahamu kiwango cha maambukizi wa kichocho cha mkojo kwa wanawake wenye umri wa miaka kumi na nane hadi miaka arubaini na tisa katika kata ndogo ya Nyando. Matokeo ya utafiti huu yatatumika kuandaa mipango madhubuti ya kuthibiti ugonjwa huu katika maeneo haya. Nitakuuliza maswali kadhaa kuhusu ugonjwa wa kichocho cha mkojo na baadaye nitakuomba unipe mkojo na kinyesi kwa ajili ya uchunguzi. Nakuahidi kwamba taarifa unazonipa zitakuwa siri kubwa; kwa hivyo usiwe na shaka unaponipa habari hii. (Tia alama kwa jibu sahihi litakalotolewa na mshiriki)

Sasa nitakuuliza maswali ya jumla kukuhusu.

SEHEMU A:

1. Nambari ya utambulisho ……

2. Kijiji …….

3. Kitongoji ……

4. Una umri gani? …. (Miaka) Ulizaliwa tarehe ngapi? …./…. /…… (Tarehe/mwezi/mwaka)

5. Hali ndoa kwa sasa

(1) Nimeolewa

(2) Sijaolewa

(3) Naishi na mwanamume

(4) Nimetengana na mume

(5) Nimepewa/ toa talaka

(5) Mjane

6. Ni ngazi ipi ya juu ya elimu uliyoifikia?

(1) Sijapata elimu yoyote

(2) Elimu ya shule ya msingi

(3) Elimu ya shule ya sekondari

(4) Chuo

(5) Nyingine (taja)…….

7. Umeishi katika kijiji hiki kwa muda gani? …… (Miaka)

8. Unafanya shughuli gani?

(1) Mwanafunzi

(2) Mama wa nyumbani

(3) Biashara ndogo ndogo

(4) Mkulima

(5) Nyingine kama ipo (taja) ……

9. Ni aina gani ya chanzo cha maji unayoyatumia katika maisha ya kila siku?

i. Maji ya bomba …… (1) Ndio (2) Hapana
ii. Kisima kirefu ……. (1) Ndio (2) Hapana
iii. Dimbwi ……. (1) Ndio (2) Hapana
iv. Kisima kifupi ……. (1) Ndio (2) Hapana
v. Mto ……. (1) Ndio (2) Hapana
vi. Nyingine kama ipo (taja) ……

10. Ni chanzo cha aina gani cha maji uliyokuwa ukitumia katika muda mwingi wa maisha yako ya utoto (tangu kuzaliwa hadi miaka kumi na saba)?

i. Maji ya bomba …… (1) Ndio (2) Hapana
ii. Kisima kirefu ……. (1) Ndio (2) Hapana
iii. Dimbwi ……..…… (1) Ndio (2) Hapana
iv. Kisima kifupi ……..……... (1) Ndio (2) Hapana
v. Mto …… (1) Ndio (2) Hapana
vi. Nyingine kama ipo (taja) …….

11. Ni shughuli gani unazozifanya zinazokufanya kuingia/kugusana na chanzo cha maji kilichoko wazi?

i. Kilimo ……. (1) Ndio (2) Hapana
ii. Kuchota maji ……. ….. (1) Ndio (2) Hapana
iii. Kuvua samaki …….……. (1) Ndio (2) Hapana
iv. Kufua …….……... (1) Ndio (2) Hapana
v. Kuoga/kuogelea …….……. (1) Ndio (2) Hapana
vi. Nyingine kama ipo (taja) ……

SEHEMU B: VISABABISHI VYA KICHOCHO (Zungushia jibu lililotolewa na mshiriki)

12. Je umewahi kusikia kuhusu kichocho cha mkojo) Kama jibu lako ni hapana tafadhali nenda kwenye swali la 18

(1) Ndio

(2) Hapana

13. Kama ndio, ni njia zipi kati ya hizi zinaweza kukusababishia kupata kichocho cha mkojo?

i. Kujamiiana ……..… (1) Ndio (2) Hapana
ii. Kugusa/ kukanyaga maji machafu …….…… (1) Ndio (2) Hapana
iii. Kula vyakula vichafu …….…… (1) Ndio (2) Hapana

14. Ni dalili zipi unazodhani zinahusiana na ugonjwa wa kichocho cha mkojo kwenye eneo hii ya Nyando?

i. Kukohoa ……. (1) Ndio (2) Hapana
ii. Kuwashwa …….…….…. (1) Ndio (2) Hapana
iii. Kuumwa kichwa ……. (1) Ndio (2) Hapana
iv. Homa …….……. (1) Ndio (2) Hapana
v. Maumivi ya tumbo …….…. (1) Ndio (2) Hapana
vi. Kukojoa mkojo wenye damu …….…. (1) Ndio (2) Hapana
vii. Kujisaidia kinyesi chenye damu...…… (1) Ndio (2) Hapana
viii. Kuharisha ……..... (1) Ndio (2) Hapana

15. Je mtu mwenye kichocho cha mkojo kinaweza kutibiwa?

(1) Ndio

(2) Hapana

Kama jibu lako ni hapana tafadhali nenda kwenye swali la 17

16. Ni kwa njia gani kichocho cha mkojo kinaweza kutibiwa?

i. Kwa kumeza vidonge ……. (1) Ndio (2) Hapana
ii. Kuchomwa sindano ……..…… (1) Ndio (2) Hapana
iii. Kufanyiwa upasuaji ……..…… (1) Ndio (2) Hapana
iv. Madawa ya kienyeji ……. (1) Ndio (2) Hapana
v. Nyingine (taja) ……
vi. Sijui…….

