FACTORS INFLUENCING BURDEN OF *SCHISTOSOMA HAEMATOBIUM* INFECTION AMONG PREGNANT WOMEN IN KWALE COUNTY, KENYA

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Factors Influencing Burden of *Schistosoma Haematobium* Infection and the Influencing Factors among Pregnant Women in Kwale County, Kenya

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DECLARATION

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

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DEDICATION

This thesis is dedicated to my husband Kassim Ali Sawa for his unveiled confidence and belief in me for my abilities in climbing up my professional ladder. Thank you for your full support and encouragement Mlumewangu; to my loving little children Suleiman and Halima for tolerating me when I had very little time for you, but you survived stress and pressure from my busy schedules. I had to do what I have done to be what I am today. I love you so much. May God give you quality health in your life. More so, to the whole family for being patient, never stopping to push for my graduation. To all my children; Ninyuchi, N'yoyo, Mwapore, Suleiman and Halima may God bless you abundantly for standing by my side throughout the difficult working times to this achievement without losing faith in your mama. You are my best friends and company; I will never stop loving you. Indeed, you are my strength, my power.

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TABLE OF CONTENTS

DECLARATION ii

DEDICATION iii

ACKNOWLEDGEMENT iv

LIST OF TABLES xi

LIST OF FIGURES xii

LIST OF APPENDICES xiii

ACRONYMS AND ABBREVIATIONS xiv

DEFINITION OF OPERATIONAL TERMS xvi

ABSTRACT xvii

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background of the Study 1

1.2 Statement of the Problem 2

1.3 Justification 3

1.4 Objectives 4

1.4.1 General Objective 4

1.4.2 Specific Objectives 4

1.5 Research Questions 4

1.6Conceptual Framework 5

CHAPTER TWO 6

LITERATURE REVIEW 6

2.1 Introduction 6

2.1.1 Theoretical Framework 6

2.1.2 Epidemiology of Schistosomiasis 7

2.2 Diagnosis of *S. heamatobium* 8

2.2.1 Urine Analysis 9

2.3 Etiology of Schistosomiasis 10

2.4 Symptoms and Complications of Schistosomiasis 11

2.5 Prevalence of S. haematobium 12

2.6 Socioeconomic and Sociodemographic Factors Influencing *S. haematobium* Infection 13

2.7 Knowledge, Attitude and Practices Influencing *S. haematobiun* Infection 14

2.8 Schistosomiasis in Pregnancy 16

2.9 Prevention and Control of *S. haematobium* 16

CHAPTER THREE 17

MATERIALS AND METHODS 17

3.1 Study Area 17

3.2 Study Design 18

3.3 Study Population 19
3.3.1 Inclusion Criteria.. 19
3.3.2 Exclusion Criteria.. 19
3.3.3 Sample Size Determination 19
3.4 Sampling Procedure 20
3.5 Data Collection.. 21
3.6 Data Collection Tools 21
3.7 Pretesting of Study Tools 21
3.8 Validity of Tools 22
3.9 Reliability of Study Tools/Instruments 22
3.9.1 Data Collection Procedures.. 22
3.10 Microscopy.. 24
3.11 Dip Stick Urinalysis 24
3.12 Pregnancy Test 25
3.13 Physical Examination.. 25
3.14 Questionnaire Survey 25
3.15 Key Informant Interviews 26
3.16 Data Management 26
3.17 Data Analysis 26

3.17.1 Statistical Analysis 26
3.17.2 Thematic Analysis 27
3.18 Limitations of the Study 27
3.19 Ethics and Authority 27
3.20 Consenting Process 28
3.21 Risks to the Study 28
3.22 Benefits 28
3.23 Confidentiality 28
3.24 Voluntariness 29
CHAPTER FOUR 30
RESULTS 30
4.1 Socio-Demographic Characteristics among Pregnant Women of Kwale County 30
4.2 Objective 1: Prevalence and Intensity of *S. haematobium* Infection Among Pregnant Women in Kwale County 31
4.2.1 Prevalence of S. haematobium Infection among Pregnant Women in Kwale County 31
4.2.2 Intensity of *S. haematobium* Infection Among Pregnant Women in Kwale County 33
4.2.3 The Reproductive History of the Pregnant Women with *S. haematobium* in Kwale County. 35

4.3 Objective 2: Socio- economic Activities of the Pregnant Women with *S. haematobium* in Kwale County 36

4.4 Objective 3: Knowledge, Attitude and Practices of the Pregnant Women with *S. haematobium* Infection in Kwale County 37

4.4.1 Knowledge Factors Among Pregnant Women with *S. haematobium* Infection 37

4.4.2 Attitude among Pregnant Women with *S. haematobium* in Kwale County 38

4.4.3 Practices Among Pregnant Women with *S. haematobium* in Kwale County 38

4.5 Clinical / Investigation Examination... 39

4.5.1 Urinalysis 39

4.6 Key Informant Interview Review... 40

4.6.1 Knowledge Regarding Schistosomiasis Infection:................................ 40

4.6.2 Practices that affect Schistosomiasis Prevalence in the Community. 40

4.6.3 Attitude towards Health-Seeking Behaviour 41

4.6.4 Socio- Economic Status of Pregnant Women with Schistosomiasis Infection in Kwale County 41

CHAPTER FIVE.. 43

DISCUSSION, CONCLUSION AND RECOMMANDATIONS 43

5.1 Discussion 43

5.1.1 Prevalence of *S. haematobium* Infection among Pregnant Women in Kwale County 43

5.1.2 Intensity of *S. haematobium* Infection among Pregnant Women in Kwale County 45

5.2 Sociodemographic and Socio-Economic Factors that Influence the Burden of *S. haematobium* among Pregnant Women in Kwale County 46

5.3 Knowledge, Attitude and Practices of the Pregnant Women that could be Influencing *S. haematobium* infection among Pregnant Women in Kwale County 48

5.3.1 Knowledge 48

5.3.2 Practice 49

5.3.3 Attitude 52

5.4 General view 52

5.5 Conclusion 54

5.6 Recommendations 54

REFERENCES 56

APPENDICES 63

LIST OF TABLES

Table 2.1: Schistosoma Types and Geographical Distribution 7

Table 4.1: Socio-Demographic Characteristics of Pregnant Women in Kwale County (Study Population) 30

Table 4.2: Prevalence of S. haematobium among Pregnant Women in Kwale County 31

Table 4.3: Intensity of S. haematobium Infection among Pregnant Women in Kwale County 33

Table 4.4: Geometric Mean of Egg Count for S.haematobium Infection Among Pregnant Women in Kwale County 34

Table 4.5: Summary Statistics of the Reproductive History by Infection Status of 368 Pregnant Women 35

Table 4.6: The Fisher's Exact Test of Cross Tabulation of Parity Dead and Miscarriages 36

Table 4.7: Logistic Regression for Infection Status of S. haematobium Among Pregnant Women in Kwale County 37

Table 4.8: Multivariate Logistic Regression for the Knowledge Factors in Relation to Infection of S. haematobium Among Pregnant Women in Kwale County 38

Table 4.9: Multivariate Logistic Regression for Practice Factors to Infection Status of S. haematobium 39

LIST OF FIGURES

Figure 1.1: Conceptual Framework of the Variables 5

Figure 2.1: Lifecycle of Schistosomiasis 11

Figure 3.1: Map Showing Kwale County in Kenya 18

Figure 3.2: Flow Chart of Data Collection Procedures 23

Figure 4.1: The Prevalence of *S. haematobium* by Sub- County and Age Categories 32

Figure 4.2: The Prevalence and Geometric Means of *S. haematobium* in 17 Sites.. 35

LIST OF APPENDICES

Appendix I: Consent and Advise Form 63

Appendix IA: (Kiswahili) 66

Appendix IB: Back Translation of Consent.. 70

Appendix IC: Consent Form for the Questionnaire for IDIs in the Study 74

Appendix ID: (Kiswahili Version) 78

Appendix II: Questionnaire 82

Appendix IIA: Translation of Questionare for the Study, Prevalence of *S. haematobium* among Pregnant Mothers in Kwale County................. 89

Appendix III: Key Informant Interview Guide 95

Appendix IV: Ethical Approval Letters.. 98

Appendix V: Proof of Publication 103

ACRONYMS AND ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
ANC	Ante Natal Clinic
AU	Africa Union
CDC	Centers for Disease Control and Prevention
CHVs	Community Health Volunteers
DNDi	Drugs for Neglected Diseases Initiative
ESACIPAC	Eastern and Southern Africa Centre of International Parasite Control
ERC	Ethics Review Committee
GIT	Gastrointestinal tract
HIV	Human immunodeficiency virus
HPV	Human papillomavirus
IDI s	In- depth interviews
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KAP	Knowledge attitude practice
KEMRI	Kenya Medical Research Institute
Lab	Laboratory
NTD	Neglected Tropical Disease(s)
PHO	Public Health Officer

PI	Principal Investigator
PPE	Personal protective equipment
PZQ	Praziquantel
SERU	Scientific and Ethical Review Unit
S. haematobium	*Schistosoma haematobium*
TUMIKIA	Tuangamize Minyoo Kenya Imarisha Afya
WHA	World Health Assembly
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Term	Definition
Attitude	A settled way of thinking or feeling about something
Knowledge, Attitude and Practice survey	A method used to assess the knowledge, attitude or belief and practices or behaviours related to a topic of study
Knowledge	Facts, information and skills obtained through education or experience: understanding of a subject practically or theoretically: also, awareness or familiarity with a subject matter
Practice	Actual application or use of an idea, belief as opposed to theories or knowledge base
Schistosomias	A parasitic disease caused by trematodes of the genus Schistosoma
S. haematobium	A trematode that affects the urinary system, the agent that causes schistosomiasis
Socio-economic	Related to the differences between groups of people caused mainly by their financial differences
Socio demographics	Refers to social and demographic characteristics of a group or population; for example, age, height, gender among others

ABSTRACT

Schistosomiasis is a disease of global public health importance among populations residing in *Schistosoma*-infection prone areas. Global interventions have not succeeded yet in control, elimination nor eradication of the burden with 40 million women of reproductive age still affected. About 250 million people in 78 Countries in Africa are at risk. The Kenyan Coast is endemic to *Schistosoma haematobium* infections. Preventive measures and mass treatment of infected populations can reduce or possibly eliminate schistosomiasis. In Kenya, pregnancy is a contraindication to praziquantel (PZQ) treatment while World Health Organisation (WHO) recommends its' use in pregnancy; effects of bilharzia in pregnancy and unborn child are known to be disastrous. Pregnant women in Kwale County remain at high risk together with the unborn child. This study aimed at investigating factors that influence *Schistosoma haematobium* (*S.haematobium)* infection among pregnant women in Kwale County. This was analytical cross-sectional study; quantitative and qualitative methods were used. The study was done in Kwale County in March through August 2016 within four Sub Counties; Matuga, Kinango, Msambweni and Lunga Lunga. Sample size was 368 pregnant women. Quantitative analysis used Stata version 12.0, qualitative data used N- Vivo version 8. Thematic analysis used six steps and themes were generated and clarified. Fisher's exact tests were used for parity vs schistosomiasis comparisons with p value of 0.05 for significance. Odds ratios were used with 0.05 p value and 95% confidence interval to analyse Knowledge, Practice and Attitude factors significance as an association to *Schistosomiasis* infection. Structured questionnaires were used for quantitative data; in-depth interview guide was used on Key Informants for qualitative data. Clinical investigations were done to detect *Schistosoma* infection. Quantification of *Schistosoma* eggs using Kato-Katz technique was done. Pregnancy test was done to confirm pregnancy. Obstetric history was taken to assess previous deliveries and rule out abnormalities. The prevalence of *S.haematobium* infection among pregnant women in kwale County was 12.2%. Kinango Sub County reported highest prevalence 14.1%. Rice farming was a significant predisposing factor. Among the participants 36.7% utilize river waters and 14% use water pans. Among the participants 29% did not use toilets. Regarding knowledge of bilharziasis; 96.7% knew what bilharzia was and 84.8% were aware of the causal agent as parasite. Intensity of S.*haematobium* among pregnant mothers in Kwale County is low. Majority of the participants had no formal education which is known to increase the risk. Practices and attitude of the mothers had little significance to the infection. Rice farming was a risk factor, but the areas with highest prevalence are none rice growers. Bathing in rivers and use of untreated water increased the risk of infection. The county government together with ministry of health should integrate routine screening and treatment for *S. haematobium* disease into antenatal care services in affected areas like Kwale County. Mass drug administration campaigns to focus more on all women of reproductive age to lower community reservoir and cut the chain of reinfection which could reduce possible infections before they conceive thus alleviating gestational burden of schistosomiasis. water, sanitation and Hygiene Initiatives (WASH) to be expanded with more focus on bilharzia high prevalent areas to increase access to clean safe water sources to the community. The County government with ministry of health should increase sensitization health talks with emphasis on behaviour change to the population on

water hygiene practices, safe farming practices with emphasising on proper use of protective personal equipment to limit exposure to new infections and reinfections.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Schistosomiasis is a parasitic disease caused by trematodes of the genus *Schistosoma* which include *Schistosoma haematobium*, *S. mansoni* among others. *Schistosoma haematobium* affects the urinary system. These blood flukes lay thousands of eggs in their lifetime inside the bladder. The eggs penetrate through tissues and blood vessels into the surrounding organs where they get trapped, World Health Organisation (WHO, 2015). In women, the eggs also lodge in the uterine lining, fallopian tubes, ovaries and even the vulva. Host Immunological responses against antigen-induced by the eggs cause severe pathological effects which include granuloma, sandy patches on endometrium lining and even on the external genitalia, sores on the vulva among other effects. These pathological effects lead to easy bleeding, pain, discomfort and inability to undertake daily living activities among the infected persons, (Centre for Disease Control (CDC, 2018)

Schistosomiasis is also known as bilharziasis. It was named after a German pathologist, Theodor Bilharz, who first described the parasite as the cause of urinary schistosomiasis in 1851 as he worked in a hospital in Cairo, Egypt (Adenowo, Oyinlove, & Ogunyinka, 2015). *S. haematobium* is transmitted by direct body contact with human urine contaminated freshwater bodies. *S. haematobium* is found in Africa and in areas of the Middle East (Adenowo, Oyinlove, & Ogunyinka, 2015). People of all ages; both male and female are at risk as long as they are exposed to the parasite. However, certain populations stand a higher risk. These include school-age children, women, farmers in rice pads and fishermen (Juma, Ng'etich, & Naanyu, 2017).

Global prevalence is 207 million, 85% of which occur in Africa. Prevalence estimate in Africa endemic zones is over 50%. According to WHO, 652 million people are at risk of getting infected worldwide as 200,000 related deaths occur annually. Schistosomiasis is said to be 3rd most devastating tropical disease in the world after malaria and intestinal worms (Shadab Hussein 2023). The disease is known to be a

major source of morbidity and mortality in developing countries of Africa, S. America, the Caribbean and Asia (CDC, 2018). A study done in the Niger Delta shows some of the myths on the understanding of *S. haematobium* infectivity by the community. The general population believed that *S. haematobium* infection was due to witchcraft, others believed it was sexually transmitted. On the other hand, people believed that it is not a serious problem since it does not make them unable to feed. They also believed that *S. haematobium* infection did not have an effective cure (Girma, Agedew, Gedeamu, & Haftu, 2018). This indicates the need to explore more on attitude of the population that potentially maintains the cycle of schistosoma infection in the affected area.

In Kenya, more than 5million people are infected. Endemic areas are the coastal belt, the Lake Victoria basin and areas with irrigation scheme programmes like Mwea in Central Kenya, Machakos in Eastern Kenya and Nyando in South Nyanza (cited by Kihara Jimmy 2012).

1.2 Statement of the Problem

Globally, 40 million women of childbearing age are infected with Schistosomiasis. In Africa, about 10million women are estimated to have Schistosomiasis in pregnancy while their knowledge *of S. haematobium* infectivity is not well understood (CDC, 2014). Generally, there are inadequate studies done on knowledge, attitude and practices in relation to *S. haematobium* infection specific to pregnant women in Kenya.

The magnitude of *S. haematobium* among pregnant women in Kenya is not well known. Many studies carried out focus on the prevalence of the disease in school children, men and nonpregnant women. In Kenya, more than 5 million people are infected, with a prevalence of 40% in the South Coast. However, few studies have addressed the impact of *S. haematobium on* pregnant women. One study found a rise in subfertility linked to schistosomiasis prevalence in the coastal region (Ondigo BN, Muok EM, Oguso JK, et al.). There are several complications which are commonly associated with *S. haematobium* among pregnant women; poor birth out comes, anaemia in pregnancy among others. Pregnant women are also potential reservoirs of *S. haematobium* and can affect its cycle in the community. Studies have shown

knowledge deficit among pregnant women with schistosomiasis in other countries. Practices and socioeconomic status have been associated with schistosoma infection among pregnant women in other countries.

1.3 Justification

World health organisation (WHO) goals, 2020-2025, on control and elimination of Scistosomiasis, a debilitating disease, and a public health problem have not been achieved yet and a review of target to 2030 is in the current guideline. Schistosomiasis is one of the diseases ear marked for combat in the Kenya master plan 2013-2020 with current reviewed guidelines for the 2030 vision. In line with these guidelines, studies in endemic areas such as Kwale County will provide needed data for further strategies in realising these goals.

In South Coast Kenya, the prevalence of *S. haematobium* is 40% among the general population, however, very few studies have focused on the impact of *S. haematobium* among pregnant women. *S. haematobium* is also associated with the causation of a number of complications among pregnant women which include sub fertility, vaginal bleeding, the occurrence of nodules in the vulva and the occurrence of pain during sexual intercourse, children who were born to mothers with schistosomiasis are at high risk of having lower levels of N-antibodies for anti-measles which rendered the children susceptible to measles infection. Being among neglected diseases, schistosomiasis causes high mortality rates with serious morbidities among infected persons thus lowering further, socioeconomic status of the individuals in the community. Findings of this study will provide critical data to inform targeted public health interventions, support the development of antenatal care policies that in cooperate schistosomiaisis screening and treatment, and advocate for the inclusion of pregnant women in preventive treatment program.

1.4 Objectives

1.4.1 General Objective

To determine the prevalence and factors influencing the burden of *schistosomiasis haematobium* infection among pregnant mothers in Kwale County.

1.4.2 Specific Objectives

1. To determine the prevalence and intensity of *S. haematobium* infection among pregnant women in Kwale County
2. To determine sociodemographic and socio-economic factors that influence the burden of *Haematobium* among pregnant women in Kwale County
3. To assess knowledge, attitude and practices of the pregnant mothers that could be influencing *S. haematobium* infection among pregnant women in Kwale County.

1.5 Research Questions

This study was expected to answer the following questions:

1. What is the prevalence and intensity of *S. haematobium* infection among pregnant women in Kwale County, S. Coast?
2. What are the socio-economic factors influencing *Schistosoma haematobium* infection among pregnant women in Kwale County?
3. What is the knowledge, attitude and practices of the pregnant mothers influencing *S. haematobium* infection in Kwale County?

1.6Conceptual Framework

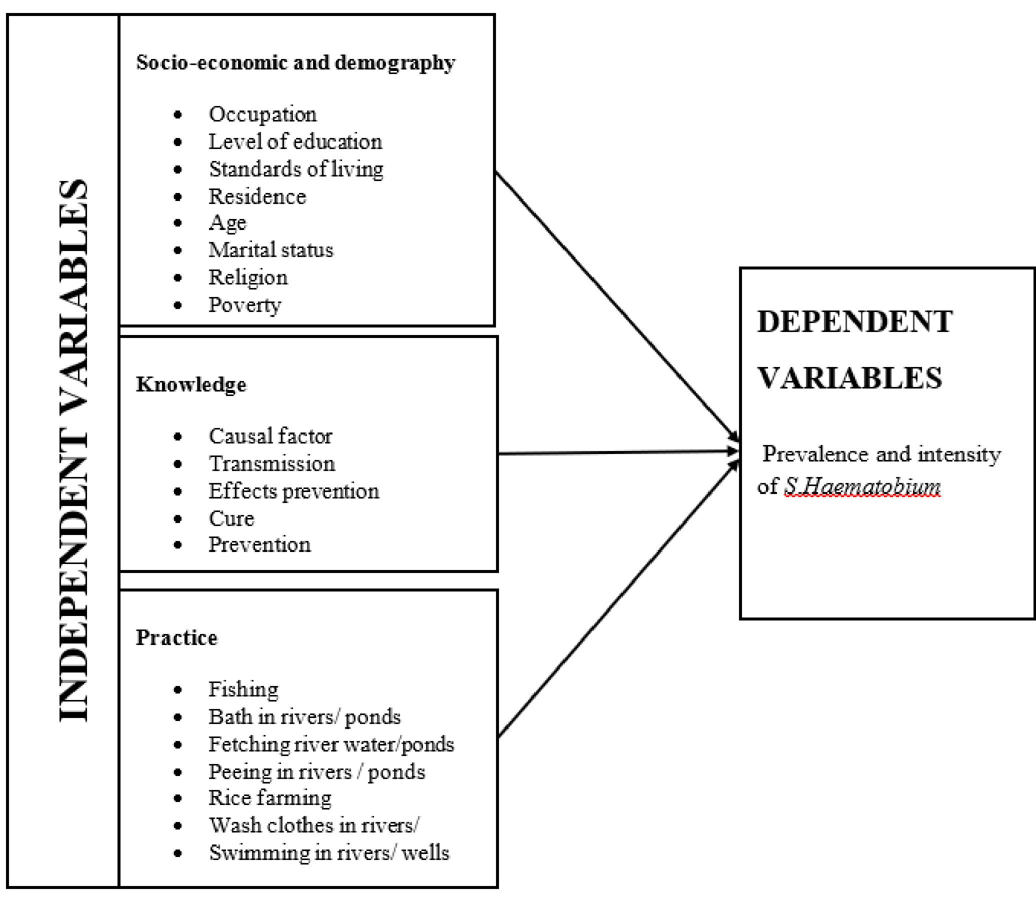

Figure 1.1: Conceptual Framework of the Variables

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

2.1.1 Theoretical Framework

2.1.1.1 Schistosomiasis

Schistosomiasis is a disease caused by helminth parasites of the genus schistosoma. There are two types of schistosome infections, intestinal and urinary. Intestinal schistosomiasis is caused by four species of schistosoma; *S. mansoni*, *S. Japonicum*, *S. mekongi* and *S. intercalatum* and affects the gastrointestinal tract (GIT). The second type is urinary schistosomiasis caused by *S. heamatobium* which affects the urogeniatal system. According to WHO, *S. haematobium* causes two thirds of schistosome infection in the Sub-Saharan Africa. Mode of transmission for all the five species is through water when cercariae penetrate through the skin of a susceptible host in contact with cercarieae infested fresh waters. Among the five species of schistosoma that are associated with Bilharziasis, two are said to be quite uncommon; the *S. intercalatum* and the *S.* mekongi. *S. heamatobium* has been associated with female genital Schistosomiasis (FGS) morbidity (Nawal 2010). Kenya has the two common species, *S. mansoni* and *S. heamatobium*. In the coastal inland strip *S. haematobium* is the prevalent source of bilharziasis. However, it is not associated with the oceanic waters. The intermediate host snail is only found in human waste contaminated bodies of fresh waters.

Table 2.1: Schistosoma Types and Geographical Distribution

Type of infection	Species	Geographical distribution
1) Intestinal schistosomiasis	a) *S. mansoni*	Africa, Middle East, Venezuela, Suriname and Caribbean Brazil
	b) *S. japonicum*	China, Indonesia and Philippines
	c) *S. mekongi*	Cambodia and Lao People's Democratic Republic
	d) *S. guineensis and S. intercalatam*	Rain forest areas of central Africa
2) Urogenital schistosomiasis	a) *S. haematobium*	Africa and the Middle East

Source: WHO (2015).

2.1.2 Epidemiology of Schistosomiasis

According to world Health Organisation (WHO, 2014) at least 249 million individuals in the world suffer from schistosomiasis with at least 700 million individuals being exposed to the disease from the schistosomiasis. The burden of schistosomiasis is greater in developing countries as opposed to developing countries. There are at least 200,000 deaths that occur in sub-Saharan Africa which are attributed to Schistosomiasis (WHO, 2015). The burden of schistosomiasis is greater in disadvantaged communities which are characterised by poverty, malnutrition, unclean water, poor sanitation and limited access to health facilities. These issues, therefore, increase the level of vulnerability of the people especially those who leave in endemic areas. Additionally, this burden makes it greater when it affects vulnerable populations e.g. pregnant women and children (Worku, Damte, Endris, Tesfa, & Aemero, 2014). It is also critical to note that schistosomiasis not only affects individuals in rural communities but it can also affect cosmopolitan residents (CDC, 2014).

In Africa, the burden of schistosomiasis is a major concern with a prevalence rate ranging from 14% to 92.8% (Galeta, Alemu, Getie, Mekonnen, & Berhano, 2015). According to(Adenowo, Oyinlove, & Ogunyinka, (2015) schistosomiasis has significantly been neglected in the Sub-Saharan Africa despite the disease being associated with the causation of at least 534,000 deaths annually. Mombo-Ngoma, Honkpehedii, & Rodolphe, (2017) Also note that there are at least 40 million women

who are of childbearing age who suffer from schistosomiasis in Africa, and it is associated with the causation of negative maternal outcomes. This is due to significant changes in the uterine lining caused by heavy loads of eggs laid by the flukes as they penetrate through tissues and blood vessels into the reproductive organs where they get trapped (WHO, 2015). Host Immunological responses against antigen-induced by the trapped eggs cause severe pathological effects to the pregnant woman. These include granuloma, sandy patches on endometrium lining and even on the external genitalia, sores on the vulva among other effects. These pathological effects lead to easy bleeding, pain, discomfort and inability to undertake daily living activities among the infected persons (CDC, 2018).

In Kenya, a study conducted by Miller-Follows, Howard, & Kramer, (2017) revealed that there is an increase in the level of subfertility which is attributed to the high prevalence rate of schistosomiasis in the coastal region. Another study conducted in Kenya revealed that children who were born to mothers with schistosomiasis were highly likely to have lower levels of N-antibodies for anti-measles which rendered the children susceptible to the measles (Ondigo et al., 2018). Thus, pregnancies of schisto infected women endure risks of newborn prone to a range of ailments like measles, anaemia, and underweight among many others. Looking at all this information, certainly there is need to evaluate the magnitude of bilharzia infection in pregnant women as a section of population in the society and the data will guide in strategies of elimination or reduction of the pandemic.

2.2 Diagnosis of *S. heamatobium*

S. haematobium infection is diagnosed through the examination of urine samples for *S. haematobium* eggs. This is largely attributed to the fact that the eggs are passed through the urine of infected persons. However, it is also critical to perform a serologic test in order to confirm the presence of the disease (CDC, 2018). Urogenital schistosomiasis is diagnosed through the use of filtration technique composed of polycarbonate filters and nylon (WHO, 2015). The diagnosis of *S. haematobium* among children is always characterised in microscopic blood in their urine detected

through the use of chemical reagent strips (WHO, 2015). This is achieved through a technique known as the Kato-Katz technique. (WHO, 2015).

Blood tests are used in the determination of the severity of its infection. Serologies and polymerase chain reaction (PCR) assay-based testing are used in the confirmation of the diagnosis of schistosomiasis (Weerakoon, Gobert, & Cai, 2015). There are several considerations that are required to conduct the laboratory testing. Firstly, a complete blood count (CBC) is usually conducted to acquire the peripheral eosinophilia especially in acute infections and or among patients with anaemia. Secondly, an increase in the alkaline phosphatase level and gamma-glutamyl transferase (GGT) level is also observed through the use of hepatic granulomatosis (Utzinger, Becker, & van Lieshout, 2015). *S. haematobium* can also be diagnosed using urinary microbiology by evaluating the extent of vesicular infections. Haematuria is also common, and concentration methods are required to make a rough determination of the egg load (Weerakoon, Gordon, Williams, & Cai, 2017). This is, however, insufficient in the measurement of disease severity as there can be variations in the egg count from specimens which are acquired from a single patient (Utzinger et al., 2015).

The transaminase levels are usually unaffected, and their elevations are usually attributed to coexisting hepatitis. Patients with schistosomiasis can also experience problems associated with renal functions mainly due to obstructive nephropathy (Weerakoon, Gordon, Williams, & Cai, 2017).

2.2.1 Urine Analysis

This analysis is usually conducted to assess the number of eggs which are contained in urine specimens. This is achieved by determining the number of egg excretions through the collection of 24hour urine. This specimens are then homogenized in order to measure the number of eggs in the sample (CDC, 2014). It is however critical to note that urinary excretions are usually unreliable especially since urine is highly likely to test positive for *S. haematobium* during the period of 10am-2 am in the day (Weerakoon, Gordon, Williams, & Cai, 2017. A sample with <100eggs in a 10mL urine is indicative of a light infection; 100-400 eggs per 10mL urine is a depiction of moderate infection; (Barakat et al., 2017). According to WHO a sample of 10mls

having 50 or a smaller number of eggs is light infection and 50 to a 100 is medium while above 100 is high intensity.

2.3 Etiology of *Schistosomiasis*

An individual becomes infected with schistosomiasis when they encounter water that is infested with cercariae. This can be through bathing, swimming or playing in the water which may also contain snails that the intermediate hosts of the parasites (*Schistosoma haematobium*, Schistosoma japonicum and *Schistosoma mansoni*). The adult schistosome parasite mainly resides in the blood vessels that surround the bladder and in the intestines (CDC, 2018). Additionally, the eggs of the parasites have spines which can break and enter the intestine or bladder, in turn, resulting in the causation of blood urine. The eggs are then passed out the body through urine or faces due to the unsanitary practices of the individual (WHO, 2015). The urine or faeces might end up in the water and result in the development of small active larvae (Miracidia). The miracidia in the freshwater infect the snails where they develop and multiply and in turn released from the infected snail. The released cercariae, in turn, penetrate the skins of the exposed individual who comes into contact with the infected water (figure 2.1 CDC, 2014).

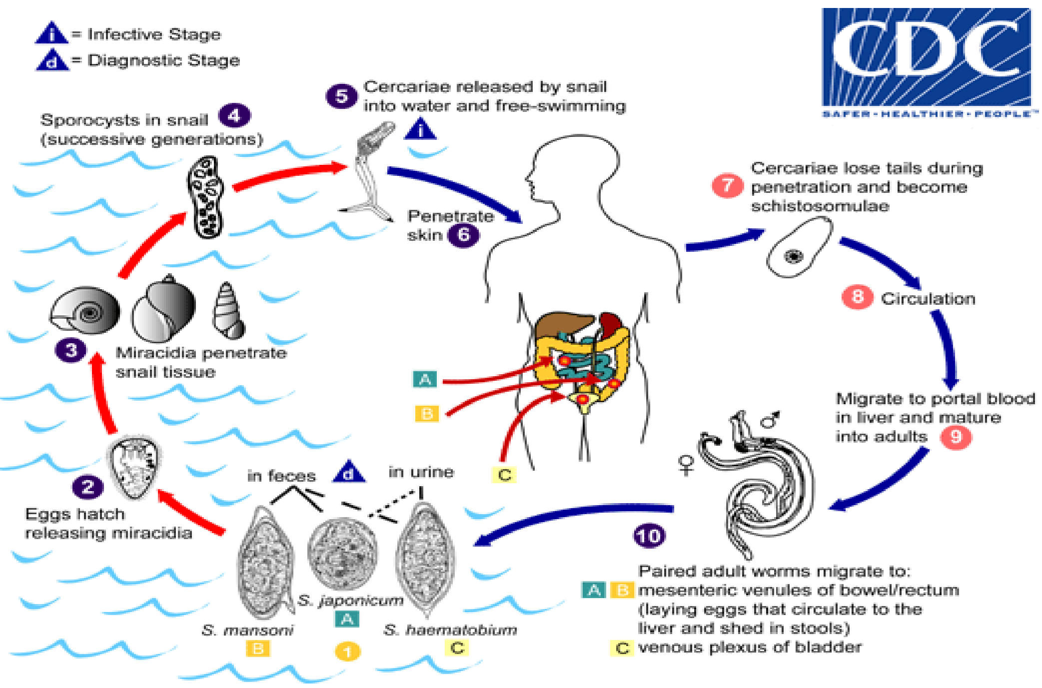

Figure 2.1: Lifecycle of Schistosomiasis

Source: CDC (2018)

2.4 Symptoms and Complications of Schistosomiasis

The symptoms of schistosomiasis are mainly attributed to the reaction from the eggs. Intestinal schistosomiasis is commonly characterized by abdominal pain, blood in the stool and diarrhoea. Advanced intestinal schistosomiasis usually results in the enlargement of the liver, accumulation of fluids in the peritoneal cavity and hypertension (Rigaud & Traclet, 2019). Intestinal schistosomiasis can also result in the enlargement of the spleen (Weerakoon et al., 2015).

Urogenital schistosomiasis is on the other hand is commonly associated with the occurrence of blood in the urine. Advanced urogenital schistosomiasis is also associated with kidney damage and fibrosis that affects the bladder and ureter. In later stages, it can also result in the causation of bladder cancer (Soentjens, Cnops, Huvse, & Yansouni, 2016). This type of schistosomiasis also results in the causation of vaginal bleeding, the occurrence of nodules in the vulva and the occurrence of pain during

sexual intercourse. Chronic urogenital schistosomiasis can also result in the causation of infertility among women (Barakat et al., 2017).

Schistosomiasis is associated with the development of several negative birth outcomes among pregnant women. It is associated with the development of low birth weight among children and can also result in abortion. Mothers who are also affected with schistosomiasis are also highly likely to develop severe bleeding in the GIT, obstruction of the GIT, renal failure, sepsis portal hypertension and myelitis. Other conditions include haemospernia, pulmonary hypertension and nephropathy.

The disease is also known for the causation of abnormalities during pregnancy as they affect uterine lining and it can also result in the causation of abortion. Other studies also show that schistosomiasis is associated with an increase in the level of anaemia, especially among infected women.

2.5 Prevalence of *S. haematobium*

S. haematobium is one of the Neglected tropical diseases (NTDs) put in focus for elimination strategies ((Kenya NTDs Master Plan 2013-2020). As cited by (P. Olaken et al 2018,) the estimate of annual global burden of disability adjusted years of *S. haematobium* is 1.9 years; Sub Saharan Africa harbors 90% of the burden globally. In Kenya, burden of *S. haematobium* manifests most in the Coast region. Other dry areas in Ukambani land have been reported and along the lake region in Nyanza. In 2013 world health Assembly (WHA) adopted the Africa Union (AU) resolution on the need to strengthen efforts to tackle NTDS. Gathering more information on prevalence and associated factors of S. *haematobium* among pregnant women in endemic Kwale County will provide a basis of tackling the global menace as stipulated in the set goals towards control, elimination and eradication of selected NTDS (Kenya NTDs Master Plan 2013-2020). This was to be achieved by the year 2020, however to date, global funds are getting exhausted in treatment and preventive campaigns against *S. haematobium* and the goal yet to be achieved. As the report says, more efforts such as the National School Based Deworming programs were launched but as well-known pregnant women in Kenya are never in cooperated in these campaigns thus research

studies in the area would hasten goal results for the improved health status and socio-economy of the affected populations and the society.

Schistosomiasis is distributed in the coastal, lower Eastern and Lake Victoria regions and is endemic in 32 Counties and 158 mapped sub-counties. The NTD programme comes under the Division of Disease Surveillance and Epidemic (Kenya landscape analysis report, 2019).

2.6 Socioeconomic and Sociodemographic Factors Influencing *S. haematobium* Infection

According to a study conducted in sub-Saharan Africa, the prevalence of schistosomiasis is still high among countries in this region due to global warming, proximity to water bodies and socio-economic factors like poverty and occupation of the exposed individuals (Adenowo et al., 2015). (Girma et al., 2018) also note that farmers are more likely to be infected with schistosomiasis as majority lack protective clothing whereby during irrigation they are exposed to the disease. A study conducted in Kwale County in Kenya also revealed that individuals with lower levels of income were more likely to suffer from the disease due to their limitation to seek and acquire medical services (Juma et al., 2017). Another study in Zambia also revealed that the risk of infection of the disease was mainly attributed to environmental, demographic and socio-economic factors (Kalinda, Chimbari, & Mukaratirwa, 2018).

Another study that focused on the influence of community-led total sanitation reported a prevalence level of 7% for schistosomiasis. The study also revealed that the socio-economic factors like fishing and farming occupations were linked to infections of the disease (Hurlimann, Silue, & Zouzou, 2018). However, Houweling, Karim-Kos, Kulik, & Stolk, (2016) also found that evidence on socio-economic factors which are associated with infection of neglected tropical diseases like schistosomiasis are scarce though the odds of infection are higher among individuals in the community who are socio-economically disadvantaged contrary to the well to do in the society.

A cross-sectional study conducted in Ivory Coast to determine the relationship of the prevalence of schistosomiasis and the WASH, environmental and socio-economic

activities in the community. Another study conducted by Adenowo et al., (2015) revealed that the prevalence of *S. haematobium* was linked to socio-economic factors like occupation activities and poverty especially in rural areas. The study however found no correlation between the prevalence of Schistosomiasis and socio-economic factors (M'Bra, Kone, Yapi, & Silue, 2018).