17. Kwa maoni yako ni shughuli gani zinaweza kukuweka katika hatari ya kuambukizwa kichocho cha mkojo?

i. Kuogelea katika maji machafu ……. (1) Ndio (2) Hapana
ii. Kilimo cha umwagiliaji ……..…… (1) Ndio (2) Hapana
iii. Kuteka maji ……..……. (1) Ndio (2) Hapana
iv. Kuosha vyombo katika maji machafu ….……. (1) Ndio (2) Hapana
v. Kuoga katika maji machafu ……..……. (1) Ndio (2) Hapana
vi. Kujamiiana …… (1) Ndio (2) Hapana
vii. Kuvua samaki ……..……. (1) Ndio (2) Hapana
viii. Kufua …… (1) Ndio (2) Hapana

Sasa nitakuuliza maswali kuhusiana na hali ya usafi wa mazingira na jinsi unavyotupa taka, tafadhali kuwa mkweli, taarifa hizi zitatunzwa kwa siri.

18. Je eneo lako la makazi lina choo? Kama jibu ni ndiyo nenda swali namba 20.

(1) Ndio

(2) Hapana

19. Kama hakuna je, unakojoa wapi?

i. Natumia choo cha jirani …….…. (1) Ndio (2) Hapana
ii. Kichakani ……. ….. (1) Ndio (2) Hapana
iii. Pengine (taja) …….

20. Je kuna choo katika maeneo unayofanyia shughuli hizi?

i. Kuoga...…….…….…. (1) Ndio (2) Hapana
ii. Kuchota maji …….…….…. (1) Ndio (2) Hapana
iii. Kulima …….…… (1) Ndio (2) Hapana
iv. Kuvua samaki …….……. (1) Ndio (2) Hapana
v. Kuogelea …….…….…… (1) Ndio (2) Hapana
vi. Kufua …….…….……. (1) Ndio (2) Hapana

21. Wakati wa shughuli tajwa hapo juu ukijisikia haja unajisaidia/ kukojoa wapi?

i. Kichakani …….……. (1) Ndio (2) Hapana
ii. Karibu na chanzo cha maji ……... (1) Ndio (2) Hapana
iii. Kuna choo mahali hapo …….…….…… (1) Ndio (2) Hapana
iv. Sehemu nyingine (itaje) …….

Sasa nitakuuliza maswali kuhusiana na matibabu ya kichocho kwa kipindi kilichopita

22.Je, umewahi dhibitishiwa na utambuzi wa ugonjwa kuwa unaugua kichocho cha mkojo?

(1) Ndio

(2) Hapana

Kama jibu lako ni hapana hamia sehemu C. Kama jibu lako ni ndiyo je, ni lini mara ya mwisho uliugua kichocho cha mkojo?

i. Naumwa sasa hivi …….…. (1) Ndio (2) Hapana
ii. Mwezi mmoja uliopita ……..... (1) Ndio (2) Hapana
iii. Zaidi ya miezi miatatu iliyopita lakini chini ya miezi site……. (1) Ndio (2) Hapana
iv. Zaidi ya miezi sita iliyopita …….……... (1) Ndio (2) Hapana
v. Mwaka mzima umepita …….……. (1) Ndio (2) Hapana
vi. Zaidi ya mwaka uliopita ……...…… (1) Ndio (2) Hapana
vii. Nyingine (taja) …….

23. Ni dalili gani ulikuwa nazo kipindi unaumwa kichocho cha mkojo?

i. Kukojoa mkojo wenye damu ……..…… (1) Ndio (2) Hapana
ii. Kujisaidia kinyesi chenye damu …….……. (1) Ndio (2) Hapana
iii. Homa …… (1) Ndio (2) Hapana
iv. Kuwashwa mwili ……. (1) Ndio (2) Hapana
v. Maumivu ya tumbo …….……. (1) Ndio (2) Hapana
vi. Nyingine (itaje) ……

24. Je ulipougua dalili hizo hapo juu ulifanyiwa uchunguzi katika kituo cha huduma za afya?

(1) Ndio

(2) Hapana

25. Je ulipata matibabu ya kichocho cha mkojo ulipougua dalili tajwa hapo juu?

(1) Ndio

(2) Hapana

26. Kama jibu ni ndio, ulitibiwa wapi?.....

27. Ulipiewa matibabu gani iwapo unaweza kumbuka? ……

28. Ni wapi ulipatiwa hayo matibabu?

i. Katika kituo cha afya ……..…. (1) Ndio (2) Hapana
ii. Kwa mganga wa dawa za miti shamba ….…… (1) Ndio (2) Hapana
iii. Kwa rafiki/jirani ……..……. (1) Ndio (2) Hapana
iv. Kwingine (taja) …….

SEHEMU C (Zungushia Jibu Linalotolewa Na Mshiriki)

29. Je, umewahi kusikia kuhusu kichocho kwenye viungo vya uzazi wa mwanamke (Female Genital Schistosomiasis)? Iwapo utajibu hapana tafadhali nenda kwenye swali namba 31.