2.7 Knowledge, Attitude and Practices Influencing *S. haematobiun* Infection

According to Sacolo, Chimbari, & Kalinda, (2018), the occurrence of schistosomiasis in Sub-Saharan Africa is mainly attributed by the limited level of knowledge on the factors associated with bilharzia transmission and spread, a contribute to the prevalent of the disease. Additionally, poor attitudes and beliefs in relation to the uptake of preventive services is also a major concern in relation to the prevention of the disease. Another study conducted in Swaziland noted that despite the implementation of control programs (health education and deworming) very little attention is directed towards the evaluation of knowledge, attitude and practices among the exposed population (Thokozani, Maseko, & Mkhonta, 2018). A study done in the Niger Delta showed some of the myths on the understanding of *S. haematobium* infectivity by the community. The general population believed that *S. haematobium* infection was due to witchcraft, others believed it was sexually transmitted. On the other hand, people believed that it is not a serious problem since it does not make them unable to feed. They also believed that *S. haematobium* infection did not have an effective cure (Girma, Agedew, Gedeamu, & Haftu, 2018). This shows the importance of KAP studies among other populations like the pregnant women of Kwale County.

In August 2018, (real case scenario in the community we reside in Kwale County), my children were on holiday in Kwale. They enjoyed fishing and bathing in a small stream 100metres from our house. When back to the city about 10 months later the boys reported blood when passing urine. Health care was sorted and subsequently recovered. A follow up was made to the rest of the children who permanently live in the surrounding and played with my boys. When interviewed about their condition they denied they had any problem. In fact, they had told my boys that it was normal to see blood in urine.

Similarly, a study conducted in Kenya in the Lake Victoria basin revealed that most of the respondents (68%) were unaware of how schistosomiasis was contracted, prevented and treated (Adoka, Anyona, Abuom, & Dida, 2014). In their study Girma, Agedew, Gedeamu, & Haftu, (2018) have also shown that the poor practices such as lack of personal protective equipment (PPE) during farming are a significant contributor to the increased prevalence of schistosomiasis in the sub-Saharan region.

According to a study conducted by Dawaki et al., (2016), at least 63% of the respondents were unaware of the methods of treatment and diagnosis of Schistosomiasis. Majority of the population were also unaware of the seriousness of the disease and the preventive measures of the disease which significantly influenced their poor sanitation practices. These findings relate to a study conducted by Umar et al., (2018) which found that the prevalence of *S. haematobium* in the region was largely reliant on the level of knowledge on the disease and the preventive measures to undertake in order to limit the occurrence of the disease in the community. According to Almazan, Escala, & Merida, (2017) the implementation of preventive measures in order to limit the occurrence of schistosomiasis in the Philippines was reliant on the level of knowledge among the exposed.

A study conducted in Kenya to determine prevalence of *S. haematobium* and the factors associated with its transmission revealed that there are several misconceptions which are associated with causes, prevention and control of the disease. The study also revealed that the health seeking behaviour of the community members was significantly correlated with limited level of knowledge (Angelo, Kinung'hi, Buza, Mwanga, & Kariuki, 2019). Another study also in Kenya revealed that the educational level of the community members was significantly associated with the Schistosomiasis infection. Additionally, the respondents displayed poor sanitation practices that significantly contributed to the *S. haematobium* infections e.g. lack of PPE when working on rice paddies and lack of toilets and hand washing after visiting the toilets (Mwai, Njenga, & Barasa, 2016).

2.8 Schistosomiasis in Pregnancy

An estimation of at least 40 million women who are in the reproductive age in the world suffer from schistosomiasis. However, there is limited information in relation to the impact of schistosomiasis in pregnancy. However, urogenital schistomiasis has been found to be common in the rural parts of central Africa (Mombo-Ngoma et al., 2017). According to Adenowo et al., (2015) the spread of S. haematobium among pregnant women was mostly associated with socio-economic factors. Additionally, a study by M'Bra, Kone, Yapi, & Silue, (2018) found that interventions like medication and adequate toilet coverage were not implemented which contribute to the spread of schistosomiasis among pregnant mothers. A study conducted in Kenya also revealed that most of the pregnant women (68%) were unaware of how schistosomiasis was contracted, prevented and treated (Adoka, Anyona, Abuom, & Dida, 2014).

2.9 Prevention and Control of *S. haematobium*

The prevention of schistosomiasis is mainly attained through maintenance of proper sanitary conditions e.g. prevention of urination in water sources (Leggat & Frean, 2016).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

This study was carried out in all four Sub-Counties; Matuga Sub-County, Msambweni Sub-county, Kinango Sub-County and Lungalunga Sub-county of Kwale County. The County is in the coastal region of Kenya, as shown in Figure 3.1. It is bordered by a long stretch of the Indian Ocean forming a coastal strip that reaches lungalunga at the Tanzanian border. In Matuga Sub County, the sites visited were 1. Waa location at a place called Bowa next to Bowa primary 2. Mbuguni in tsimba Golini location 3. Boyani in Shimba Hills 4. Tiwi 5. Mkundi 6. Mbegani and7. Lukore. In mwaluphamba location we visited 8. Burani and 9. Tiribe. In kinango Sub County we visited 10. Mwachinga. 11. Kinango 12. Gandini, in msambweni Sub County we visited 13. Diani 14. Msambweni 15. Bodo. In Lunga Lunga Sub County we visited 16. Kikoneni and 17. Shimoni. These areas cover the vast Kwale County endemic areas with *S. Haematobium*. This distribution gave a wider representation of the population in Kwale County.

Shimoni, Bodo in Lunga Lunga Sub County and Msambweni areas in Msambweni Sub County border Sea shore of the Indian Ocean; the land here is swampy patches and so they do grow rice among other crops. Kinango Area is dry semi-arid land with stony dusty appearance. The population statics are based on 2019 census survey by Kenya government as described on the next page. Residents mainly keep livestock and water scarcity is rampant in the area. Water pans dug in many parts of the Sub County are used as water sources for human use in homes and for animals. Matuga has vegetative green land with tropical rain forest habited by wildlife. Residents practice crop production for subsistence purposes. Kwale County receives varying quantities of rainfall in two seasons through the year. Long rains in March to May and short rains in November and December. Due to global climatic changes, pattern of the rainy seasons is not constant and the intensity ranges from light to torrents creating tributary flowing and forming water bodies of varying strength creating homes for snails which continue the cycle of schistosomiasis. The habitats utilize these waters for domestic

chores and do farming, too. This is where they contaminate the ecosystem thus exposing themselves to schistosomiasis as described in Chapter two, fig.1.

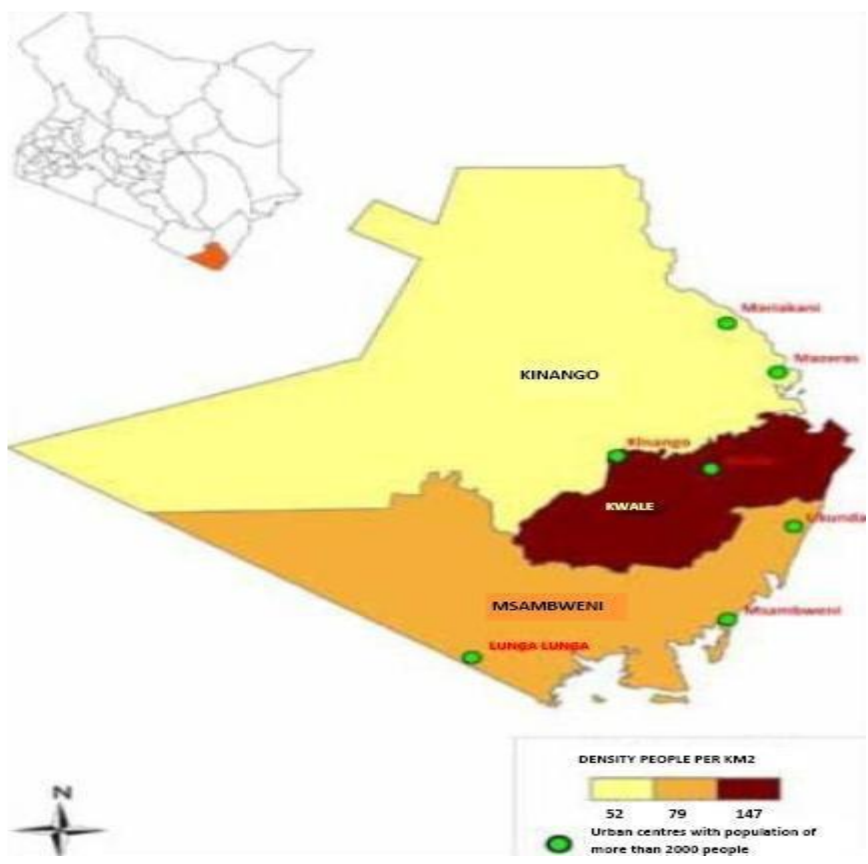

Figure 3.1: Map Showing Kwale County in Kenya

Population of Kwale County is 866820, population of Matuga Sub County population 194,252, population for Kinango Sub County 94220, population for for Msambweni Sub County 177690, population for Lungalunga Sub County is 198423 persons (Census survey, 2019). The distribution of study population by Sub County was, Matuga139 (37.8%) Kinango 64 (17.4%), Msambweni 36 (9.8%) Lungalunga 129 (35.1%).

3.2 Study Design

This was analytic cross-sectional study that applied mixed methods. It was a single point survey whereby each subject was attended to once and no follow up.

3.3 Study Population

The study population comprised of pregnant women in Kwale County. The participants were drawn from the clinics through mobilization at public barazas at chiefs' offices. The age range of the participants was 18 to 45years. The sampled population comprised married and single mothers. Majority of the women were Muslims. In Kinango Sub County majority of the pregnant women were Christians. Majority of participants had acquired primary education. Small businesses of food vending and house wifery were the main occupation among the pregnant women. The parity among the pregnant women varied between gravid one to gravid 6. Gestation period was ranging from 3wks to 8 months. The clinics were conducted between March 17th, 2016 and August 1st, 2016. It took about three and a half months to collect data.

3.3.1 Inclusion Criteria

1. Any pregnant woman residing in Kwale County
2. The pregnant women must be aged 18 years and above.
3. Eligible respondents who gave consent to participate in the study.
4. Women who were pregnant, regardless of the gestation period.

3.3.2 Exclusion Criteria

1. Eligible participants who did not consent to participate in the study
2. Pregnant women who were critically ill
3. Pregnant women with mental problems (degree of retardation and psychotic behaviour)
4. None Kwale residents
5. Negative pregnant test

3.3.3 Sample Size Determination

The sample size was determined using Cochran's equation. According to Karama et al (2002), in Msambweni area within the Kwale County *S. haematobium* prevalence is

40% and this is within Kwale County so roughly 40% was assumed as the prevalence that was applied in the equation:

$$n = \frac{z^2pq}{e^2}$$

Where;

n= Minimum sample size;
Z = Standard normal deviate for α (1.96);
p= the prevalence of *S. haematobium* within the area of study;
e= precision (0.05).

Using this formula, the minimum sample size required was 368.

3.4 Sampling Procedure

The study was carried out in a community setting whereby participants were mobilized through chief's barazas, sensitized and invited to attend clinics at selected points such as schools, marketplaces and some health facilities purposively based on predetermined prevalence such that they could produce required intended subjects. These areas could provide Schistosoma *haematobium* information because they were known for endemicity of schistosomiasis as documented in previous studies. Sequential sampling was used to select participants screened and selected as they came to the clinics until sample size was reached**.** Recruitment sites were defined as clinics due to the set up and procedures of undertakings. The activities of the clinics were independent and had no reference to routine hospital procedures. Participants were drawn from the community selected using sequential method, as they came, from large numbers of attendees with and without Schistosomiasis until 368 pregnant women were enrolled as in the sample size determination method. The study area being kwale County was selected purposively by virtue of exhibiting high prevalence rates of *Schistosoma haematobium* infection among pregnant women and women of reproductive age studies in the coast region as shown by Jimmy Kihara (Kihara, 2012).

3.5 Data Collection

Study assistants; health workers and volunteers were trained a week before the study began. The study team visited 18 sites twice: first for familiarization, training and planning schedules, secondly when clinics were conducted which ran from March 17th to August 1st, 2017, in 4 Kwale Sub Counties. Structured questionnaires were administered to pregnant women, collecting socio-demographics, and KAP data. Urine samples (20mL) were collected between 10 AM and 2 PM for *S. haematobium* egg analysis at KEMRI Laboratory using the filtration technique. The eggs were counted, and the mean was expressed as the number of eggs per 10 ml of urine. Key informants were randomly selected among health workers; respondents were given guided questionnaires to fill in and return to the PI. This data was analysed by N-Vivo version 8 into themes. The data was securely stored in both soft and hard copies.

3.6 Data Collection Tools

Structured questionnaires were used to collect qualitative data. Participants answered questions such as knowledge on schistosomiasis or bilharzia disease, causal factors, preventive measures and treatment. Interview guide was used to collect key informants' interview data in the qualitative arm. The participants were health workers in those areas; Nurses and Public health officers. They answered questions on knowledge levels of the pregnant mothers they attended to in those areas, sanitation status within the community and accessibility of clean water for use at the homes in the community they served. They also answered questions on socioeconomic status of the community they served. Clinical data was collected using light microscopes, filters, dipstick Uri sticks, pregnancy rapid diagnostic kit (PDT kit) and recorded on medical record forms. Obstetric check list was used for physical assessment. It assessed gestation period, position of the inborn, confirmed pregnancy and also presence of heartbeat for the unborn child, blood pressure of the mother and general health.

3.7 Pretesting of Study Tools

Structured questionnaires for qualitative data and guided interview tool for quantitative data were developed by the principal investigator and coinvestigators.

They were pretested as a pilot assessment for reliability during training of study assistants using a small group of participants. Weaknesses of the tools were identified and corrected for more clarity before data collection. A practical administration of the outlined questions was done among pregnant women attending ANC clinic at Kwale Sub County hospital the tool was then reviewed and corrected and made clearer. Kwale KEMRI is where the training was conducted within Kwale level 4 hospital in Matuga Sub County. Check list for physical body assessment was pretested during the training too on women attending ANC clinic.

Urinalysis used uristics to assess the sample and forms with details of data listed to guide and accuracy.

Clinical data used standard equipment and materials which included well calibrated light microscopes for Schistosoma diagnosis on slide smears of urine drops, filters for the cartokazt filtration technique.

3.8 Validity of Tools

The pretested data was analysed and reviewed then tools were corrected for errors. Typos, clarity and smartness for the intended data collection.

3.9 Reliability of Study Tools/Instruments

Some aliquots of the urine sampled were counterchecked at the kwale County level 4 hospital labs by hospital bound lab technologists having been trained as study assistants of the project. This was done to validate accuracy of findings and specificity of tools.

3.9.1 Data Collection Procedures

Data collection for the study was carried out according to the flow chart shown in Figure 3.2

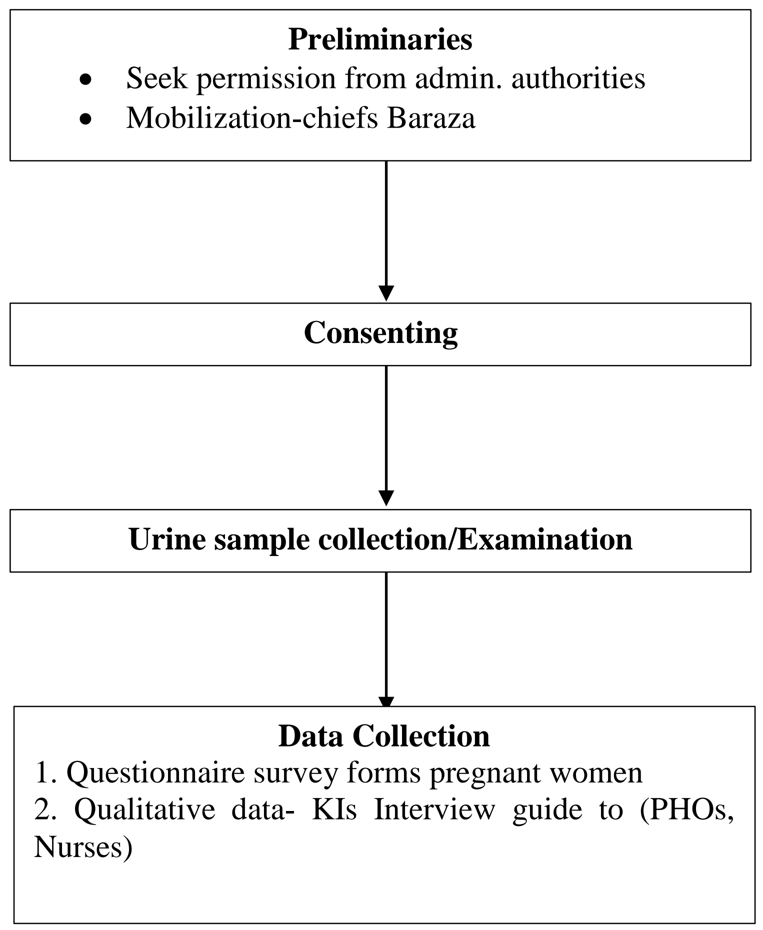

Figure 3.2: Flow Chart of Data Collection Procedures

Quantitative data was collected simultaneously from the same participants (pregnant women) by different study assistants. Data were gathered as per the procedures outlined; laboratory (lab) request forms were used for urine examination by a laboratory technician. Lab. analysis for the presence of *S. haematobium* in urine samples and for diagnostic purposes were the methods used for data collection. Filtration technique using Kato Kazt method was used to count the number of eggs in 10ml urine aliquot. For knowledge, attitude, practice and behaviour variables questionnaires were administered to the subjects by the PI and study assistants. Interview guide was administered by the PI and study assistants for key informants' data collection. The pregnant mothers had to first read and sign the consent form before commencement of any procedure, while those who could not read or write were read for and made to understand the informed consent before thumb printing.

The volunteer was given a urine sample cup and asked to produce 20mls fresh urine sample. This was from 10.00 o'clock in the morning, being the recommended time for maximum egg circulation in the urinary system till 2pm. A good quantity is usually harvested from the urine sample if the test is positive of *S. haematobium* as confirmed by KEMRI parasitologist undertaking mass deworming activities in South coast in partnership with the Ministry of Health, the peak hour for urine collection being at 14hrs and an hour before 10 am or after1 pm the egg concentration is normally low. The urine was taken to the lab for filtration using the filtration technique. Aliquots of 10mls urine each were filtered through a 13mm diameter polycarbonate membrane with a 12μm pore size, examined under the microscope (10xpower). After filtration, the filtrate was put on a slide then examined through a microscope. The method used is not 100% accurate but it is specific for *S. haematobium* urine examination, so quality was guaranteed. Then the number of eggs of *S. haematobium* were counted and the mean expressed as no. of eggs per 10 ml of urine.

3.10 Microscopy

Parasitological examinations of the eggs in urine were done using nuclear pore filtration technique as described by Kahama et al., (1998). Fresh urine sample was collected from each pregnant woman between 10.00 and 14.00hrs, aliquot of urine was filtered through a 13mm diameter polycarbonate membrane with a 12um pore size, examined under the microscope (40xpower) and the number of eggs of *S. haematobium* were counted and the mean expressed as no. of eggs per 10 ml of urine.

3.11 Dip Stick Urinalysis

The same sample of urine collected was used for the urinalysis using Uri sticks by the PI. The Uri sticks are indicated for various colour changes as guided by the test kit to show presence or absence of sugar, protein, acidity and others. Urinalysis was done to rule out any other abnormalities for proper management of the client. After urine was examined, the results were recorded on the urine test form and filed into a folder named urine test results. The volunteers were referred to the nearest health facility afterwards to receive an examination report of the urine from KEMRI, Kwale.

3.12 Pregnancy Test

Pregnancy direct test (PDT) was done using the same urine sample collected at one point in time. Rapid strip test kit for pregnancy was used by the PI and a trained study assistant. The strip was dipped into the volunteer's urine sample and read after standing for 3-5 minutes. The strip indicated two lines for the positive outcome and one line for the negative tests.

3.13 Physical Examination

The participants confirmed to be pregnant through PDT test and those suspected to be through observation were all directed to the physical examination room. The PI with the help of the study assistant registered the pregnant women like in the routine ANC clinics. Names were represented by initials and other unique identifiers such as their phone number contacts, residence, age, parity and a full history of pregnancy. Then the mother was asked to lie down on the couch and detailed physical examination done. Palpation to confirm gestation and parts of foetus was done; auscultation for heartbeats of the foetus was done. Those who had no abnormal health findings were sent to a desk set for one-on-one interviews in a private corner. This part involved examining the participant physically after clinical tests were done.

3.14 Questionnaire Survey

The introduction was made and the questionnaire explained to as it was earlier on arrival. The questionnaire had clear questions for ease of response. When the mother made the choice of the answer, a tick was put against the selected choice. When all the questions were answered the mother was released and told to wait for results through the nearest health facility after the urine examination was done at the KEMRI labs based at Kwale hospital. This was the last procedure, and the subject was discharged from the study at this point. Information on socioeconomic status, demographic as well as risks associated with *S. haematobium* infection was gathered and entered into the computer.

3.15 Key Informant Interviews

Questionnaires were issued to the key informants (health workers within the study area i.e. Nurses and Public health technicians/officers); questions were asked by study team as they wrote down notes. The data was then coded and translated into themes then entered into a computer using MS word 2007 then exported to N-VIVO version 8 for thematic analysis where all respondents were categorized under specific themes and described.

3.16 Data Management

Hard copies of the qualitative data were stored under key and lock in secured cabinets. Soft copies for both quantitative and qualitative data were in computers and secured in with passwords and controlled access to the computers, only authorised by the PI.

3.17 Data Analysis

3.17.1 Statistical Analysis

Spreadsheets in Microsoft Excel with unique identifiers were used for data entries. Statistical analysis was done using STATA version 12.0. Descriptive statistics were reported using means and standard deviations for continuous variables while frequencies and percentages were used for categorical variables. Bivariate analysis using Chi-square or Fisher's exact tests (where applicable) were used to examine associations between categorical socio-economic factors and outcome variable (*S. haematobium* infection). Student's t-test was used to test for associations between continuous independent variables and the outcome variable. A P-value of less than 0.05 was considered significant. Bivariable binary logistic regression was fitted to evaluate the strength of associations between the outcome variable and various independent variables. Crude odds and 95% confidence intervals are reported. For variables that were significant in the bivariable logistic regression, a multivariable logistic analysis was fitted. This was done to determine whether the independent variables were significant predictors of the outcome variable. Adjusted odds ratios and 95% confidence intervals are purported.

3.17.2 Thematic Analysis

The data was coded and translated into themes entered into MS Word 2007 and then exported to N-VIVO version 8 for thematic analysis. Qualitative analysis followed six steps: labelling content, grouping coded data, generating themes and defining the themes for clarity.

3.18 Limitations of the Study

The selection criteria excluded those under 18 years of age, who could have given us a scope of information regarding early pregnancies and Schistosoma morbidities.

3.19 Ethics and Authority

Ethical clearance was received from Kenya Medical Research Institute, Scientific and Ethics Review Unit (SERU), protocol 3016 (see appendix 1V approval letters) and all participants 18 yrs and above were given opportunity to informed consenting; each was given English or Swahili version of written information about the study procedures (see appendix 1 consent and advice form), benefits and risks regarding the study and to give informed consent. During data transcription names were coded with numeric unique identity for confidentiality.

Permission to carry out the project was sought from the relevant authorities in Kwale County and Kwale Sub-County hospital, area Chiefs and all relevant authorities (See Appendix IV).

In order to ensure that the study followed the principles of respect, beneficence and justice and in order to protect and prevent unnecessary risk to respondents, the protocol was reviewed and approved by the Centre for Clinical Trials, CCR, Scientific Committee, KEMRI and KEMRI Scientific and Ethics Review Unit (SERU) formerly Ethics and Review Committee (ERC), SSC no. 3016 was given. The appropriate ethical and consent forms are attached in the appendices. All participants had to consent to take part in the study and were assured that their identities would not be revealed. The participants were also assured that there were no risks associated with the study and taking part in the study was voluntary.

3.20 Consenting Process

The study assistants gave the consent forms to each participant one at a time and allowed them to read through and understand, while for those who could not read or write the form was read to them and questions were then welcome with answers given respectively. Once the participant showed satisfaction with the information, they were not allowed to sign on the indicated area on the form; while those who could not read nor write were given ink to touch on their thumb then print on the given space as a sign of acceptance to be part of the study**.**

3.21 Risks to the Study

There were no risks noted in the study as the clients were informed earlier in the consenting process.

3.22 Benefits

This study only compensated the participants with snacks for lunch since most of the participants were coming from far and for a long stay at the clinic due to numbers of the volunteers and the lengthy procedures of the study. Milk and bread were provided in the process.

3.23 Confidentiality

The information collected from the participants was treated as private and very confidential. Special identifiers were used to label participant content including residence, initials of their names and phone numbers. Data was handled by the study assistants and the PI only; then stored in a lock under key. Data was then entered into the computer by the PI and one study assistant. The security codes for the computer were kept secretly with password.

The information has not been leaked to anyone hence forth and is still under key and lock.

3.24 Voluntariness

The participants were all made aware of their rights and were given the option of deciding to join or withdraw from participation at any point. Those recruited had no doubts on any procedures or stages of the study and therefore none of them withdrew their consent.

CHAPTER FOUR

RESULTS

4.1 Socio-Demographic Characteristics among Pregnant Women of Kwale County

The response rate was 100 % with all sampled 368 subjects participating to the end of study. Study participants were 18-43 years old with a mean age of 26 years (SD= 5.72 years) within Kwale County. This comprised 139 (37.8%) women in Matuga Sub-County, 129 (35.1%) in Lungalunga, 64 (17.4%) in Kinango and 36 (9.8%) in Msambweni. Most of the women were aged 25 years and below (193, 52.5%), and 22 (6.0%) were aged 36 years and above. 332 (90.4%) were married, 28 (7.7%) were single and the rest were either divorced or widowed. 257 (69.8%) were homemakers, 8 (2.2%) had informal jobs and 103 (28.0%) worked in the formal sector. 221 (61.1%) of the women had achieved primary education and only 39 (10.8%) had been to Secondary school and above as shown in Table 4.1 below.

Table 4.1: Socio-Demographic Characteristics of Pregnant Women in Kwale County (Study Population)

Study population by Sub- County		**Age groups**	
Matuga	139(37.8%)	25 years old and below	193 (52.5%)
Kinango	64(17.4%)	26-35 years old	153(41.6%)
Msambweni	36(9.8%)	36 and above years old	22(5.6%)
Lungalunga	129(35.1%)		
Study population by Religion		**Occupation**	
Muslims		252(68.7%)	257 (69.8%)
Christian	115 (31.3%)	Informal jobs	8 (2.2%)
Muslims	252 (68.7%)	Formal jobs	103 (28%)
Study population by Education levels		**Marital Status**	
Never been to school	102(28.2%)	Single	28(7.6%)
Primary	221(61.1%)	Married	332(90.5%)
Secondary and above	39(10.8%)	Widowed/Divorced	7(1.9%)

4.2 Objective 1: Prevalence and Intensity of *S. haematobium* Infection among Pregnant Women in Kwale County

4.2.1 Prevalence of *S. haematobium* Infection among Pregnant Women in Kwale County

The prevalence of *S.haematobium* infection in Kwale County among pregnant women was 12.2% (9.3%-16.1% CI) among the 368 respondents. Response rate was 100%. Older women 36 years and above had a higher prevalence 18.2% (7.5%-44.1% CI) than the younger population while the youngest population 25 years and below had the lowest prevalence of 10.9% (7.3-16.3% CI). The women who had primary level of education had higher prevalence rate of 14.02% (10.1%-19.4% CI) while those with secondary level of education and above had 12.8% prevalence (5.7%-29.1% CI). However, those with nil school education had lowest prevalence of 6.9% (3.4-14.0% CI). Muslim participants had a higher prevalence rate 13.9% (10.0-18.5% CI) than Christians with 8.7% (4.7-15.5%). Kinango Sub County had the highest prevalence 14.1 (7.7%-25.8% CI), Msambweni Sub County had the lowest prevalence rate of 2.8% (0.4%-19.2% CI). Informal occupation category had highest prevalence of 13.6% (8.4%-22.1% CI) while home makers (with no occupation) had 12.1% (8.7%-16.5% CI). There was nil infection detected among the pregnant women who have formal occupation (Table 4.2)

Table 4.2: Prevalence of *S. haematobium* among Pregnant Women in Kwale County

	Prevalence	95% CI Prevalence
Overall Prevalence	**12.2%**	**9.3%- 16.1%**
Prevalence by age category		
25 years old and below	10.9%	7.3%-16.3%
26-35 years old	13.1%	8.7%-19.7%
36 and above years old	18.2%	7.5%-44.1%
Prevalence by level of education		
Never been to school	6.9%	3.4%-14.0%
Primary	14.02%	10.1%-19.4%
Secondary and above	12.8%	5.7%-29.1%
Prevalence by religion		
Muslims	13.9%	10.0%-18.5%

	Prevalence	95% CI Prevalence
Christians	8.7%	4.7%-15.5%
Prevalence by Sub-counties		
Matuga	12.9%	8.4%-19.9%
Kinango	14.1%	7.7%-25.8%
Msambweni	2.8%	0.4%-19.2%
Lunga Lunga	13.2%	8.5%-20.5%
Prevalence by Site (only the three highest prevalence reported)		
Site 1 (Waa-Bowa)	30% (p-value= 0.013)	11.6%-77.3%
Site 2 (Mbuguni)	28.6% (p-value=0.003)	12.5%-51.2%
Site 8 (Boyani)	25% (p-value=0.024)	7.5%-83%
Prevalence by occupation		
Homemakers	12.1%	8.7%-16.5%
Formal sectors	0.00%	0.00
Informal sectors	13.6%	8.4%-22.1%

4.2.1.1 The Prevalence of S. haematobium by Sub County and Age Categories

Kinango and lunga lunga Sub Counties had highest prevalence among older population 36-43 years of age whileMatuga and Msambweni Sub County had high prevalence among a younger population 26-35 years of age as compared to Kinango. The youngest age group and the oldest age categories in Msambweni Sub County were not affected by schistosomiasis. Schistosomiasis distribution among pregnant women in Kwale County varies with age and residence (Figure 4.1).

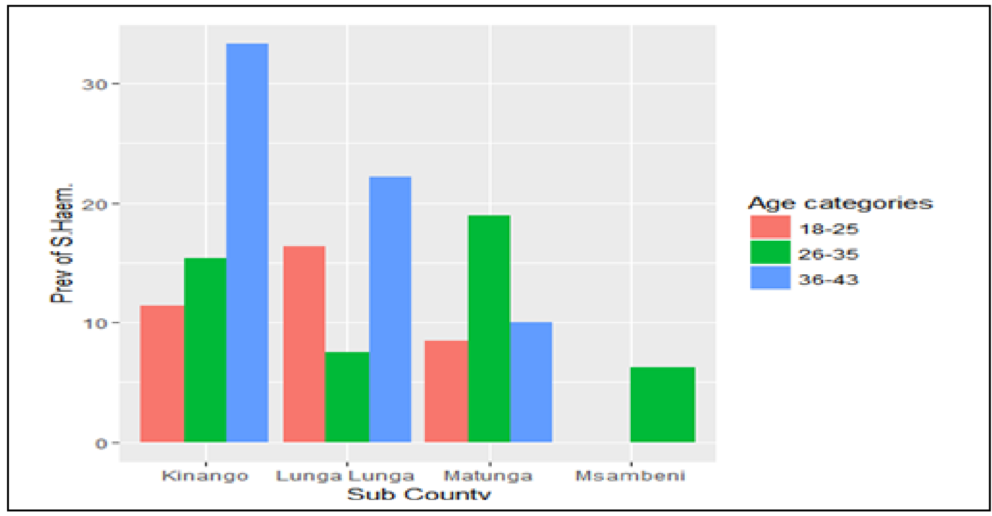

Figure 4.1: The Prevalence of *S. haematobium* by Sub- County and Age Categories

4.2.2 Intensity of *S. haematobium* Infection Among Pregnant Women in Kwale County

The egg count per 10ml urine was then classified into light and heavy infection according to WHO guidelines and prevalence calculated shown above. Infection with *S. haematobium* among the pregnant mothers in Kwale County was of light intensity, those with heavy intensity were 2.7% and light intensity was 9.6% prevalence. The heavier the intensity the more the burden of the infection on the affected individuals. Light intensity manifests with less severe symptoms as compared to heavy intensity

Table 4.3: Intensity of *S. haematobium* Infection among Pregnant Women in Kwale County

Egg count intensity	Prevalence	95% CI
Heavy (>50 eggs)	2.7%	1.4-4.9
Light (≤50 eggs)	9.6%	7.0-13.1

The geometric mean of the age category 25-35 years (16.84474, 95% CI: 7.7603-36.56329) was higher than the age categories 25 years and below and 36 years and above. Those who had never been to school had a higher geometric mean (20.94, 95% CI: 2.38-183.9246). in terms of religion, Muslims had a higher geometric mean (14.495, 95% CI: 7.65-24.04) of egg count for S.*haematobium* infection as compared to Christians. A higher geometric mean of egg count was reported in Matuga (21.06, 95% CI: 8.98-49.39). Those who had informal jobs also presented with a higher egg count (13.06, 95% CI: 6.47-26.33) than home makers (Table 4.4).

Table 4.3: Geometric Mean of Egg Count for *S.haematobium* Infection Among Pregnant Women in Kwale County

Egg counts mean	(N) Geometric mean of the egg count	95% CI of the geometric mean
Overall	**(45)13.8544**	**7.98-24.04**
Geometric Mean by Age categories		
25 years old and below	(21) 11.29352	4.2669-29.89107
26-35 years old	(20) 16.84474	7.7603-36.56329
36 and above years old	(4) 15.2482	3.2205-72.194009
Geometric Mean by Education level		
Never been to school	(7)20.94	2.38-183.9246
Primary	(31)12.15	6.35-23.2346
Secondary and above	(5)13.965	0.95-204.45
Geom. Mean by religion		
Muslims	(35)14.495	7.65-24.04
Christians	(10)11.54	3.31-40.21
Geom. Mean by Sub- County		
Matuga	(18)21.06	8.98-49.39
Kinango	(9)14.40	4.12-30.33
Msambweni	(1)49	-
Lunga lunga	(18)8.08	2.81-23.20
Geom. Mean by Occupation		
Home makers	(31)13.06	6.47-26.33
Formal Jobs	(0)0.00	
Informal jobs	(14) 15.78	5.87-42.41

Figure 4.2 below represents the prevalence and geometric means of the 17 sites covered in this study. Study sites 1, 2 and 8 had the highest prevalence of ***S. Haematobium.*** Sites 12, 1 and 9 had the highest geometric means.

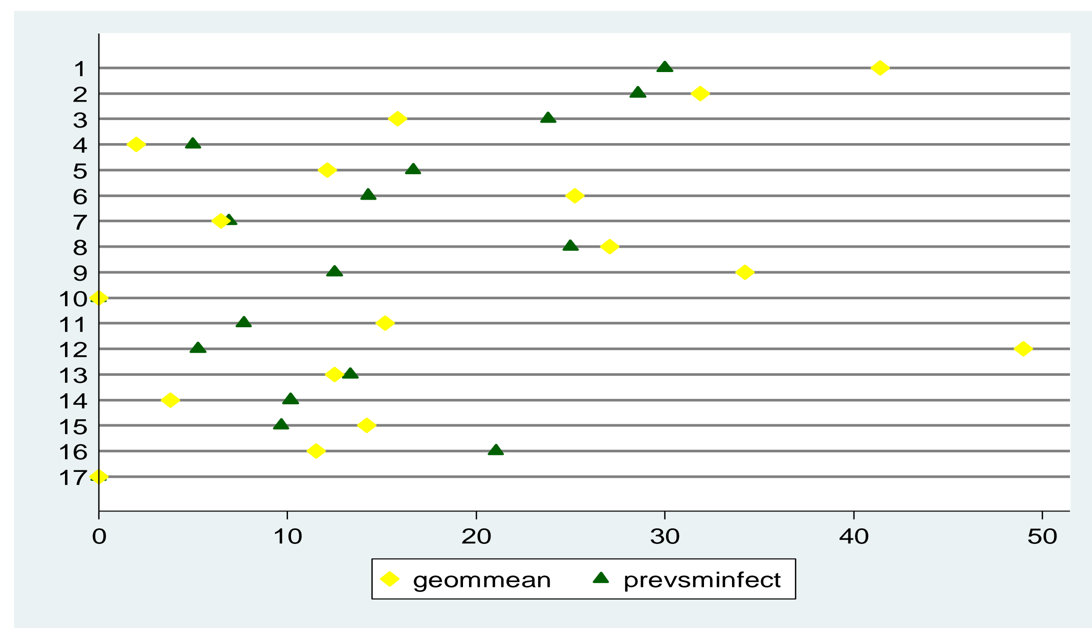

Figure 4.2: The Prevalence and Geometric Means of *S. haematobium* in 17 Sites.

4.2.3 The Reproductive History of the Pregnant Women with *S. haematobium* in Kwale County

The mean and median parity alive of the infected versus not infected mothers were compared and the results presented in Table 4.5 below. There was no significant difference between reproductive history and infection status (P-value>0.05).

Table 4.4: Summary Statistics of the Reproductive History by Infection Status of 368 Pregnant Women

***S. haematobium* infection**	**Geometric Mean parity alive**	**Median parity alive**	**Min- Max parity alive**	**P-value**
Infected	2.8	3	0-9	0.076
Not infected	2.5	2	0-10	

The association between infection status and proportion of parity death and miscarriages was also tested. Table 4.6 shows that there was no significant association (P-value>0.05).