(1) Ndio

(2) Hapana

30. Kama ndiyo, ulipata wapi habari hizo?

i. Katika kituo cha afya …….. (1) Ndio (2) Hapana
ii. Shuleni ……. (1) Ndio (2) Hapana
iii. Kwa rafiki ……. (1) Ndio (2) Hapana
iv. Redio ……. (1) Ndio (2) Hapana
v. Gazeti …… (1) Ndio (2) Hapana
vi. Vipeperushi ……..…… (1) Ndio (2) Hapana
vii. Televisheni ……..…… (1) Ndio (2) Hapana
viii. Nyingine (taja) …….

31. Je umewahi kuugua Female Genital Schistosomiasis?

(1) Ndio
(2) Hapana
(3) Sijui

32. Je, umewahi kupatwa na dalili zifuatazo?

i. Kuwashwa ukeni ……. (1) Ndio (2) Hapana
ii. Kutokwa na majimaji yasiyo ya kawaida ukeni ….……. (1) Ndio (2) Hapana
iii. Tumbo kuuma ……. (1) Ndio (2) Hapana
iv. Kutokwa na damu mara baada ya kujamiiana……. (1) Ndio (2) Hapana
v. Kubadilika mara kwa mara kwa mzunguko wa hedhi ……. (1) Ndio (2) Hapana

33. Je, ulitafuta matibabu ulipopatwa na dalili tajwa hapo juu? Kama jibu ni hapana ishia hapo.

(1) Ndio
(2) Hapana

34. Je, uligundulika ukiwa na ugonjwa gani? …….

35. Je, ulipewa matibabu gani? …….

36. Je, dalili hizo ziliisha ulivyopatiwa hayo matibabu?

(1) Ndio

(2) Hapana

37. Tafadhali saidia nambari ya simu kwa urahisi wa ufuatiliaji …….

ASANTE KWA USHIRIKI WAKO.

APPENDIX VII: INFORMED CONSENT FORM (DHOLUO VERSION)

Namba mar yangruok …….

Hangruok mar bedo e penjoni

Kaw mos mara! Nyinga en Owino Vincent Ong'wen kendo atimo penjogi mondo ayud nonro kod ng'eyo matut kotenore kod tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo) gi gino ma miyo tuoni ng'eny kuom mine mayudore e gwenge mag Rabuor, Bwanda kod Nyamware. Somoni bende geno mar yudo duoko mayango kaka tuoni ger ne jogo ma omako, gigo ma nyalo miyo ng'ato yudo tuoni kod rach ma tuoni weyo kata kelone mine ma osegame.

Gino ma somoni manyo kod Gik ma somoni oting'o

Somoni nitie kod geno mar choko nonro ewi tuo mar schistosomiasis ma mako yor lach kendo yudo duoko kaluwore gi gigo matuoni nitiere godo e yor nyuol mar jo mamine ma odak e gwenge mag Nyando ei dho udi ma ibiro yier ne timo nonroni. Duoko mar somoni abiro tiyo godo e loso lipot mara mondo okonya kaluwore kod dwaro mar tieko tiegruok mamalo e mbalariany mar Nairobi. Ibiro dwar ni mondo iduok penjo kendo ichiw lachni gi oko ma duog (chieth) mondo timnegi nonro ka iyie mar bedo achiel koda e somoni. Onge duoko ma en ADIER kat ma en MIRIAMBO e penjogi omiyo kik iluor.

Singruok mar rito siri

Duoko duto ma oyudi ibiro rwak e kompyuta ma oyango namba mar somoni. Singruok bende nitie mar keto duoko tee elwet japenjo kod jogo manone kende. Jogo ma ok oyienegi yudo duokogi ok nyal kendo ok oyienegi ng'eyogi.

Hinyruok

Wasingore bende ni onge hinyruok moro ma ibiro yudo kokalo e bedo achiel koda e somoni/penjogi

Ratiro mar weyo kod kaka inyalo weyo bedo e somoni

Bedo e somoni luwore kod yie mari. Bende inyalo weyo bedo achiel koda e somoni e sechego ma iyiero kata obedo mana ni iseketo koda yie mari mar bedo e somoni. Dagi bedo e somoni kata weyo ok bi keloni fwayi kata kum kuom yudo ber ma owinjore iyudi.

Kony

Duoko ma oyudi e somoni nyalo konyi in iwuon kata jogo mamoko ka okalo kuomi. Kony ma ibiro yudo en kaka, ka oyudore ni intiere kod tuo kata chandruok mikelogi schistosomiasis, ibiro timni ote makende e od thieth ma nitiere gi nyalo mar konyi yudo thieth mar tuoni. Jok mamoko to nyalo yudo kony nikech duoko mawayudo biro konyowa e yango pek kata ng'eny ma tuoni (urinary schistosomiasis) osemako godo mine mosechopo higni mag nyuol e gwenge mag Nyando. Duoko kata nonro mar tuoni bende biro bedo ayanga ne jogo manitie kod chenro mag lero ne mine madwaro winjo nonro mag tuoni (urinary schistosomiasis).

Jogo ma onego imany

Ka in kod penjo moro amora kotenore kod somoni, inyalo manyo jalos/jaluw chenro mar somoni, jachok penjo: Owino Vincent Ong'wen, ma en japuonjre e mbalariany mar Nairobi kar tiegruok mar Medical Microbiology, P.O.BOX 30197 - 00100, Nairobi (Namba mar simu en: 0710819411). Ka in kod penjo kaluwore kod ratiro magi kaka ng'atno ma obedo e somoni, inyalo gochone jakom mar Kenyatta National Hospital-University of Nairobi Ethics and Research Committee e namba mar simu (254-020) 2726300-9 Ext 44355

Ayie bedo e somoni: EE…….. Dawe…….