Table 4.5: The Fisher's Exact Test of Cross Tabulation of Parity Dead and Miscarriages

S. Haematobium infection	Parity dead		Miscarriages	
	No of subjects with parity dead	**One or More parity dead**	**No miscarriages**	**One or more**
Infected	37	8	31	14
Not infected	279	43	250	72
P-value	0.488		0.913	

4.3 Objective 2: Socio- economic Activities of the Pregnant Women with *S. haematobium* in Kwale County

Majority (Over 75%) of the women had their source of water being river or borehole, with 70.3% of the women having a toilet in the homestead. The toilet was being used by a median of 7 people per toilet. Among the pregnant women, 150 lived in iron roofed houses with mean rooms of 2.37 (median rooms =3), ranging from 1-6rooms per household.

Among the participants, 234 (64.29%) of the participants had their kids attending school, the rest (130) reported to have underage kids or no kids.

Kitchen placement was the only socio-economic activity that was significantly associated with the infection (P-value=0.02). With those who had their kitchen placed in the same hut as they sleep reporting a significantly higher prevalence than those with kitchen placed outside of different room with the one, they sleep.

Only 24% of women used electricity or Solar as a source of light in their homes while most (357/368) of them used firewood and charcoal as source of fuel. Majority (42/45) of the infected women had their source of food being farming although the difference is insignificant (P-value=0.0945). But it was evident that rice farming significantly (P-value<0.05) affects the infection with 5 out of 11 women who practice rice farming being positive of *S. Haematobium* (Table 4.9).

Table 4.6: Logistic Regression for Infection Status of *S. haematobium* Among Pregnant Women in Kwale County

Socio-Economic factors	Odds Ratio	P-value	95% CI
Source of water			
River Vs Tapped water	0.4636	0.245	0.1269-1.694
Borehole vs Tapped water	0.5808	0.157	0.2736-1.2328
Water pans vs tapped water	0.4796	0.210	0.1521-1.5116
Presence of the toilet in the homestead			
Without vs with	0.9642	0.923	0.4608-2.017
Type of the housing roof			
Thatched hut Vs Iron roof	0.6081	0.221	0.7652-3.3740
Kitchen placement			
In the house slept vs Outside	0.4232	0.024	0.2009-0.8898
Source of Light			
Open fire Vs electricity/Solar	1.1184	0.797	0.4764-2.6256
Others Vs electricity/Solar	3.0055	0.231	0.4906-19.033
Source of Fuel			
Charcoal vs Firewood	0.4284	0.206	0.1152-1.5922
Others Vs Firewood	0.5314	0.584	0.0551-5.1192

4.4 Objective 3: Knowledge, Attitude and Practices of the Pregnant Women with *S. haematobium* Infection in Kwale County

4.4.1 Knowledge Factors among Pregnant Women with *S. haematobium* Infection

The response rate was 100% for the 368 participants recruited. 80% of the mothers were completely knowledgeable about Bilharzia. They knew that it is a disease, what causes it, if it is preventable how to prevent themselves and more importantly, they knew how to identify if they had the disease and to seek medical care if infected. However, all the knowledge factors did not significantly affect the infection of *S. haematobium* (Table 4.7).

Table 4.7: Multivariate Logistic Regression for the Knowledge Factors in Relation to Infection of *S. haematobium* Among Pregnant Women in Kwale County

Knowledge Factors	Odds Ratio	P-value	95% CI
Is Bilharzia a disease?			
No vs Yes	1.9051	0.484	0.31-11.52
Causes of Bilharzia			
Water vs Water insects/parasites	1.4569	0.454	0.54-3.90
Not Known/Bewitched vs Water insects/parasites	0.000	0.989	-----
Means of transmission			
Sexual contact vs Drinking/washing with parasite infested water.	0.4283	0.417	0.05-3.37
Not Known/Bewitched vs Drinking/washing with parasite infested water.	0.8671	0.897	0.10-7.48
Is Bilharzia preventable			
No vs Yes	1.34	0.499	0.57-3.14
Is there need to know about Bilharzia			
No vs Yes	1.13	0.877	0.22-5.81

4.4.2 Attitude among Pregnant Women with *S. haematobium* in Kwale County

Beliefs of the participants showed some of the infected believing that the infection was due to witchcraft. Some of the participants believed it was a normal passage in life to pass blood in urine. This attitude however did not have significance in relation to the bilharzia infection.

4.4.3 Practices among Pregnant Women with *S. haematobium* in Kwale County

Among the 368 pregnant women, 135 (54.44%) of the participants had their main source of water from the river, 102 of those women take a bath in the river further 63 of those admitted passing urine in the water**.** Although these are paramount factors leading to infection or transmission of the *S. haematobium,* they were not significantly associated with infection (Table 4.8). Only 13/45 (28.88%) of the infected pregnant women go to the river for water and to take bath.

Table 4.8: Multivariate Logistic Regression for Practice Factors to Infection Status of *S. haematobium*

Practice Factors	Odd Ratio	P-value	95% CI
Taking a bath in the river			
No vs Yes	0.56	0.413	0.14-2.20
Passing Urine in the river			
No vs Yes	1.17	0.832	0.26-5.22
Place of water use			
Use in River vs Use away	2.1638	0.243	0.59-7.91
No River vs Use away	1.9283	0.210	0.69-5.38

4.5 Clinical / Investigation Examination

4.5.1 Urinalysis

Out of total 368 pregnant women, 4.34% (16/368) had urine colour as turbid which is associated with a UTI infection, 4.61% (17/368) had brown urine indicating they were under drug treatment while the rest has normal urine colour. The urine colour was insignificantly (exact test p-value=0.220) associated with *S. haematobium* infection status. Among the participants 33.97% (125/368) had epithelial cells in their urine, the presence of epithelial cells associated significantly (p-value=0.001) with *S. haematobium* infection. 22.5% (81/360) had white blood cells in their urine which significantly (p-value= 0.000) associated with *S. haematobium* infection. Similarly, 4.96% (18/368) had red blood cells in the urine which significantly (p-value=0.001) associated with *S. haematobium*. Among them 7.99% (29/368) had an alkaline urine (ph. 5-7), with 334/363 (92.01%) having a normal urine ph and 106/368 (28.8%) had leucocytes in their urine. Unlike all other blood cells, the presence of leucocytes insignificantly (p-value= 0.635) associated to *S. haematobium* infection. Out of 368, 291/368(0.7%) women had a non-normal urine gravity (Less than 1.20 or greater than 1.03). Urine gravity was significantly associated with *S. haematobium* infection (P-value= 0.048) (Table 4.10).

4.6 Key Informant Interview Review

4.6.1 Knowledge Regarding Schistosomiasis Infection

On the general knowledge of the participants on *S. haematobium* disease, how it is transmitted, treated or prevented, heath interventions by NGOs and the Ministry of Health, including deworming, health talks, household follow-ups CLTS activities and the TUMIKIA project, have improved community knowledge on helminths including *S. haematobium.* These efforts also involve the distribution of water gourd for treating drinking water, short trainings to volunteers among the population on diagnosing and treating eligible populations with PQZ.

Findings: *"Tumikia project used to support CHVs to give drugs in affected areas together with the public health officer."* (Respondent one).

"Health talks by staff; PHOs, Nurses, Clinicians and Community Health Volunteers." (Respondent three)

"Yes, continuous follow-up of households on CLTS activities for the household to provide and use latrines, personal hygiene, public awareness on the disease and prevention measures." (Respondent Four)

4.6.2 Practices that affect Schistosomiasis Prevalence in the Community

4.6.2.1 Practice and Behaviour of the Population that Influences the Infection Cycle of S. haematobium in Kwale County

S. haematobium prevalence was influenced by poor socioeconomic status leading to dependence on water from rivers, water pans and ponds, they bathed in the rivers exposing themselves to infection and putting others at risk as they passed urine in the river.

Some of the common water sources in the area include boreholes, earth pans, wells, rivers, and dams.

"Wells and springs." (Respondent one)

Lessons were offered on pit latrine construction, but the actual practice was low because of unaffordability.

"Continuous health education and provision of advice on the construction of pit latrines both in schools and homes." (Respondent four)

The percentage of those who practice this after the lessons is low due to poverty.

"Some communities lack toilets as most community members defecate in open spaces which increased the occurrence of bilharzia." (Respondent Four).

4.6.3 Attitude towards Health-Seeking Behaviour

Most individuals in the community sought treatment after infection. However, some respondents believed that signs and symptoms of the disease were a curse, urinating blood was said to be normal. The supporting except *"They feel urination of blood is normal and they have no contribution to the aspect of control."* (Respondent three). "*Seek treatment in health facilities after some time."* (Respondent one). *"When they are infected, they seek medical care."* (Respondent two)

The prevalence of S. *haematobium* is high at 12.7%. Most respondents consider it a major health concern, although it is not prioritized by local health systems. Despite limited knowledge of the disease, quantitative data shows low literacy levels among the pregnant women in Kwale County, with many having little or no education. Key informants attribute the spread of S. *haematobium* to illiteracy, ignorance and knowledge gaps.

"Illiteracy, ignorance and knowledge gap." (Respondent Two)

4.6.4 Socio- Economic Status of Pregnant Women with Schistosomiasis Infection in Kwale County

Socioeconomic status of the participant was based on low-income indicators within their daily occupational activities. Majority of the mothers were illiterate, mainly home makers, married with families with no formal income. As shown in the responses this

led to poor living conditions, semi -permanent housing, in access to clean water sources for home use, inability to construct pit latrines or use modern toilets. Instead, the population continue to embrace primitive toilet habits such as open defecation in the surrounding bushes.

"Some communities lack toilets as most community members defecate in open spaces which increased the occurrence of bilharzia." (Respondent Four)

Lessons were offered on pit latrine construction, but the actual practice was low because of affordability.

"Continuous health education and provision of advice on the construction of pit latrines both in schools and homes." (Respondent four)

The percentage of those who practice this after the lessons is low due to poverty.

Some of the common water sources in the area include boreholes, earth pans, wells, rivers, and dams.

"Wells and springs." (Respondent one)

The main source of income in the community includes small scale businesses, food vending, farming and merry go round activities.

"Farming cooking and selling food." (Respondent one)
"Small scale businesses and farming." (Respondent Two)
"Small scale and medium scale businesses." (Respondent three)
"Mainly women do minor business-like food vending and merry-go-round activities." (Respondent four)

"Illiteracy, ignorance and knowledge gap." **(Respondent Two)**

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMANDATIONS

5.1 Discussion

5.1.1 Prevalence of *S. haematobium* Infection among Pregnant Women in Kwale County

Schistosomiasis prevalence among pregnant women in Kwale County is 12.2% as found in this study; significantly lower than similar studies in other endemic zones. In Zimbabwe, prevalence reported in 2020 was 26.8% (Murenjekwa W, Makasi R, Ntozini et al, 2020). In Senegal prevalence of *S. haematobium* among pregnant women was reported to be 21.81 %, (Ndiour CN, Senghor B, Thiam O et al, 2024*)*, while in Madagascar 2024, a high of 55.8% prevalence among pregnant women with schistosomiasis was reported. In Gabon 2019, 22.3% prevalence of schistosomiasis among pregnant women was reported. These figures highlight the significant public health concerns and neglect faced by women in endemic regions. The burden still persists in most regions of the world with known endemicity. The global efforts on eradication campaigns for a bilharzia free world by 2030 is still under great challenge.

Unlike most studies, the highest prevalence of *S. haematobium* in Kwale County was observed in older women, 36 years and above, (Charan J, Biswas T, 2013), Murenjekwa W, Makasi R, Ntozini R *et al*, (2021). Though not statistically significant, the age group at highest risk varies by region. For example, a study in Tanzania found higher infection rates among women 18 years and below. This variation may be due to differences in socio-economic activities and greater uptake of preventive measures by younger populations. However, many studies have reported younger age categories as seen in studies done in Nigeria 18 years old and below with a prevalence of 8.9% were reported as the highest risk group, (Dawaki et al., 2016). Another cross-sectional study also reported 70% prevalence with 35yrs and below at highest risk (M.Umar *et al*, 2018). In another cross-sectional study to determine the prevalence and morbidity indicators of *S. haematobium* among pregnant women*,* 70% prevalence was reported with those at highest risk being 35years of age and below (M. Umar et al., 2018).

Another study conducted in Central Nigeria also reported a prevalence rate of 8.9% for *S. haematobium infection* with most participants in the age 18years and below at highest risk (Dawaki et al., 2016), which is contrary to the findings in this study of the pregnant women of Kwale County reporting ages 36 years and above as highest risk population. This differs with the findings in this study that shows 36 years and above population at a higher risk of infection than the younger population. A study conducted in Nigeria with a total of 2064 respondents who were used to assess the prevalence and intensity of infection of schistosomiasis among pregnant women revealed that individuals of the age of 11-20 years and farmers were highly likely to be affected by *Schistosomiasis* contrary to their counterparts (Ugochukwu et al., 2013) A study conducted in South Africa revealed that *S. haematobium* was endemic in the rural region and women age 16-22 were reported as most at risk. Another study also showed women who were 25 years and younger as likely to report high schistosomes infection (Anchang-Kimbi, Elad, Sotoing, & Achidi, 2017). Salam et al., (2017) also found a prevalence level of 22% for *S. haematobium* which was reported in the mass drug administration exercise.

Kinango and Lunga Lunga Sub Counties had the highest prevalence of *S. haematobium* in Kwale County (14.1% and 13.2% respectively), likely due to poor water access in these semi-arid areas, whereby people rely on stagnant water pans for washing and bathing, increasing transmission risk. In Msambweni, infection rates were lowest. This could be due to increased awareness of the problem among the community. Probably presence of research activities in the area avail health services to the populations within providing constant surveys and mitigation programs. However, the intensity of *Schistosoma haematobium* was high probably due to chronicity of the infection among the participants (ref. Table 4.2.2). Generally, drier areas had a higher prevalence probably due to inadequate safe water accessibility, inadequate knowledge of the problem combined with less effective preventive measures. Most of the study participants were from lower socio-economic circles, they included homemakers and informal workers who reported higher prevalence, while nil infection reported among formally employed individuals highlighting poverty as a risk factor in this region (ref. table 4.2.1). Rice farmers were at a higher

risk 45.5% compared to other farming activities. Certainly, the swampy waterlogged rice pads are home to vectors that continue the cycle of *S. haematobium*.

5.1.2 Intensity of *S. haematobium* Infection among Pregnant Women in Kwale County

The study in Kwale County reported light intensity among bilharzia infected participants with one participant reporting heavy infection. Majority of the infected participants 97.6% had less than 50 eggs per 10ml urine sample that is what is regarded as light intensity according to WHO. The heavy intensity over 50 eggs per 10ml urine sample was reported among 2.5% of the participants. Severity of symptoms and possibility of complications is lower in light intensity than in heavy intensity infections.

A study conducted in Kwale to determine the risk factors which are associated with the occurrence of *S. haematobium* infection revealed that the intensity of the disease was 3.1eggs /10ml urine which was conducted through the use of urine filtration (Chadeka, Nagi, & Sunahara, 2017). This was low intensity just as found in this study. Similarly, a study conducted to determine the efficacy and safety of praziquantel in the treatment of human schistosomiasis in a randomised, double-blind placebo-controlled trial in the endemic regions in the Philippine among pregnant women with low intensity schistosome infection reported nil significance in PZQ treatment to improve birth outcomes (Olveda, Acosta, Tallo, & Baltazar, 2016). A similar study conducted by Lee, Lee, & Jeoung, (2019) reported a prevalence rate of 36.3% for *S. hameatobium* with an average number of eggs per 10ml urine being 17.0 among pregnant women. A study conducted by Salawu & Odaibo, (2016) in rural Nigeria to assess the level of schistosomiasis transmission among 250 pregnant women and the associated risk factors reported an overall mean infection intensity of 69.6 ±165.2 eggs/10mL urine. Another study also conducted in Nigeria showed a prevalence level of 31.5% among women who were 20-24 years. The study also revealed that women in their first-trimester pregnancy and primigravidae were more likely to record the highest intensity of the *S. haematobium* infection of 33.1 ±27.7 eggs/10mL of urine (O. Salawu & Odaibo, 2013). Similarly, found an infection intensity of <100 eggs/10mL urine for *S.*

haematobium with individuals who were16-20 years being at highest risk of the infection. However, the study found no association between the prevalence of *S. haematobium* and its intensity (Ivoke, Ivoke, Nwani, Ekeh, & Asogwa, 2014).A study in Brazil reported a prevalence level of 34.5% and an intensity of 54.9 eggs/10mL of urine among the study population for schistosomiasis. The occurrence of this disease was also significantly linked to the poor level of sanitation in the area (Calasans, Souza, & Melo, 2018). Ugochukwu, Onwuliri, Osuoala, & Dozie, (2013) also found a significant association between the prevalence and intensity of the *S. haematobium* which peaked among individuals of the age of 11-20 years and a reported mean egg count of 10.1 eggs/10mL of urine. Majority of the findings show low intensity of the haematobium infections just like the findings in Kwale County, Kenya.

5.2 Sociodemographic and Socio-Economic Factors that Influence the Burden of *S.* h*aematobium* among Pregnant Women in Kwale County

This study has reported *S. haematobium* infection among participants with informal employment and home makers while those with formal employment had nil infection, 13.6%, 12.1% respectively and 0.00%.

Participants who were Muslims had 13.9% prevalence of *S. haematobium infection* while Christians had 8.7% prevalence. It is not clear whether uptake of health care services and public health intervention is low among the Muslims, or it could be geographical locations that brought this variation.

Along the coastal strip, variation was noted among residents of Matuga Sub County who had higher prevalence of 12.9% as compared to Msambweni Sub County with only 2.8% prevalence. Could be accessibility to intervention programs is skewed in distribution within the County. Some of the populations were more from the interior rural areas with poor living standards, clean water inadequacy and low literacy levels. Majority of the women in this study have no access to electricity, they live in the rural areas where 88.2% use charcoal and firewood as the main source of fuel: 71.7% use open fire for lighting up at night, only 24.1 % use solar or electricity revealing poverty among the population. These findings are similar to a study conducted in sub-Saharan Africa which also showed that the prevalence of *S. haematobium* was linked to socio-

economic factors like occupation activities and poverty especially in rural areas (Adenowo et al., 2015).

The infection distribution among levels of education did not have significance as it is noted both educated and none educated participants got the infection and more so secondary levels and above had the highest prevalence 12.8% with the none educated having lowest prevalence 6.9%. High prevalence of *S. haematobium* was reported among pregnant women with low literacy levels, primary school levels 14.2%.as compared to those who reached secondary and above at 12.8% while 6.9% prevalence was reported among those who never went to school. Education level here had no statistical significance in association to Schistosomiasis. However, those with formal employment in the occupation category had 0.0% prevalence; these are likely to be more educated women among secondary and above levels than it is likely with those who never went to school. Homemakers among these pregnant women had13.1% while those in informal jobs as described in the key informants' results; food vendors reported 15.8% prevalence. It is likely that the home makers and those in informal employment had primary level of education and below 323 (87.8%) of the total sample. It is possible that the more educated the mothers were the less affected they were by *S. haematobiun* infection, but the statistics did not show significance. In the key informant interview results, it was reported that, "the level of knowledge in relation to infection, prevention and control of bilharzia was noted to be insufficient among the study participants. This could be attributed to the fact that majority of the respondents had only acquired basic education." As it seems, less formal education leads to less access to formal works and therefore less conducive residences leading to vulnerability to infection.

Level of education had no significance in relation to prevalence of bilharzia among the pregnant women in Kwale County. However, a study in Cameroon reported 95% of infected mothers having had only primary education. In Kwale County 20.9% of infected women had no formal education or had only primary-level education, but general awareness (knowledge) of the disease was adequate, without a significant link to prevalence. Notably, 12.8% of the infected women had secondary education or higher, suggesting that environmental factors rather than educational background, may

play a role to exposure in Kwale County but general awareness of the disease was adequate, without a significant link to prevalence. Notably, 12.8% of the infected women had secondary education or higher, suggesting that environmental factors rather than educational background, may play a larger role in exposure in Kwale County.

5.3 Knowledge, Attitude and Practices of the Pregnant Women that could be Influencing *S. haematobium* infection among Pregnant Women in Kwale County

5.3.1 Knowledge

The participants' knowledge of bilharzia infection was reported adequate (80%) though in relation to prevalence of the infection there is no corelation of knowledge influence and being free from infection. In the knowledge of the bilharzia interview, 96.7% knew that bilharzias is a disease while only 3.3% said it was not a disease, 84.7% said causes of *S. haematobium* are water insects/parasites while others said its witch craft or they didn't know the cause Among the participants, 84.7% knew that contact with parasite infested water was how transmission of schistosomiasis occurs while 10.3% said it was witchcraft and the rest 4.9% said through sexual contact with infected person. These knowledge gaps have significance if preventive and eradication goals are to be realised. Among the pregnant women, 79.3% knew that blood in urine is a sign for bilharzias in an infected person, 8.2 said pain in private parts and 3% said headache is a sign of the infection while 9.3% said they did not know. About treatment of bilharzias 99.5% said it does require treatment while 0.5% said it does not require. These findings show that majority of the pregnant women have full information about the disease occurrence however this knowledge is not significant in relation to prevalence findings thus the association of *S. haematobium* in relation to knowledge is insignificant; those with information relevant to schistosomiasis infection surfer equal share of the burden of bilharzia in Kwale County.

Those who knew about bilharzia equally got the infection; other factors need to be observed. A study in Yemen revealed that majority of household's participants had a fair knowledge of the transmission, signs and symptoms of the disease and they did not consider the disease harmful, (Ndiour CN, Senghor B, Thiam O et al, 2024).

Although not statistically significant, those with limited knowledge about bilharzia had higher odds of infection. This included individuals unaware of Bilharzia as a disease, its cause or that it is preventable. Studies confirm that knowledge, attitudes and practices are crucial in determining *S. haematobium* prevalence, (Charan J, Biswas T, 2013).

More Studies that confirm that knowledge, attitudes and practices are crucial in determining *S. haematobium* prevalence were reported by Adam I, ALhabardi NA, Al-Wutayd O et al (2021), Murenjekwa W, Makasi R, Ntozini R, Chasekwa B, Mutasa K et al (2021).

A study conducted in Nigeria of 551 respondents revealed that, three-quarters of the population were aware that *S. haematobium* was a serious disease and it was essential to seek treatment to diagnose and treat the disease, however, their practices were insufficient. This shows that adequate knowledge alone with no practice good will or interest is not key to lowering prevalence. Additionally, 63% of the respondents had no idea of the preventive measure to deal with the disease and their practices were inadequate (Dawaki et al., 2016).

A similar study conducted in the Philippines also revealed that the level of knowledge was associated with schistosomiasis and this was significant in the implementation of preventive practices to help in the management of the disease (Almazan et al., 2017). According to Angelo, Kinung'hi, Buza, Mwanga, & Kariuki, (2019) majority of the population had misconceptions regarding the cause of schistosomiasis, modes of transmission and prevention and control of the disease which also impacted their health-seeking behaviour.

5.3.2 Practice

Practices such as use of river water sources for home use, bathing in the rivers and passing urine in the waters as they bath is a continuity factor for the Schistosoma infection cycle. A study conducted in South Africa revealed that *S. haematobium* was endemic in the rural region and it is largely associated with unsafe water contact with women age 16-22 being at most risk. This study reported 54.4% of the participants

drawing water for use from rivers and of these 75% bath inside the rivers of whom 61% pass urine in the river as they bath. Another study also showed women who used stream water more were more likely to report high schistosome infection (Anchang-Kimbi, Elad, Sotoing, & Achidi, 2017). Salam et al., (2017) also found a prevalence level of 22% for *S. haematobium* among river water users which was reported in the mass drug administration exercise. The socio-economic practises of the participant cling to majority using river water and open water pans, 41.2% and 14.2% respectively, for bathing and fetch water for home use, they have no access to clean safe water for use; bathing in rivers is known to be a risk factor. The key informants interview results confirmed this, too; “Some of the common water sources in the area include boreholes, earth pans, wells, tap water, river, and dams.”

“Wells and springs.” (Respondent one)
“Boreholes, wells and earth pans.” (Respondent two)
“Water catchment, rivers and dams.” (Respondent three)

A study which was conducted in Nigeria reported a prevalence of 32.1% for *S. haematobium* infections with the infection being strongly correlated with water contact (S. Umar, Shinkafi, & Hudu, 2017). Another study conducted in South Africa revealed that *S. haematobium* was endemic in the rural region and it is largely associated with unsafe water contact with women age 16-22 being at most risk. A study conducted in Ivory Coast implemented a cross-sectional study to assess the relationship between the prevalence of schistosomiasis and environmental and socio-economic activities. The study sampled 728 households from which prevalence of 3.5% was seen which was relatively low level of infection. The findings also revealed that majority of the households lived far from water access points and the community abstained from swimming in open freshwater bodies. Additionally, the socio-economic status of the participants did not influence the prevalence of the disease (M’Bra et al., 2018). A similar study that aimed at assessing the level of community-led total sanitation and prevalence of schistosomiasis assessed a total of 810 respondents. A follow-up cross-sectional study implemented in the study revealed that the prevalence of *S. haematobium* (7.0%) was associated with the socioeconomic factors of the respondents. This included fishing and farming occupations which predisposed the

respondents to infections through open defecation (Hurlimann et al., 2018). According to a study conducted by Houweling, Karim-Kos, Kulik, & Stolk, (2016) evidence on the specific socio-economic factors which are associated with infection of neglected tropical diseases like schistosomiasis are scarce however the odds of infection are higher among individuals in the community who are socio-economically disadvantaged contrary to the well to do. A study conducted in sub-Saharan Africa also noted that the prevalence of *S. haematobium* was linked to socio-economic factors like occupation activities and poverty especially in rural areas (Adenowo et al., 2015). Similarly, individuals with a low level of income and/or are farmers are highly likely to be exposed to the disease (Juma et al., 2017) Additionally, studies by Girma et al., (2018) which aimed at determining the prevalence of schistosomiasis revealed that majority of the affected and exposed individuals did not have personal protective equipment to protect them from being in contact with infected water in their farming practices.

Even though the odds ratios did not reach significant levels, the practices of the population maintain the endemicity in the affected areas of Kwale County. Majority of the participants were poor as shown in the type of housing, cooking inside the huts they slept in shows low standards of living. A reflection of kitchen placement statistics showed a significance with p- value 0.02. Higher prevalence was reported among those cooking and sleeping in the same huts as compared to those who were able to afford separate kitchen from the house they slept. Among the participants 76% lived poorly with no access to electricity but used charcoal and firewood. The poor population was more affected among the participants. Farming was the main source of food for all the participants. Rice farming was practised by 11 participants among them 5 (45.5%) were infected with schistosomiasis which showed significance with p-value 0.05%. However, other factors need to be assessed since the Sub- Counties with highest prevalence were dry semi-arid areas where no rice grows and people are suffering the burden of bilharzias. This study shows clearly that having formal jobs to do keeps the women in Kwale County free of infections like bilharzias. Probably, if the burden is handled bottom up; from the pre-school ages and all women are well groomed academically and get-well educated chances of acquiring formal employment could be

improved and with more people living up standards then the cycle of Schistosoma Haematobium could be cut off one day.

Other studies in sub-Saharan Africa that also link *S. haematobium* prevalence to socioeconomic factors like occupation and poverty, particularly in rural areas include, (Miller-Fellows SC, Howard L, Kramer R, Hildebrand V *et al*, 2017); DAWAKI S, AL-MEKHLAFI HM, ITHOI I et *al,* 2016). Other predisposing practices included poor sanitation in the homesteads like low latrine coverage, open defecation, use of stagnated water in washing utensils and bathing and individuals who were infected did not seek the treatment they contaminate water bodies. These findings relate to a study conducted by Umar et al. (2018) which revealed that the level of knowledge, attitude and practices towards *S. haematobium* were critical contributors to its prevalence in the community. A study conducted in Yemen to determine the level of knowledge, attitude and practices towards schistosomiasis revealed that majority of the captured households had fair knowledge on the transmission, signs and symptoms of the disease and they also considered the disease to be harmful. However, their practices were insufficient in helping to deal with the prevention of infection of *S. haematobium* (Sady, Al-Mekhlafi, Atroosh, & Al-Delaimy, 2015).

5.3.3 Attitude

Beliefs of the participants showed some of the infected believing it was due to witchcraft. A study done in the Niger Delta showed some of the myths on the understanding of *S. haematobium* infectivity by the community. The general population believed that *S. haematobium* infection was due to witchcraft and that it was sexually transmitted with no effective cure Girma M, Agedew E, Gedeamu G et al (2024). The attitude towards schistosomiasis was associated with marital status, wearing PPE and working on paddies (Mwai et al., 2016).

5.4 General view

This study determined that *S. haematobium* in Kwale County is still prevalent irrespective of various intervention mentioned by participants in the interviews and this could be associated with inadequate distribution or provision of public health

interventions within the County health systems. The study outlined the most affected populations and thus population at risk of bilharzia transmission in Kwale County which included pregnant women with no formal employment, older age category 36 years of age and above, the areas habited by Muslim population are of concern because Christians had less infection rates compared to the Muslim participants. It is not clear though how religion can be a factor of concern as far as bilharzia transmission is concern. It is possible that the environment of residence harbours associated factors. Rice growing areas are high risk areas because 45.5% of the rice farmers were infected, poor or low living standards express poverty and therefore in Kwale County the poor people are more at risk of getting infected with *S*, *haematobium*. Additionally, Kinango and Lungalunga Sub-Counties in Kwale County are most affected by *S. haematobium* and are a public health priority concern.as emerged in this study, those with formal employment had no infection at all. This shows that the population with non-formal employment cannot access affluent living standards that can keep people in safe residential quarters. Kinango and Lungalunga Sub Counties had highest prevalence probably due to inadequacy of safe water for household use. The areas are dry with poor rainfall, sources of water being man-made water pans with stagnant water collections. On the other hand, the older population that is at risk as shown could be associated with analogue concepts thus not reaching out for necessary services that can prevent exposure. These findings relate to a study conducted by Umar et al., (2018) which revealed that the level of knowledge, attitude and practices towards *S. haematobium* were critical contributors to its prevalence in the community. A study conducted in Yemen to determine the level of knowledge, attitude and practices towards schistosomiasis revealed that majority of the captured households had fair knowledge on the transmission, signs and symptoms of the disease and they also considered the disease to be harmful. However, their practices were insufficient in helping to deal with the prevention of infection of *S. haematobium* (Sady, Al-Mekhlafi, Atroosh, & Al-Delaimy, 2015).

A study conducted in Nigeria of 551 respondents reported that three-quarters of the population were aware that *S. haematobium* was a serious disease and it was essential to seek treatment to diagnose and treat the disease, however, their practices were insufficient. Additionally, 63% of the respondents had no idea of the preventive

measures to deal with the disease and their practices were inadequate (Dawaki et al., 2016).

It may be appropriate to say that knowledge visa vee practices of the community in association with prevention efforts for schistosomiasis must rhyme; they must go hand in hand, otherwise sufficient knowledge with poor social practices cannot achieve prevention nor control goals as evidently seen in this study and the cited studies elsewhere.

5.5 Conclusion

In Kwale County, there is a high prevalence (12.7%) of *S. haematobium* infection among pregnant women, posing significant public health concerns as no praziquantel (PZQ) treatment is provided during antenatal care. While the general knowledge about Schistosomiasis was adequate, low literacy levels and socioeconomic challenges hinder the effective uptake of preventive measures. Although the intensity of infection was low, allowing for potential successful prevention efforts, common practices such as bathing in the rivers and the use of untreated water contribute to the ongoing transmission. Additionally, the impact of rice farming was inconclusive, suggesting that other risk factors should be investigated.

5.6 Recommendations

1. The county government together with ministry of health to integrate routine screening and treatment for *S. haematobium* disease into antenatal care services in affected areas like Kwale County. Mass drug administration campaigns to focus more on all women of reproductive age to lower community reservoir and cut the chain of reinfection which could reduce possible infections before they conceive thus alleviate gestational burden of schistosomiasis.

2. Water, sanitation and Hygiene Initiatives (WASH) to be expanded with more focus on bilharzia high prevalent areas to increase access to clean safe water sources to the community

3. The County government with ministry of health to increase sensitization health talks with emphasis on behaviour change to the population on water hygiene practices, safe farming practices emphasising on proper use of protective personal equipment to limit exposure to new infections and reinfections.

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Matuga (Subcounty, Kenya) - Population Statistics, Charts, Map and Location

Msambweni (Subcounty, Kenya) - Population Statistics, Charts, Map and Location

Kinango (Subcounty, Kenya) - Population Statistics, Charts, Map and Location

Lunga Lunga (Subcounty, Kenya) - Population Statistics, Charts, Map and Location

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APPENDICES

Appendix I: Consent and Advise Form

CONSENT FORM FOR THE STUDY.

PREVALENCE OF S. *HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Investigators to contact:

Name	Institution	Role	Contacts
Rehema Mwachuo	GRADUATE SCHOOL, KEMRI/ JKUAT	Principal Investigator	0722791539
Phelgona A. Otieno, PhD	KEMRI	Co-Investigator	0721973971
Simon Karanja, PhD	JKUAT	Co-Investigator	0726424669

Researchers Statement: This is a study being conducted by a team from Kenya Medical Research Institute, KEMRI and GRADUATE SCHOOL/JKUAT. The purpose of this form is to give you information that you require to know before willingly accepting to participate in the study. This process is called Informed Consenting.

Why is this study being done? The magnitude of *S. haematobium* infection among pregnant women in Kenya is not known. Prevalence data is on general population and school children. There is need to quantify *S. haematobium* infection among pregnant women as it is one of the potential reservoir populations. Additionally, *S. haematobium* is known to complicate pregnancy and pregnancy outcome thus in this endemic area it will be of great benefit to know how heavy the burden of the disease is among pregnant women so that adequate measures can be implemented to prevent possible impact on the mother and her unborn baby.

Knowledge, attitude, cultural practices and individuals' behavior among *S. haematobium* infected women is associated with literacy levels and socio-economic status. Relevant data on KAP towards *S. haematobium* infection among pregnant women will provide a guide to preventive and control measures for *S. haematobium* in Kwale County. Generally, the study outcome could necessitate routine screening for *S. haematobium* among ANC attending mothers in endemic areas.

What will happen if I take part in this part of the study? If you qualify by the stipulated screening assessment, you can be enrolled in the study. The following procedures will be performed on you.

We will ask you several questions to gather information on your socio demographic information as well as obstetric history.

A Physical examination will be done.

Pregnancy test

The following specimens will be collected:

Urine: 20mls of fresh urine

ALL THESE TESTS WILL BE DONE ONLY ONCE.

How long will I take in the study? You will be seen only once during the study. However, if the test results reveal anything that needs attention, we will refer you appropriately. The interview and procedures may take about 1 hour.

How many people are taking part in the study? A total of 368 pregnant women will be enrolled in the study.

Can I stop or refuse to participate? Yes, participation is voluntary, and you can refuse to participate or even stop in the middle if you do not feel comfortable. There will be no punitive actions taken against you for this.

WHAT risks do I expect from the screening procedures? There are no risks expected in this study. However, subjects could be uncomfortable spending their precious time with the study team and might opt to leave before the intended goal is achieved. To overcome this challenge, subjects will be reassured and at the end of the procedures they shall be compensated with their fare back home.

Are there benefits in participation? Yes, we may be able to detect health problems in you and your pregnancy that would otherwise have not been noted before. We will refer you for proper health care as appropriate and free consultation advice.

What other choices do I have? You do not have to participate in the study. You could go straight for medical care in the regular clinics.

Will my medical information be kept private? Yes, all information we obtain will be kept confidential. However, if we need to refer you for further care, we will perform due diligence to disclose the relevant medical details that may help in further care.

What is the cost of taking part in the study? You will be reimbursed for travel to the study site, but no additional money or supplies will be provided to you. You will not be required to pay anything for participation.

Who can answer my questions about the study? You can contact the researchers about concerns or complaints you have on the numbers given below.

The Principal Investigator is Rehema Mwachuo. Contact her on 0722791539. On matters concerning your rights as a participant you may contact the KEMRI ETHICS REVIEW COMMITTEE (ERC), P.O. BOX 54840-00200, NAIROBI. Telephone number; 020-272254 EX 3331 0722205901, 0733400003; E-mail address: ERCAdmin@kemri.org, Mobile Number: 0717719477

A copy of this form will be given to you. Do you have any questions?

Participants' statement:

My rights have been explained to me. I have had a chance to ask questions.

If you accept to participate in the study please sign below.

I consent to participate in the study.

Yes ____________________ Date: ________________________________

No______________________ Date: ________________________________

Given by: _____________________________ _____________________________

(Name of participant) (Signature of participant) (Date)

Administered by: _______________________ ___________________________

(Name of project staff) (Signature) (Date)

Witnessed by ______________________________ _______________________

(Name of witness) (Signature) (Date)

Appendix IA: (Kiswahili)

FOMU YA RIDHAA

PREVALENCE OF *S. HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Watafiti unaweza wasiliana:

Name	Institution	Role	Contacts
Rehema Mwachuo	ITROMID/JKUAT	Principal Investigator	0722791539
Phelgona A. Otieno, PhD	KEMRI	Co-Investigator	0721973971

Simon Karanja, PhD	JKUAT	Co-Investigator	0726424669

Taarifa ya mtafiti: Hili ni somo la utafiti linafanywa na kikundi kutoka Kenya Medical Research Institute, ITROMID/JKUAT. Umuhimu wa hii fomu nikupeana maelezo unayohitaji kujua kabla kukubali kwa ridhaa yako kuhusika katika huu utafiti. Utaratibu huu unaitwa ridhaa ya ufahamu.