Ayie chiwo yo minyalo nwanga kodo ma en namba mar sime minyalo luwa go: Ee……

Nying' jaduok penjo …….

Seyi mar jaduok penjo……. Tarik …….

Ayanga mar jachok penjo

Ayangra ni jaduok penjo omi thuolo mar penjo penjo molure gi somoni, to bende ni penjo ne duto odwoki kare kalure gi ngeyo gi lony ma an go. Ayangra ni jaduok penjo owinjo maber kendo be oyie bedo e somoni.

Seyi mar jachok penjo ……. Tarik …….

Inyalo tudrwok gi jachok penjo e:

Owino Vincent Ong'wen

University of Nairobi

Department of Medical Microbiology

owinovincent2012@gmail.com

+254710819411

Namba mar jochung':

Prof Walter Jaoko

Department of Medical Microbiology

University of Nairobi

Email: wjaoko@uonbi.ac.ke

0727555254

Dr. David Odongo

Department of Biological Sciences

University of Nairobi

Email: david.odongo@uonbi.ac.ke

0722984090/0733074965

The secretariat

KNH-UoN ERC

Tel. (254-020) 2726300-9 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

APPENDIX VIII: QUESTIONNAIRE (Dholuo version)

(To be filled by the interviewer)

Amosi. Nyinga en Owino Vincent Ong'wen. An japuonjre e mbalariany mar Nairobi. Atimo somo e gweng'u kaye ka adwaro ng'eyo tut mar tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo) osebedo kachando godo joma mine kod nyiri mosechopo e higni apar ga boro nyaka piero ang'uen go chiko. Duoko mar somoni biro konya e chenro mar loso yore mabeyo kendo mowinjre minyalo geng' kata konyo godo tuoni. Adhi penji penjo moko kotenore kod tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo) kaeto e giko mar penjogi adhi kwayo mondo iyie ikonya kod lachni matin kod oko ni maduong (chieth) mondo okonya e timo pim moko mar yudo duoko mowinjore ewi tuoni. Kadipo iyudori kod kute mag tuoni to abiro ori e kar thieth mantie machiegni kodi mondo iyud thieth ewi tuoni. Mogik to asingora ni duoko duto ma imiya biro bedo mana e siri kendo mana ekindwa kodi, omiyo akwayi mondo ibed ja adiera e miya duoko kuom penjo ma adhipenji.

PART A: Nonro mar Dak

1. Namba mar yangruok (ID. NO) ……

2. Gweng'u……

3. Anyuondi……

4. In kod higni adi? ..... (Higa) Higa kod dwe kod tarik mari mar nyuol en …….

5. Nonro mar keny: Osekendi ……. Pok Okendi ……

6. En kar tiegruok mane ma malo ma isechope kod somo? (Chuo tik kama owinjore)

   i. Onge ……
   ii. Primary ……
   iii. Secondary ……
   iv. College ……
   v. Mokalo college (Wach kama sombi osegike) ……..

7. Isedak e gweng'ni kuom higni maromo nade? …… (Higni)

8. Sani itimo ang'o?

i. Nyathi sikul ……
ii. Dhako mosekendi to onge kod tich…….
iii. Ohala matindo…….
iv. Japur……...
v. Moko (Wach gima itimo) ……...

9. Pi ma itiyo godo e ot igolo kanye?

i. Machwer mar fereji …….. ……(1) Ee (2) Dawe
ii. Kisima mokuny matut …….....(1)Ee (2Dawe
iii. dago …….……..(1) Ee (2) Dawe
iv. Kisima mokuny mathanythany ….....……..(1) Ee (2) Dawe
v. Aora ……. (1) Ee (2) Dawe
vi. Nam …….…….(1) Ee (2) Dawe

10. Pi mane itiyo godo kane pod itin ne igolo kanye? (chakre e nyuolni nyaka higni apar kod abirio)

i. Machwer mar fereji …….. ……(1) Ee (2) Dawe
ii. Kisima mokuny matut …….....(1) Ee (2) Dawe
iii. dago …….…… (1)Ee (2) Dawe
iv. Kisima mokuny mathanythany ….....……(1) Ee (2) Dawe
v. Aora …….. (1) Ee (2) Dawe
vi. Nam …….(1)Ee (2) Dawe

11. Gin gik mage makeliga manyo pi?

i. Yore mag pur ……..(1)Ee (2) Dawe
ii. Umbo/Tuomo pi ……..(1)Ee (2) Dawe
iii. Lupo ……(1)Ee (2) Dawe
iv. Luoko …… (1)Ee (2) Dawe
v. Goyo abal ……. (1)Ee (2) Dawe
vi. Moko (inyalo ndiko) ……

PART B: Gigo mamedo ongala mar yudo tuo mar Schistosomiasis (Ket tik)

Koro adwa penji penjo kotenore kod tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo).

12. Be isewinjo gimoro kuom tuo mar urinary schistosomiasis? Ka podi to dhie penjo namba 18.

(1) EE

(2) DAWE

13. Tuoni ng'ato nyalo yude nang'o?

i. Kokalo kuom riuruok mar keny/timbe mag keny …… (1) EE (2) DAWE
ii. Modho kata tiyo kod pi ma ochido ……. (1) EE (2) DAWE
iii. Chamo chiemo ma ochido kata mantie kod kute mag tuoni…. (1)EE (2)DAWE

14. Gin ranyisi mage ma iyango godo tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo) e Nyando kae?

i. Ahonda …… … (1) EE (2) DAWE
ii. Sakni mar del……. (1) EE (2) DAWE
iii. Wich bar …… (1) EE (2) DAWE
iv. Liet…… (1) EE (2) DAWE
v. Ich kach ……..……... (1) EE (2) DAWE
vi. Lach motimo remo……. (1) EE (2) DAWE
vii. Chieth/konyruok motimo remo ……..... (1)EE (2) DAWE
viii. Diep…… (1) EE (2) DAWE

15. Bende inyalo thiedh ng'at mantie kod urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo)?

1. EE

2. DAWE

Ka duok en dawe to dhie penjo namba 17.

16. Tuoni inyalo thiedhe nang'o?

i. Ka imuonyo yedhe ma indilo…… (1) EE (2) DAWE
ii. Ka ochwoyi kod sindan ……. (1) EE (2) DAWE
iii. Ka oteri e bero……...…… (1) EE (2) DAWE
iv. Ka itiyo kod yedhe mag bungu ……..…… (1) EE (2)DAWE
v. Ka itiyo gi yore ma moko (Inyalo ndiko) ……..
vi. Ok angeyo ……..

17. Gin tije mage manyalo miyo igam tuoni?

i. Goyo abal …….. …….(1) EE (2) DAWE
ii. Puro …….(1) EE (2) DAWE
iii. Umbo ……..……. (1) EE (2) DAWE
iv. Luoko sande kata gik ot ……..(1) EE (2) DAWE
v. Luokruok …… (1) EE (2) DAWE
vi. Timbe mag keny ……. (1) EE (2) DAWE
vii. Lupo …… (1) EE (2) DAWE

18. Bende dalau nitie kod choo/kar layo?

(1) Ee

(2) Dawe

19. Ka onge to idhiga konyori kod lach kanye?

i. E choo mar jiranda …… (1) EE (2) DAWE
ii. Ei bungu ……..... (1) EE (2) DAWE

20. Bende nitie choche kuonde ma itime tijegi?

i. Luokruok …… (1) EE (2) DAWE
ii. Umbo ……. …….(1) EE (2) DAWE
iii. Pur…… ……(1) EE (2) DAWE
iv. Lupo ……...…. (1) EE (2) DAWE

v. Goyo abal……. ……(1) EE (2) DAWE
vi. Luoko lewni ……. (1) EE (2) DAWE

21. Ikonyori kanye kod lach seche ma itimo tijegi?

i. Ei bungu manitie machiegni kanyo…… (1) EE (2) DAWE
ii. Etie pi (kama igolo e pi) …… (1) EE (2) DAWE
iii. Nitiere choo machiegni …….(1) EE (2) DAWE

Koro adwa penji penjo motenore kod thieth ma iseyudo kokalo kuom tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo).

22. Bende noseyangi ni isegamo kata bedo gi tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo)? (1) EE ……. (2) DAWE…… Ka duoko en dawe to dhi e part C. Ka duoko en ee, to nene igamo tuoni karang'o?

i. Sani ……...…… (1) EE (2) DAWE
ii. Dwe achiel mosekalo ……...…… (1) EE (2) DAWE
iii. Mohingo dweche adek mosekalo to tinne dweche auchiel mosekalo… (1) EE (2) DAWE
iv. Mohingo dweche auchiel mosekalo …….. (1) EE (2) DAWE
v. E higa mosekalo …… (1) EE (2) DAWE
vi. Mohingo higa achiel mosekalo …… (1) EE (2) DAWE
vii. Moko (Inyalo ndiko) ……

23. Ranyisi mage mag tuoni mane ma intiere godo?

i. Lach motimo remo ……..…….. ….(1) EE (2) DAWE
ii. Konyruok/Chieth motimo remo…….……..… (1) EE (2) DAWE
iii. Liet ……..……...… (1) EE (2) DAWE
iv. Wich bar ……...…….. (1) EE (2) DAWE
v. Ich kach ……...……(1) EE (2) DAWE
vi. Moko (Inyalo ndiko) …….

24. Bende ne otimni nonro mar tuoni e kar thieth?

(1) Ee

(2) Dawe

25. Bende ne iyudo thieth mar tuoni?

(1) Ee

(2) Dawe

26. Ka duoko en ee to ne iyudo thieth mar tuoni kune? ……..

27. Yath mane mane okonyi e thiedho tuoni ka po ni inyalo paro?……..

28. Yadhno ne iyudo kanye?

i. Kar thieth ……..… (1) EE (2) DAWE
ii. Ir ajuoga maloso yedhe mag bungu machiegni kodi…… (1) EE (2) DAWE
iii. Ir osiepni kata jirandi ……. (1) EE (2) DAWE
iv. Moko (Inyalo wacho mokogo)…… (1) EE (2) DAWE

PART C: (Lwor duoko miyiero)

Koro adwaro penji penjo motenore kod tuo mar urinary schistosomiasis (Tuo ma miyo ng'ato layo remo ka odhi olo pi/layo) ma iyudo e duong' mar jo mamine (Dho sungu dende ni female genital schistosomiasis –En tuo ma tong'e mar kute makelo tuo ma miyo kato layo remo ka odhi olo pi/layo koro moko e dag lach to moko bende moko e fuondni moloso duong' mar jo mamine to magi duto kelo kuot mar duong' jo mamine mosiko kanyakla kod loko duong' jo mamine bedo gi ringo ma tonde tonde). Parie ni duoko ma ichiwo biro bedo mar siri. Koro akwayi mondo iwach adierani duto kuom penjo ma adhi penji.