Ridhaa ya ufahamu

Ni kwanini huu utafiti unafanywa? KIwango cha kichocho kati ya kina mama wajawazito Kenya hakijulikani. Uwepo wa kichocho kwa rekodi nikuhusu idadi ya watu wote kwa jumla na watoto wa shule. Kunamuhimu kujua wingi wa kichocho kwa mama wajawazito kwa sababu wanaouwezo wa kuvibeba vidudu vya kichocho. Zaidi kichocho kinajulikana kusababisha shida zakiafya zaidi namatokeo ya ujauzito na kwahivyo katika hili eneo lililojaa kichocho itakuwa manufaa makubwa kujua uzito wa hii shida kwa mama wajawazito ili njia zinazofaa ziweze kuchukuliwa kuzuia uwezekano wa kuathiri mama na motto tumboni.

Ujuzi, tabia na matendo ya kiasili katika jamii kati ya wajawazito inahusishwa na viwango vya elimu na hali ya uchumi. Maelezo ya muhimu yanayohusu ujuzi,tabia na matendo ya mama wajawazito juu ya kichocho yatatoa mwelekezo katika kuzuia na kuondoa kichocho katika kaunti ya Kwale.

Ni nini kitafanyika nikihusika kwenye huu utafiti? Ukifaulu katika vipimo vya mchujo wa kuingia, unawezakuingizwa kwenye utafiti. Utapimwa vipimo vifuatavyo.

Tutakuuliza maswali mengi tujue maelezo ya kibinafsi na hstoria ya uzazi.

Utapimwa mwili

Mkojo utapimwa vidudu vya kichocho

Utapimwa mimba

Sampuli kidogo ya mkojo itachukuliwa kama milimita 20mls

Vipimovyote vitafanyika mara moja tu

Nitachukua mda gani kwenye utafiti? Utaonekana mara moja tu. Ijapokua iwapo matokeo yatadhihirisha kituchochote kihitajicho kuangaziwa tutakutuma kwa matibabu ifaayo.

Maswali pamoja na vipimo vitakavyofanywa vita chukua kama saa moja tu.

Ni watu wangapi wanahusika katika huu utafiti?

Jumla ya mama wajawazito 368 watachukuliwa kwa huu utafiti.

Naweza kuacha ama kukataa kuhusika? Ndio, kuhusika ni kwa ridhaa yako na unawezakukataa ama kuacha katikati kamahujisikii raha.hakutakuwa na kutuhumiwa juu hii.

Ni athari gani ninatarajia kutokana na vipimo vya mkojo? Hakuna athari zozote lakini muhusika anaweza asijisikie raha kutumia wakati wake muhimu na watafiti na anawezaamua kuondoka kabla tamati ya matarajio kupatikana. Kuthibiti changamoto hizi wahusika wataliwazwa na mwisho wa utaratibu watalipizwa na tikiti ya usafiri wa nyumbani.

Kuna manufaa kuhusika? Ndio. Tunawezakutambua matatizo ya afya yako na ya mimba ambayo hayangeweza kujulikana mbeleni.Tutakutuma kwa matibabu ya faayo iwezekanavyo nakupewa mawaidha ya bure.

Ni chaguo gani lengine nikonalo? Huna lazima yakuhusika kwenye utafiti. Unawezakuenda kwa matibabu kwenye kiliniki za kawaida moja kwa moja.

Maelezo ya matibabu yangu yatawekwa siri? Ndio maelezo yote tupatayo itawekwa siri. Ijapokuwa ikiwakunamuhimu wa kukutuma kwa kwa matibabu zaidi tutafanya usawa wakufunua maelezo muhimu ya matibabu yanayoweza kusaidia katika matibabu zaidi.

Ni gharama kiasi gani kuhusika kwenye huu utafiti? Utarudishiwa pesa za matumizi ya kusafiri kuja na kurudi kutoka kwa kituo cha utafiti.

Ni nani anawezakujibu maswali yangu kuhusu huu utafiti? Unawezakuwasiliana na watafiti kuhusu mambo uyaonayo ya dhati au malalamiko ulionayo kupitia nambari zilizopo chini.

Mtafiti mkuu ni Rehema mwachuo. Mpigie nambari 0722791539. Kuhusiana na haki zako kama muhusishwa kwenye utafiti, pigia KEMRI ETHICS REVIEW COMMITTEE (ERC), P.O. BOX 54840-00200, NAIROBI. Nambari ya simu; 020-272254 EX 3331 0722205901, 0733400003; Barua pepe: ERCAdmin@kemri.org, Simu ya rununu: 0717719477

Utapewa copi ya fomu hii.

Una swali lolote?

Maelezo ya muhusika

Haki yangu nimeelezewa. Nimepata fursa ya kuuliza maswali

Kama unakubalikuhusika kwenye utafiti tafadhali weka sahihi hapo chini.

Ninaridhikakuhusika kwenye utafiti.

Ndio ________________________________Tarehe____________________________

La__________________________________Tarehe___________________________

Imepewa na ________________________ Tarehe______________________________

Jina la muhusika_________________Sahihi _________________Tarehe_________

Shahidi ___________________Sahihi__________________Tarehe______________

Appendix IB: Back Translation of Consent

CONSENT FORM

PREVALENCE OF *S. HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Watafiti unaweza wasiliana: investigators you can contact

Name	Institution	Role	Contacts
Rehema Mwachuo	ITROMID/JKUAT	Principal Investigator	0722791539
Phelgona A. Otieno, PhD	KEMRI	Co-Investigator	0721973971
Simon Karanja, PhD	JKUAT	Co-Investigator	0726424669

Investigator's statement: This is a study being done by a group from Kenya Medical Research, ITROMID/JKUAT. Importance of this form is to give information you need to know before accepting to take part in this study. This process is called consent of knowledge.

Informed consent

Why is this study being done? Level of bilharzia among pregnant mothers in Kenya is not known. Presence of bilharzia in record is on the general population and school children. There is need to know the amount of bilharzia among pregnant women because they have the ability to carry the insects that cause bilharzia. More, bilharzia is known to cause health problems and pregnancy outcome and so in this area full of bilharzia, it will be a great benefit to know the weight of the problem so that correct measures can be taken to prevent possibilities of any effects to the mother and unborn baby.

Knowledge, attitude and cultural practices among pregnant mothers is associated with education levels and economic status. Important information about knowledge,

attitude and practice among pregnant mothers on bilharzia will produce guidance in preventing and removing bilharzia in Kwale County.

What will happen if I participate in this study?

If you succeed in the grading of screening for recruitment you can be included in the study.

You will be examined for the following

We will ask you many questions to know your personal information and history of delivery.

will be examined physically

Urine will be examined for bilharzia.

You will be examined pregnancy

A small sample of urine will be taken about 20mls

All tests will be done once

How long will I take in the study? You will be seen once only. Even though if the results show anything that needs attention, we will send you for appropriate health care.

How many people are in this study?

A total of 368 pregnant mothers.

Can I stop or refuse to participate?

Yes, participation is your consent and you can refuse or stop in the middle if you do not feel like and there will be no victimization against you.

What danger do I expect from screening examinations? There is no danger but the participant may not feel happy spending her time with investigators and might opt to leave before the end for expected outcome. To overcome these challenges participants will be reassured and at the end of the process they will be compensated with their fare back home.

Is there any benefit in participating? Yes. we can identify health issues for you and your pregnancy which would not have been otherwise. We will refer you for appropriate care as necessary and you will receive free advice.

What other choice do I have? There is no force in your participation. You can go for care anywhere else directly.

Will the information on my health be kept secretly? All the information we get will be kept secretly. However, if there is need to refer you, we will be forced to give only the required information for your treatment.

What is the cost of participation? You will be refunded your fare back home.

Who can answerer my questions on the study? You can contact the study group for any serious issues using numbers below.

The Principal Investigator is Rehema Mwachuo. Contact her on 0722791539. On matters concerning your rights as a participant you may contact the KEMRI ETHICS REVIEW COMMITTEE (ERC), P.O. BOX 54840-00200, NAIROBI. Telephone number; 020-272254 EX 3331 0722205901, 0733400003; E-mail address: ERCAdmin@kemri.org, Mobile Number: 0717719477

You will be given a copy of this form.

Any question?

Information of participant

My rights have been explained to me. I have had a chance to ask questions.

If you agree to participate in this study sign below.

.I am satisfied to join the study.

Yes ________________________________Date_______________________________

No ________________________________Date_______________________________

Given by _____________________________Date______________________________

Name of participant_____________________Sign_______________Date_________

Witness________________________________Sign______________Date________

Appendix IC: Consent Form for the Questionnaire for IDIs in the Study

PREVALENCE OF *S. HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Investigators to contact:

Name	Institution	Role	Contacts
Rehema Mwachuo	ITROMID/JKUAT	Principal Investigator	0722791539
Phelgona A. Otieno, PhD	KEMRI	Co-Investigator	0721973971
Simon Karanja, PhD	JKUAT	Co-Investigator	0726424669

Researchers Statement: This is a study being conducted by a team from Kenya Medical Research Institute, ITROMID/JKUAT. The purpose of this form is to give you information that you require to know before willingly accepting to participate in this sub section of the study. This process is called Informed Consent for IDIs.

Why is this section of the study being done? As it is necessary to quantify the schisto infection among pregnant women in this study area, it is additionally important to do In Depth Interview among the subjects so as to understand in detail the knowledge the people have on this problem, way of belief and behavior of the population that can bring down on raise up the quantities of the infection in the community. This section of the study will help the investigators understand the level of awareness on this subject among the population.

Knowledge, attitude, cultural practices and individuals' behavior among *S.haematobium* infected women is associated with literacy levels, as shown in a Nigerian KAP study, and socio economic status. Relevant data on KAP towards *S. haematobium* infection among pregnant women will provide a guide to preventive and control measures for *S. haematobium* in Kwale Coumty . Generally, the study outcome could necessitate routine screening for *S.haematobium* infected antenatal mothers in

endemic areas, introduce awareness measures and follow up of those infected with schistosomiasis after delivery.

What will happen if I take part in this part of the study? If you qualify by the stipulated recruitment requirements, you can be enrolled in this part of the study. The following procedure will be performed if you agree;

We will ask you several questions to gather information on your socio demographic information as well as obstetric history.

How long will I take in this part of the study? The interview process will take 15 minutes.

How many people are taking part in the study? 10 selected pregnant women will be enrolled in this part of the study.

Can I stop or refuse to participate? Yes, participation is voluntary and you can refuse to participate or even stop in the middle if you do not feel comfortable. There will be no punitive actions taken against you for this.

What risks do I expect from this interview process? There are no risks expected in this part of study. However, subjects could be uncomfortable spending their precious time with the study team and might opt to leave before the intended goal is achieved. To overcome this challenge, subjects will be reassured and at the end of the procedures they shall be compensated with their fair back home.

Are there benefits in participation? Yes, we will give you free awareness talk on prevention and control of bilharzia infection.

What other choices do I have? You do not have to participate in this section of the study. You could leave as soon as the first procedures of the study are completed.

Will my medical information be kept private? Yes, all information we obtain will be kept confidential. However, if we need to refer you for further care, we will perform due diligence to disclose the relevant medical details that may help in further care.

What is the cost of taking part in this part of the study? You will be reimbursed for travel to the study site, but no additional money or supplies will be provided to you. You will also not be required to pay anything for participation.

Who can answer my questions about this section of the study? You can contact the researchers about concerns or complaints you have on the numbers given below.

The Principal Investigator is Rehema Mwachuo. Contact her on 0722791539. On matters concerning your rights as a participant you may contact the KEMRI ETHICS REVIEW COMMITTEE (ERC), P.O. BOX 54840-00200, NAIROBI. Telephone number; 020-272254 EX 3331 0722205901, 0733400003; E-mail address: ERCAdmin@kemri.org, Mobile Number: 0717719477

Do you have any questions?

Participants' statement:

My rights have been explained to me. I have had a chance to ask questions.

If you accept to participate in this section of the study please sign below.

I consent to participate in the sub section of the study.

Yes ______________________Date: _______________________________________

No________________________Date: ____

Given by: _____________________________ _____________________________

(Name of participant) (Signature of participant) (Date)

Administered by: _______________________ ____________________________

(Name of project staff) (Signature) (Date)

Witnessed by _______________________________ _______________________

(Name of witness) (Signature) (Date)

A copy of this form will be given to you

Appendix ID: (Kiswahili Version)

FOMU YA RIDHAA KWA SEHEMU YA MASWALI KWENYE MAZUNGUMZO YA KINDANI KATIKA UTAFITI;

UWEPO WA KICHOCHO KATIKA MAMA WAJAWAZITO KATIKA KAUNTI YA KWALE; UJUZI, TABIA NA VITENDO JUU YA MAAMBUKIZI YA KICHOCHO.

Watafiti unaweza wasiliana:

Name	Institution	Role	Contacts
Rehema Mwachuo	ITROMID/JKUAT	Principal Investigator	0722791539
Phelgona A. Otieno, PhD	KEMRI	Co-Investigator	0721973971
Simon Karanja, PhD	JKUAT	Co-Investigator	0726424669

Taarifa ya mtafiti: Hili ni somo la utafiti linafanywa na kikundi kutoka Kenya Medical Research Institute, ITROMID/JKUAT. Umuhimu wa hii fomu nikukupatia maelezo unayohitaji kujua kabla kukubali kwa ridhaa yako kuhusika katika sehemu hii ndogo ya utafiti. Utaratibu huu unaitwa ridhaa ya ufahamu katika sehemu ya mwaswali kwenye majadiliano ya kindani.

Ridhaa ya ufahamu kwenye maswali ya majadiliano ya kindani

Ni kwanini hii sehemu ya utafiti inafanywa? Kama ilivyo muhimu kujua wingi wa kichocho kati ya mama wajawazito katika eneo hili la utafiti, ni muhimu zaidi kufanya maswali ya majadiliano ya kina/ ndani kati ya wahusika ilikuelewa kwakirefu uelewi ulio na watu hawa kuhusu hii shida, Njia za imani na vitendo vyao kwa jamii vinavyoweza kuzidisha ama kupunguza idadi ya maambukizi katika jamii.Hii sehemu

ya utafitiitasaidia watafiti kuelewa kiwango cha uhamasisho katika hili somo kwenye jamii hii ya utafiti. Kwajumla huu utafiti matokeo ya huu utafiti yanaweza kuhimiza uchunguzi uchunguzi wa kawaida wa kichocho kati ya mama wajawazito katika maeneo yaliyoathirika, anzisha zoezi la uhamasisho na kufuatilia wale walio athirika katika maeneo yaliyoathirika na maambukizi ya kichocho baada ya kujifungua.

Ujuzi, tabia na matendo ya kiasili katika jamii kati ya wajawazito inahusishwa na viwango vya elimu na hali ya uchumi , kama ilivyojiri katika utafiti nchini nigeria. Maelezo ya muhimu yanayohusu ujuzi, tabia na matendo ya mama wajawazito juu ya kichocho yatatoa mwelekezo katika kuzuia na kuondoa kichocho katika kaunti ya Kwale.

Ni nini kitafanyika nikihusika kwenye huu utafiti? Ukifaulu katika viwango vya mchujo wa kuingia, unawezakuingizwa kwenye sehemu hii ya utafiti. Ukikubali utafanyiwa yanayojiri; tutakuulizamaswali kuhusu wewemweye yakibinafsi kisha mengine ya ujauzito na historia ya uzazi wako.

Nitachukua mda gani kwenye utafiti? Tutachukua dakika kumi na tano tuu kujadiliana.

Ni watu wangapi wanahusika katikasehemu hii ya utafiti?

Mama wajawazito 10 watachukuliwa kwa hii sehemu ya utafiti.

Naweza kuacha ama kukataa kuhusika? Ndio, kuhusika ni kwa ridhaa yako na unawezakukataa ama kuacha katikati kamahujisikii raha.hakutakuwa na kutuhumiwa juu ya hii.

Ni athari gani ninatarajia kwenye majadiliano haya ya kina? Hakuna athari zozote lakini muhusika anaweza asijisikie raha kutumia wakati wake muhimu na watafiti na anawezaamua kuondoka kabla tamati ya matarajio kupatikana. Kuthibiti changamoto hizi wahusika wataliwazwa na mwisho wa utaratibu watalipizwa na tikiti ya usafiri wa nyumbani.

Kuna manufaa kuhusika? Ndio. Tutakupatia mawaidha ya bure kuhusu kuzuia na kuthibiti maambukizi ya kichocho

Ni chaguo gani lengine nikonalo? Huna lazima yakuhusika kwenye utafiti. Unawezakuondoka tuu baada ya vipimo vya awali kumalizika.

Maelezo ya matibabu yangu yatawekwa siri? Ndio maelezo yote tupatayo itawekwa siri. Ijapokuwa ikiwakunamuhimu wa kukutuma kwa kwa matibabu zaidi tutafanya usawa wakufunua maelezo muhimu ya matibabu yanayoweza kusaidia katika matibabu zaidi.

Ni gharama kiasi gani kuhusika kwenye huu utafiti? Utarudishiwa pesa za matumizi ya kusafiri kuja na kurudi kutoka kwa kituo cha utafiti.

Ni nani anawezakujibu maswali yangu kuhusu huu utafiti? Unawezakuwasiliana na watafiti kuhusu mambo uyaonayo ya dhati au malalamiko ulionayo kupitia nambari zilizopo chini.

The Principal Investigator is Rehema mwachuo. Contact her on 0722791539. On matters concerning your rights as a participant you may contact the KEMRI ETHICS REVIEW COMMITTEE (ERC), P.O. BOX 54840-00200, NAIROBI. Telephone number; 020-272254 EX 3331 0722205901, 0733400003; E-mail address: ERCAdmin@kemri.org, Mobile Number: 0717719477

Utapewa copi ya fomu hii.

Una swali lolote?

Maelezo ya muhusika

Haki yangu nimeelezewa. Nimepata fursa ya kuuliza maswali

Kama unakubalikuhusika kwenye utafiti tafadhali weka sahihi hapo chini.

Ninaridhikakuhusika kwenye utafiti.