29. Bende isewinjo gimoro kuom tuo mar genital schistosomiasis kuom jo mamine (Dho sungu dende ni female genital schistosomiasis –En tuo ma tong'e mar kute makelo tuo ma miyo kato layo remo ka odhi olo pi/layo koro moko e dag lach to moko bende moko e fuondni moloso duong' mar jo mamine to magi duto kelo kuot mar duong' jo mamine mosiko kanyakla kod loko duong' jo mamine bedo gi ringo ma tonde tonde)?

(1) Ee

(2) Dawe, ka duokoni en dawe to dhi nyaka e penjo namba 31.

30. Ka duokoni en ee, ne iyudo nonro mar tuoni kata ka iwuoyo ewi tuoni kanye?

i. Kar thieth ……...……... (1) EE (2) DAWE
ii. Ei sikul ……...…….…… (1) EE (2) DAWE
iii. Kuom osiepna ……...……... (1) EE (2) DAWE
iv. Ei nyakalondo .....…….…… (1) EE (2) DAWE
v. Ei gaset …….……. (1) EE (2) DAWE
vi. Ei oboke …….…… (1) EE (2) DAWE
vii. Ei wang jowi (TV)……... (1) EE (2) DAWE
viii. Moko (Inyalo wacho mokogo) …….……. (1) EE (2) DAWE

31. Bende tuo mar female genital schistosomiasis (En tuo ma tong'e mar kute makelo tuo ma miyo kato layo remo ka odhi olo pi/layo koro moko e dag lach to moko bende moko e fuondni moloso duong' mar jo mamine to magi duto kelo kuot mar duong' jo mamine mosiko kanyakla kod loko duong' jo mamine bedo gi ringo ma tonde tonde) osemaki?

(1) Ee

(2) Dawe

(3) Ok ang'eyo

32. Bende ranyisi ma adhi penjigi osemaki?

i. Duong' ma rewni…….…… (1) EE (2) DAWE
ii. Duong' ma chwer maonge chung'……. (1) EE (2) DAWE
iii. Kor maremo ……. (1) EE (2) DAWE
iv. Golo remo tok riuruok mar keny …….…. (1) EE (2) DAWE
v. Golo remo mar mine ma ok oluwore……. (1) EE (2) DAWE

33. Bende ne imanyo yor thieth kane isefuenyo ni intiere kod ranyisi mag tuoni? Ka duoko en dawe to itieko duoko penjogi ka.

(1) Ee

(2) Dawe

34. Ne oyudore ni in kod tuo mane? …….

35. Ne othiedhi kod yath mane? ……..

36. Bende ranyisi mag tuoni nolal kata norumo bang'e kane iseyudo thieth?

(1) Ee

(2) Dawe

37. Yie ichiw namba ni mar sime minyalo gochni go bange …….…….

APPENDIX IX: INTRODUCTORY LETTERS

Owino Vincent Ong'wen,

University of Nairobi,

Cell phone:0710819411

owinovincent@students.uonbi.ac.ke,

Nairobi.

01/07/2021

Chief Executive Committee Member,

Department of Health and Sanitation,

County Government of Kisumu,

Kisumu.

Dear Sir/Madam,

RE: Notification about research study in Nyando Sub-county, Kisumu.

I'm a student at the University of Nairobi pursuing a master's degree in tropical and infectious diseases. A research project I'm working on right now is called "Prevalence and Risk Factors Associated with Urinary Schistosomiasis Among Women of Reproductive Age in Nyando Sub-County, Kenya."

This letter is intended to inform you of my research study that I'm conducting in the Nyando Sub-county. All collected information will be kept in the strictest confidence and used only for academic reasons.Thanks in advance,

Yours faithfully,

Owino Vincent Ong'wen,

Msc TID: University of Nairobi

Owino Vincent Ong’wen,

University of Nairobi,

Cell phone:0710819411

owinovincent@students.uonbi.ac.ke,

Nairobi.

01/07/2021

Manager,

Division of Vector Borne Diseases (DVBD),

Kisumu.

Dear Sir/Madam,

RE: REQUEST TO USE DVBD LABORATORY TO STORE SAMPLES COLLECTED AND LABORATORY INVESTIGATION.

Hello, I'm a student at the University of Nairobi studying a master's degree in tropical and infectious diseases. A research project I'm working on right now is called "Prevalence and Risk Factors Associated with Urinary Schistosomiasis Among Women of Reproductive Age in Nyando Sub-County, Kenya."The purpose for this letter is to notify you about my research study in Nyando Sub-county and likewise humbly request you to allow me to store collected urine and stool samples in DVBD and likewise do laboratory investigation.

All information received will be kept in strict confidence and used only for academic purposes.Thanks in advance,

Yours faithfully,

Owino Vincent Ong’wen,

Msc TID: University of Nairobi

Owino Vincent Ong'wen,

University of Nairobi,

Cell phone: 0710819411

owinovincent@students.uonbi.ac.ke,

Nairobi.

01/07/2021

Dear Madam,

RE: INSTRUCTIONS ON COLLECTION OF URINE SAMPLES

Hello, I'm a student at the University of Nairobi studying a Master's in Tropical and Infectious Diseases. Prevalence and Risk Factors Associated with Urinary Schistosomiasis Among Women of Reproductive Age in Nyando Sub-County, Kenya is the topic of a research study I'm working on right now.Procedure for collection of Urine:

I) Study Participant preparation

1. The patient identification number should be labeled on the sterile urine container. Date and time the specimen is collected to be included.

2. Before beginning the procedure, thoroughly wash your handsfollowed by wearing of disposable hand gloves.

3. To clean the perineal area, use betadine or hibiclens.

A) Separate the labia folds and use a betadine swab or hibiclens to wipe one side back and forth (anterior to posterior), then throw away the swab or towelette.

B) Use a second betadine swab or hibiclens to clean the other side from front to back, then throw them away.

C) Wipe down the center from the back and front with a third hibiclens or betadine swab, then discard.

D) Keep the labia apart and pat the periurethral area with clean, dry gauze to remove any last traces of betadine.

II) The first bit of urination should be passed into the toilet.

III) The container with urine specimen should be put beneath the research participant once the urine flow has started to capture the midportion (midstream "clean catch") any contaminants getting into the container.

IV) Excess urine can be disposed of in the toilet.

V) Cover the container as soon as the process is finished, taking great care not to contact the interior of the container or the interior part of the lid. Taking care to avoid touching the interior of the container or the lid.

VI) Attach label of study participant Identification number to container and place specimen in cool box

VII) Remove gloves and wash hands.

All data presented will be applied in academic learnings with high levels of confidentiality accorded to the content.

Thanks,

Yours faithfully,

Owino Vincent Ong’wen,

Msc TID: University of Nairobi

Owino Vincent Ong'wen,

University of Nairobi,

Cell phone: 0710819411

owinovincent@students.uonbi.ac.ke,

Nairobi.

01/07/2021

Dear Madam,

RE: INSTRUCTIONS ON COLLECTION OF STOOL SAMPLES

Hello, I'm a student at the University of Nairobi studying a Master's in Tropical and Infectious DiseasesI am currently undertaking a research project on "Prevalence and Risk Factors Associated with Urinary Schistosomiasis among Women of Reproductive Age in Nyando Sub-county, Kenya."

Procedure for collection of stool:

I) Study Participant preparation

1. Both vials are labeled with patient identification number. Date and time the specimen is collected to be included.

2.Put on a pair of disposable gloves and wash your hands thoroughly before starting the procedure.

3. Use the bathroom toilet.

4. Use a wide-mouth container, bedpan, or a piece of clean newspaper, plastic bag, or saran wrap to cover the toilet seat opening and collect the waste. If you use these, the waste won't spill into the toilet. Precautions must be taken to prevent urine from contaminating the samples of feces.

5. Dispatch the two vials from the zip-top bag. Be careful when opening the PVA and 10% formalin bottles.

There should be no spilling or emptying of the vials' contents. Using the spatula, add roughly 3 or 5 spoonfuls of soft or firm stool (from the same bowel movement) to each vial (collection spoon attached to the cap). Stool samples must be taken from any portions of the stool that seem red, slimy, or watery. Take a small quantity from either end and the center of the specimen if the stool is hard. The two vials should be taken out of the zip-top bag. Open the PVA and 10% formalin bottles with caution. It is not advised to spill or empty the liquid inside the vials. Add approximately 3 spoonfuls of hard feces or 5 spoonfuls of soft stool (from the same bowel movement) to each vial using the spatula (collecting spoon attached to the cap). It's important to take stool samples from areas of the stool that seem red, slimy, or watery. If the feces is firm, take a small amount from each end and the center of the specimen.

6 With the spatula, thoroughly combine the specimen and liquid in each container. Replacing the appropriate vials' tops and spatulas. As firmly as you can, close the lid. To distribute the specimen evenly, invert each container.

7. Take off your gloves and wash your hands.

8. Place the vials back into the zip lock bag and close it tightly.

9. Wash hands thoroughly.

. All collected information will only be used for academic purposes and will be handled with the strictest confidentially.

Thanks,

Yours faithfully,

Owino Vincent Ong’wen,

Msc TID: University of Nairobi

APPENDIX X: LABORATORY PROCEDURES

Laboratory diagnosis of *S. mansoni.*

Preparation of Malachite green solution and cellophane

1. When preparing 3% malachite green solution, measure dissolve 3g of malachite green powder in 100 ml of pure water
2. When preparing a solution of 50% glycerol dilute 1 volume of glycerol in the same volume of distilled water
3. To prepare the malachite green solution, take 1 ml of the malachite green (3%) solution and mix it with 200 mls of 50% glycerol solution the shake well to have a homogenous solution. Prepare the cellophane and leave them in the malachite green solution at least 48 hours before use
4. Avoid exposure of maachite green solution to to sunlight and/or protect the beaker with aluminium foil. The solution must be renewed regularly every week.
5. **Procedure**