Ndio

________________________________Tarehe_____________________________

La______________________________Tarehe____________________________

Imepewa na________________________Tarehe_____________________

Jina la muhusika________________Sahihi ____________________Tarehe_________

Shahidi ___________________Sahihi_________________Tarehe________________

Appendix II: Questionnaire

QUESTIONNAIRE FOR THE STUDY PREVALENCE OF *S. HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTO-SOMIASIS IN KWALE COUNTY

Introduction

This questionnaire is a tool designed to collect all the necessary information required in this study. The study participant will be asked questions by the study assistant and PI as written on this form. Given answers will be ticked as appropriate

Section 1- Socio-demography

REGISTRATION NO……………………………………………………………………

Date……………………………………………………………………………………

1.Age…………………………..…………………………………………………………

Tick as appropriate

Please Tick with a pencil the selected answer

2. Marital status…

a. Single

b. Married

c. Divorced

d. Widowed

3. Parity

1. How many live births?

2. How many miscarriages?

3. How many dead and at what age?

4. Level of education…

a. Primary

a. Secondary

b. College

c. University

5. Type of occupation…………………………………………………………

6. Residence……………………………………………………………………

7. Religion

a. Muslim

b. Christian

c. Other
specify…………………………………………………………………………

Section 11- Knowledge/attitude

1. What do you think bilharzia is?

a. Sickness or disease

b. Normal health

2. What do you think can cause bilharzias?

a. Water

b. Water insects/parasites

c. Witchcraft

d. Not known

3. How does a person get bilharzias?

a. Drinking or washing with insects/ parasite infested water

b. Sexual contact with infected partner

c. Not known

d. When bewitched

4. Who can get bilharzia?

a. Anybody

b. Some people

c. Those bewitched

d. Even myself

5. Can you get bilharzia?

Yes No

6. How would you know you have bilharzia?

a. Passing blood in urine

b. Not known

c. Pain in the private parts

b. Headache

7. Do you think you have bilharzia? Yes No

Explain…………………………………………………………………………
……………………………………………………………..………………….

8. Is there any need to know about bilharzia?

Yes No

9. Is bilharzia a disease? YES NO

10. If yes does bilharzia require treatment?

Yes No

11. Can you prevent bilharzia?

Yes No

12. If you can, how would you prevent bilharzia?

13. If not, why do you think so?

14. In your community, where do people seek cure if they are thought or known to have bilharzia? Explain……..……………………………………………………………….

PRACTICE

1. Do you bath in the river?

YES

NO

2. Do you pass urine in the river as you bath? …

YES

NO

3. How far is your nearest source of water? (Estimate by the time one leaves home to fetch a bucket of water for home use without doing anything else at the fetching point and no waiting time).

4. Explain activities which you normally do at the water source point; bathing, washing clothes, swimming and any other? Whether you fetch and use water away from the source or stand/ sit in the river/pond or lake as you use water.

5. Explain activities which you normally do at the water source point; bathing, washing clothes, swimming and any other? Whether you fetch and use water away from the source or stand/ sit in the river/pond or lake as you use water.

Section 111-Socio economic

1. What is your source of water for home use?

Please tick as appropriate

a. Tap

b. River

c. Bore hole

d. Water pan

2. Do you use a toilet at your homestead?

Yes

No

3. If not why? …………………………………………………………………………………...……

Open answer questions

4. About how many people use one toilet/ pit latrine? ....

5. Do you live in a thatched hut or iron roofed house?

6. How many rooms does the house you leave in have?

7. Where is the Kitchen housed?

a. In the same house we sleep in

b. Outside in another house/hut

8. What is the source of light at home?

a. electricity

b. open fire light

c. solar

d. Other, specify…………………………………………………………………

9. What is the source of fuel used for cooking?

a. firewood

b. charcoal

c. electricity

d. gas

e. kerosene

f. other…

Specify………………………………………………………………………………

10. What do you grow on your farm, if any?...

11. What is your source of food at home?...

12. Do your kids go to school, if any?...

13. If they don’t, why? Explain………………………………………………………………………………

Appendix IIA: Translation of Questionare for the Study, Prevalence of *S. haematobium* among Pregnant Mothers in Kwale County

KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS

FROM ENGLISH INTO KISWAHILI

Sehemu ya kwanza- maelezo ya mambo ya kibinafsi

REGISTRATION NO……………………………………………………………….

NAMBARI YA USAJILI…………………………………………………………...

Date……………………………TAREHE……………………………………………

1. Age…………………………UMRI…………………………………………

Jaza bokisi kamauonavyo ni sahihi- tafadhali tumia kalamu ya makaa kujazia

2. Hali ya kinyumba

a. Upekeako?

b. Umeolewa?

c. Umetalakiwa?

d. ‘umjane?

3. Hali ya uzazi (peana jawabu uonalo ni sahihi)

1. Umezaa mara ngapi? ………………………………

2. Watoto wangapi ulizaa wakiwa hai?..

3. Mimba ngapi zimetoka kabla wakati mwafaka wakuzali-wa?...........................

4. Watoto wangapi wamekufa na wakiwa umri gani?....................................

5. Kiwango cha elimu

a. Shule ya msingi

b. Shule ya secondary

c. Chuo cha mafunzo ya kazi

d. Chuo kikuu

6. Type of occupation………………………………………………………..………………
KAZI……………………………………………………………………………………

7. Residence………………………………………...
MAKAZI…………………………………………………………………………………

8. Dini yako a. muislamu b. mkristo c. Dini ya kinyumbani/ kiasili d. Nyingine yoyote………eleza………………………………………………………………………

Sehemu ya pili- maswali ya ufahamu na tabia

1. What do you think bilharzia is…………………………………UNAFIKIRI KICHOCHO NI NINI?

a. Ni ugonjwa

b. Ni afya ya kawaida

2. What do you think causes bilharzias? NINI UNADHANI HUSABABISHA KICHOCHO?

a. Maji yoyote

b. Maji yenye na wadudu ama vidudu vya kichocho

c. Uchawi

d. Haijulikani

3. How does a person get bilharzia…UNADHANI KICHOCHO HUSHIKA MTU VIPI?

a. Kunywa maji au kuoga kwa maji yenye wadudu ama vidudu vya kichocho

b. Kuonana kimwili na mpenzi mwenye vidudu vya kichocho

c. Haijulikani

d. Ukirogwa

4. Who can get bilharzia…NANI AWEZA KUPATA KICHOCHO?

a. Mtu yeyote

b. Watu wengine

c. Wenyekurogwa

d. Hata mimi mwenyewe

5. Do you think you can get bilharzia…UNAFIKIRI UNAWEZA KUSHIKWA NA KICHOCHO?

Ndio

La

6. How would you know you have bilharzia...UTAJUAJE UNA KICHOCHO?

a. Kukojoa mikojoo yenye damu

b. Haijulikani

c. Uchungu kwenye sehemu za siri

D. Kuumwa na kichwa

1. Do you think you have bilharzias? Yes No …….
UNAFIKIRI UNA KICHOCHO?... NDIO LA

2. Is there any need to know about bilharzia? KUNA HAJA YA KUJUA JUU YA KICHOCHO?

Ndio La

3. Is bilharzia a disease YES NO

JE KICHOCHO NI UGONJWA? NDIO LA

4. If yes, does bilharzia require treatment…...? KAMA NDIO, KICHOCHO CHAHITAJI KUTIBIWA?

Ndio La

5. Can you prevent bilharzia? JE WAWEZA KUZUIA KICHOCHO?

Ndio La

6. KAMA INAWEZEKANA, VIPI UNAWEZA KUZUIA KICHOCHO?

……………………………………………………………………………........................

7. KAMAHAIWEZEKANI, UNAFIKIRI NI KWA NINI?

…………………………………………………………………….................................

8. In your community, where do people seek cure if they are thought or known to have bilharzia? Explain……………………………………………………………………………….

VITENDO

6. Do you bath in the river? ………… WEWE HUOGA MTONI? ………

YES NDIO

NO LA

7. Do you pass urine in the river as you bath? …… UNAKOJOA MTONI UNAPO OGA?

YES NDIO

NO LA

8. NI UMBALI ULIOJE KUTOKA NYUMBANI HADI MTONI?

REFUSHA KIASI NA MDA WA KUTOKA HADI KURUDI BILA KUFANYA CHOCHOTE KWA MTO………………………………………………………………………

9. VITENDO GANI UNAFANYIA NDANI YA MAJI? ORODHESHA………………………

10. UNACHOTA MAJI NAKUTUMIA NJE YA MTO? NDIO LA

SEHEMU YA TATU- HALI YA KIJAMII NA KIUCHUMI

CHAGUA IKUPASAVYO

1. What is your source of water for home use? ….UNATOA WAPI MAJI YA KUTUMIA NYUMBANI? ……………………………………………..…………….

a. Tap …… MFEREJI

b. River………… MTONI

c. Well…………… KISIMA

d. Water pan……. MTSARA

2. Do you use a toilet/pit latrine at your homestead? Yes / No UNATUMIA CHOO NYUMBANI KWENU? NDIO LA

3. If not why? IKIWA LA, KWANINI?..

4. About how many people use one toilet/ pit latrine? KAMA WATU WANGAPI HU-TUMIA CHOO KIMOJA?…………………………………………………………

5. Do you live in a thatched hurt or iron roofed house?................UNAISHI NYUMBA YA a. MAKUTI/NYASI AU b. YA MABATI?

6. How many rooms does the house you leave in have...NYUMBA UISHIYO INA VYUMBA VINGAPI? a. o b.1 c. 2 d. zaidi ya mbili

7. Where is the Kitchen housed?

a. In the same house we sleep in

b. Outside in another house/hut

8. What is the source of light at home at night?...MWANGAZA UNAPATA KUTOKANA NA NINI USIKU? a. Umeme b. mafuta ya taa b. mwangaza wa moto wa kuni c. ingineyo. Eleza zaidi……………………………………….……………...

9. What is the source of fuel used for cooking? MNATUMIA MOTO GANI KUPIKIA?

a. KUNI

b. MAKAA

c. STIMA

d. GESI

e. MAFUTA YA TAA

10. MNALIMA NINI NYUMBANI?

11. CHAKULA CHA NYUMBANI MNAPATA WAPI?

12. WATOTO WANAENDA SHULE? (KAMA UKONAO)

13. KAMA HAWAENDI NI KWA NINI?

Appendix III: Key Informant Interview Guide

Introduction of the Project:

This study intends to determine the prevalence of *S.haematobium* and asses the level of knowledge, kind of attitude and practices of the people that could influence bilharzias among pregnant mothers in Kwale County: The information you provide below is about the population within your area of service.

Kindly, Complete the form as you find appropriate.

Initials................ Age..

1. Profession...
2. Level of education................................. College ☐ University ☐
3. Study area (Sub County) ....Study area (actual Health facility code number) ....
4. Date ....

1) Is *S.haematobium* a common problem among the population in your catchment area where you work?

Yes (1) No (2)

2) How would you rank *S.haematobium* as a public health concern among the population within your area of service?

High (1) low (2) medium (3)

……………………………………………………………………………………
……….

3) Is there anything that is being done to address the problem currently and is there anything else that can be done to address this problem further?

Describe

……………………………………………………………………………………

4) What could be the factors influencing bilharzias infection among the community you serve?

Describe

……………………………………………………………………………………

5) What role do you play in the preventive efforts? If any**.**

Explain...
....

6) Is there any program by whichever organisation e.g. government, NGOs etc, that particularly focuses on *S,haematobium* infection among the population around? And if yes, do you think the people have benefited from this program?

Briefly,
explain...

How is the toilet use coverage in this area? What measures are you taking as health personnel in the area you serve that ensures proper refuse/human

waste disposal? How do the people respond or feel about poor usage of toilet in their homes?

....

7) What is the common source of water for domestic use for people in the community you serve?..
8) How do the people respond to infections like bilharzias in this area and what is their contribution to control and prevention of bilharzias cases in the community?

Is your health facility easily accessible to all people you offer services to and are your services affordable to the people within your area of service?

Explain…………………………………………………………………….

9) Is treatment for *S.haematobiunm* infection available to all patients when they require it?

Yes ☐ No ☐

Explain

....

....

10) What are the main 1. sources of income, 2. socio economic activities and 3 professional activities carried out commonly here by the women (if any)?

....

11) How do you rate the literacy levels among women in this area (Generally)?

1. High 2. Low 3. Average

Appendix IV: Ethical Approval Letters

KWALE COUNTY

DEPARTMENT OF HEALTH

Telephone No.0202107065
Fax:
Email: kwalehealthdirector13@gmail.com

Ref: CG/KWL/6/30/VOL.1/20

OFFICE OF THE COUNTY COORDINATOR FOR HEALTH
P.O. BOX 200
KWALE

Date: 9th May, 2016

REHEMA O. MWACHUO – TM 306-0965/2012
ITROMID/JKUAT/KEMRI
NAIROBI

RE: AUTHORITY TO CONDUCT RESEARCH

The above named student from Institute of Tropical Medicine and Infectious diseases, KEMRI, is hereby authorized to carry out research in Prevalence of S. Haematobium among pregnant women; KAP towards Schistosomiasis in Kwale County.

The research period is from February 2016 (time of arrival to the County) to September 7th 2016 as per the letter from Scientific and Ethics Review Unit, KEMRI dated 8th, September 2015 for protocol NO. 3016.

Please accord her the necessary assistance.
On completion submit a copy of your research findings to our office.

Dr. Hajara EL-Busaidy
County Director of Health
Kwale

CC

CEC – Health
Kwale

All Sub County MOH

THE PRESIDENCY

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telegrams: "DISTRICTER",..............................
Telephone: ....
E-mail...
When replying please quote
Ref. No. ....
and date

OFFICE OF THE CHIEF
......W/A A......... LOCATION
P.O. Box ...1........................
...MATUGA...............
3rd / MARCH / 2016.

TO WHOM IT MAY CONCERN

Dear Sir/Madam

REF: INTRODUCTION LETTER
REHEMA MWACHUO ID/NO 10768932

I Confirm that the above Stated Person is a resident of Kwale County, Matuga Sub County and a Student persuing a Master's Degree in Medical epidemiology.

Kindly assist her as she Conduct her medical research to our local Communities.

Thank you

Your's faithfully

CHIEF
W/A LOCATION

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel: (254) (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax: (254) (020) 2720030
E-mail: director@kemri.org, info@kemri.org, Website. www.kemri.org

KEMRI/RES/7/3/1 **November 08, 2017**

TO: **REHEMA MWACHUO,**
PRINCIPAL INVESTIGATOR

THROUGH: **THE DIRECTOR, CCR,**
NAIROBI.

13/11/2017

Dear Madam,

RE: SERU 3016: (*REQUEST FOR ANNUAL RENEWAL*): PREVALENCE OF HAEMATOBIUM AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Thank you for the continuing review report for the period **November 08, 2016** to **October 10, 2017.**

This is to inform you that the expedited review team of the KEMRI Scientific and Ethics Review Unit (SERU) was of the informed opinion that the progress made during the reported period is satisfactory. The study has therefore been granted **approval**.

This approval is valid from **November 08, 2017** through to **November 07, 2018**. Please note that authorization to conduct this study will automatically expire on **November 07, 2018**. If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the SERU by **September 26, 2018.**

You are required to submit any amendments to this protocol and any other information pertinent to human participation in this study to the SERU for review prior to initiation.

You may continue with the study.

Yours faithfully,

DR. MERCY KARIMI NJERU
ACTING HEAD,
KEMRI SCIENTIFIC AND ETHICS REVIEW UNIT

14 NOV 2018

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel:(254) (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax: (254) (020) 2720030
E-mail: director@kemri.org, info@kemri.org, Website.www.kemri.org

KEMRI/RES/7/3/1

November 08, 2018

TO: **REHEMA MWACHUO,**
PRINCIPAL INVESTIGATOR

THROUGH: **THE DIRECTOR, CCR,**
NAIROBI

Dear Madam,

RE: **SERU PROTOCOL NO. 3016 (*REQUEST FOR ANNUAL RENEWAL*): PREVALENCE OF HAEMATOBIUM AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS**

Thank you for the continuing review report for the period **November 08, 2017** to **September 26, 2018**

This is to inform you that the expedited review team of the KEMRI Scientific and Ethics Review Unit (SERU) was of the informed opinion that the progress made during the reported period is satisfactory. The study has therefore been granted **approval**.

This approval is valid from **November 08, 2018** through to **November 07, 2019**. Please note that authorization to conduct this study will automatically expire on **November 07, 2019**. If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the SERU by **September 26, 2019.**

You are required to submit any amendments to this protocol and any other information pertinent to human participation in this study to the SERU for review prior to initiation.

You may continue with the study.

Yours faithfully,

ENOCK KEBENEI
ACTING HEAD,
KEMRI SCIENTIFIC AND ETHICS REVIEW UNIT

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel: (254) (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax: (254) (020) 2720030
E-mail: director@kemri.org, info@kemri.org, Website. www.kemri.org

KEMRI/RES/7/3/1 **November 9, 2016**

TO: **REHEMA MWACHUO,**
PRINCIPAL INVESTIGATOR

THROUGH: **ACTING DIRECTOR, CCR,** forwarded. 11/11/2016.
NAIROBI

Dear Madam,

RE: SSC PROTOCOL NO. 3016 (*REQUEST FOR ANNUAL RENEWAL AND DEVIATION*): PREVALENCE OF *S. HAEMATOBIUM* AMONG PREGNANT MOTHERS IN KWALE COUNTY; KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS SCHISTOSOMIASIS.

Thank you for the continuing review report for the period **September 2015 to September 2016.**

The Committee noted that a protocol deviation form has been submitted, as the request for annual renewal was done after the date of submission required.

This is to inform you that at the 257th A meeting of the KEMRI Scientific and Ethics Review Unit (SERU) held on **8th November 2016**, the Committee **conducted the annual review and approved** the above referenced application for another year.

This approval is valid from **November 8, 2016** through to **7th November 2017** Please note that authorization to conduct this study will automatically expire on **7th November 2017**. If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the **SERU** by **September 26, 2017.**

Any unanticipated problems resulting from the implementation of this protocol should be brought to the attention of the SERU. You are also required to submit any proposed changes to this protocol to SERU prior to initiation and advise us when the study is completed or discontinued.

You may continue on the study.

Yours faithfully,

FOR: **DR. EVANS AMUKOYE,**
ACTING HEAD,
KEMRI SCIENTIFIC AND ETHICS REVIEW UNIT

Appendix V: Proof of Publication

Mwachuo, R. O., Karanja, S., & Otieno, P. (2024). Knowledge, attitude and practices associated with S. Haematobium infections among pregnant mothers in Kwale County, Kenya. *African Journal of Health Sciences*, *37*(2). https://ojs.ajhsjournal.or.ke/index.php/home/article/view/315

Knowledge, Attitude and Practices Associated with *S. Haematobium* Infections among Pregnant Mothers in Kwale County, Kenya

Mwachuo Rehema[1*], Karanja Simon[2], and Otieno Phelgona[1]

[1]*Centre for Clinical Research, Kenya Medical Research Institute, Nairobi, Kenya and* [2]*Department of Environmental Health and Disease Control, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya*

***Corresponding author**: Rehema Omar Mwachuo. Email address: rmwachuo@yahoo.com

DOI*:* https://dx.doi.org/10.4314/ajhs.v37i2.8

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Abstract

BACKGROUND

Schistosomiasis is a disease of global public health importance among populations residing in *Schistosoma*-infection endemic zones such as the Kenyan coast. Preventive measures and mass treatment of infected populations can reduce or possibly eliminate schistosomiasis. This study investigated the knowledge, attitude and practices associated with *S. haematobium* infection among pregnant mothers in Kwale County, Kenya.