1. Opne the container with stool and make the solution homogenious for beter distribution of eggs in the sample (if any) by using a clean spatula. I case the solution gets hard to dissolve, add some saline solution at 0.9% NaOCl to homogenize.. thththttth
2. . Put around 1 gram of stool on the sieving material and use the wooden stool to sieve the stool carefuly through a nylon screen. Use a spatula to remove all accumulated stool.
3. Put the Kato-Katz template oon the first slide “A” being careful to place it at the middle. Usin the spatula, fill the hole on the template completely making sure no air bubbles remain by removing any excess stool that may be present.
4. Vertically and carefuly remove the template avoiding any horizontal movements.
5. Put the Kato-Katz on the second slide “B” being careful to put it at the middle of the slide. Use spatula to compeletely fill the hole of the template ensuring no air bubbles left or removing any excess stool.
6. Using a clean and flat surface to press against the cellophane, add pre-soaked on the stool cylinders on both slides. Observe the feacal material spreading evenly between cellophane strop and microscope. Ensure the cellophane is not wrinkled of moved and crefuly support the without any breakeages.

7. . Gently remove the slide by sliding them sideways to ensure the cellophane is not separated from the slide. With the cellophane facing upwards, carefuly place the slide on the bench to observe how water evaporates while leaving glycerol to clear the feaces.
8. Allow the prepared slides to clear for about 20 minutes, this will ensure the background is properly stained to provide a good contrast to visualize the ova.
9. Read all slides within 30-60 minutes or preparation since hookworm eggs rapidly clear and may not be visible after 30—60 minutes.
10. Ensure not more than 10 slides are prepared at a time.
11. Place a green sticky dot on each of the samples that has had kato Katz slide prepared to indicate they have been processed.

TWO SLIDES MUST BE READY AND READ IN DUPLICATE FOR EACH STOOL SAMPLE.

Kato-Katz Preparation Illustrations

1. Putting the template on the microscope slide
2. Preparing the stool out of the stool container
3. Sieve the stool through the wire mesh
4. Take the sieved stool with the help of the spatula and fill the hole in the Kato Katz template. Caution: remove all excess stool and only fill the hole
5. Remove the template. Caution: Make sure to remove the template vertically without moving the template horizontally
6. Put the cellophane stained in malachite green on top of the stool cylinder
7. Invert the slide and press it carefully on another microscope slide or a smooth, hard surface. Make sure the stool is distributed evenly. Caution: be careful not to break the slide when putting pressure on.
8. Put the slide on a slide rack and leave to stain for 30min. After 30min and within 60min, the slide needs to be read, as otherwise Hookworm eggs might degenerate.

Reading procedure

1. 1. Two slides are made for Kato Katz for each stool sample. Under a light microscope, look at the entire slide (40-100x magnification). For each helminth species separately, tally the quantity of eggs and record them.

2. A laboratory supervisor reads the 10% of samples used for quality control at random in addition to the two slide readers.**Results**

1. Presence of SCH and STH eggs will be defined based on one or more of the STH and SCH species.

   To gauge the severity of the infection. There must be a count of the eggs. There is a WHO recommendation for how to categorize the various infection intensities. A Kato-Katz smear has a stool content of 41.7 mg. The egg count from the slide must be multiplied by a factor of 24 (24 x 41.7 mg 1 g) in order to determine the number of eggs per 1 g of feces (EPG).

Epg = eggs per gram	**Light intensity infections**	**Moderate intensity infections**	**Heavy intensity infections**
Schistosoma	1-100 epg	101-400epg	>400 epg

Laboratory diagnosis of *S. haematobium*

1. 1. Gather 20–30 mL of urine in a dry, clean container (between 1000 and 1400 h).
2. 2. The appearance of the urine must be reported. Urine from moderate to severe infections generally contains blood, is murky, and is colored red or red-brown. Add two drops of saponin solution after there is visible blood to lyse the red blood cells. This makes it easier to find the eggs.
3. 3. To sediment the schistotome eggs, add 10 ml of thoroughly mixed urine to a conical tube and centrifuge at RCF 500–1000 g. (avoid centrifuging at greater force because this can cause the eggs to hatch). Dispose of the supernatant liquid. Transfer the entire sediment to a slide, cover it with a cover glass, and then use the 10 objective and an appropriately closed condenser iris to study the sediment under a microscope.

5.4 Count the eggs in the preparation and note how many eggs are present in every 10 milliliters of urine. There is no need to keep counting if there are more than 50 eggs. Reporting the count as "more than 50 eggs/10 ml" is appropriate. These figures point to a serious infection.

APPENDIX XI: ETHICAL APPROVAL

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/81

7th March, 2022

Vincent Owino Ong'wen
Reg.No. W64/33926/2019
Dept. of Medical Microbiology
Faculty of Health Science
University of Nairobi

Dear Vincent,

RESEARCH PROPOSAL: PREVALENCE AND RISK FACTORS ASSOCIATED WITH URINARY SCHISTOSOMIASIS AMONG WOMEN OF REPRODUCTIVE AGE IN NYANDO SUB-COUNTY KENYA (P864/11/2021)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P864/11/2021.** The approval period is 7th March 2022 – 6th March 2023.

This approval is subject to compliance with the following requirements;

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

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Chair, Dept. of Microbiology, UoN
Supervisors: Prof. Walter Jaoko, KAVI-Institute of Clinical Research, UoN
Dr. David Odongo, School of Biological Sciences, UoN