PREVALENCE AND RISK FACTORS FOR RE-INFECTION OF URINARY SCHISTOSOMIASIS AMONG PUBLIC SECONDARY SCHOOL STUDENTS IN ISE/ORUN LGA, EKITI STATE

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ABSTRACT

Schistosomiasis is one of the most serious and prevalent neglected tropical diseases (NTDs) in Africa. It is a serious debilitating and sometimes fatal parasitic disease. This study aimed to determine the prevalence, risk factors for re-infection and knowledge of urinary schistosomiasis among public secondary school students of Ise/Orun LGA. There has been increase in the prevalence months after MAM activities in Ise/Orun LGA. Also, most studies centered on epidemiology of the disease with little or no attention towards accessing their knowledge about schistosomiasis.

A descriptive cross sectional survey was carried out in four selected communities in Ise/Orun LGA, Ekiti State. A total of 635 students from four public secondary schools were interviewed using multi stage sampling technique. Data was collected using semi- structured interviewer administered questionnaire. Terminal urine samples were collected from 635 students for microscopic examination of the sediments for ova of *S. heamatobium*. Respondents with positive urine samples were referred for treatment to comprehensive health centre in the community.. Data obtained were entered and analyzed using Epi Info 7 software package.

Six hundred and thirty five questionnaires were administered translating to 98% response rate, mean age of respondents was 14 years, and 77% of respondents were in junior secondary school. Orun community has the largest proportion of respondents (43%). Well water, 351 (55.3%) was the commonest source of water for domestic and open defeacation was 307 (48%). Sixty five (10.2%) samples were positive for ova of *S. heamatobium* with boys accounting for 41(63.1%). Ogbese and Obada communities were the most affected with 32.2% and 14.8% community specific attack rate. Ninety-three (14.6%) admitted ever passed bloody urine, while 54 (8.5%) were currently passing bloody urine. Many, 429 (67.6%) heard information about schistosomiasis and the school, 434 (67.6%) was the commonest source of information. Good knowledge about urinary schistosomiasis was 63,6%, while 36.4% had poor knowledge about the disease. Use of drug, 352 (55.4%) and behavioural change by stopping urinating in rivers, 75 (11.8%). were some of the suggested schistosomiasis control measures. Use of open defecation (OR 1.4, p values <0.05, 95% CI.1.4 – 4.2), ever and currently passing bloody urine had OR 1.9, p values <0.01, 95% CI.1.9 – 5.9 and OR 1.2, p values 0.02, 95% CI.1.2 – 5.1 respectively. Swim or wade in river (OR 1.8, p values <0.01, 95% CI.1.8 – 6.1), urinate in the river (OR 2.4, p values <0.05, 95% CI.1.4 – 4.1) and not seek treatment for schistosomiasis (OR 0.4, p values <0.05, 95% CI.0.2 – 0.7) were significant factors.

Determinants of knowledge about schistosomiasis were age of respondents not <= 14 years (OR 1.5, 95% CI.1 – 2.1) and level of education not below JSS 3 (OR 1.7, 95% CI. (1.2 – 2.4). Others include if the respondents had sought treatment for bloody urine, had not heard or use praziquantel. Among the communities, living at Ise and Ogbese were significant to having poor knowledge of schistosomiasis. Predictors of schistosomiasis infection in the Ise/Orun LGA communities were respondents residing at Ogbese community (AOR 10. 95% C.I., (5 – 50), not seeking treatment for schistosomiasis (AOR 4.3, 95% CI. (1.3 – 14.4), and heard of schistosomiasis (bloody urine), AOR 0.3, 95% CI 0.2-0.8 was a protective factor for schistosomiasis transmission. The prevalence of urinary schistosomiasis from the study was high and intensity of infection associated with age and gender. High proportion engaged in wadding and swimming in rivers while some do urinate in water bodies while swimming. Parental occupation (farming) of most respondent exposed them to contact with water bodies frequently putting them at higher risk. School was identified as major source of information about urinary schistosomiasis during school health programmes. Most respondents had average knowledge about the disease and preventive strategies, with poor knowledge about its transmission. Findings from the study will enhance proper interventional strategy planning towards reducing morbidity due to urinary schistosomiasis.

Keywords: MAM, Re-infection, knowledge, control of schistosomiasis and haematuria

CERTIFICATION PAGE

We certify that this work was done by **OJO HERBERT KAYODE** in the Department of Epidemiology and Medical Statistics, Faculty of Piublic Health, University of Ibadan, Nigeria under my supervision.

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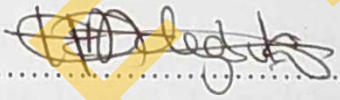

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DEDICATION

Dedicated to my beloved wife, Bukola and my precious children "Tolulope and Teniola"

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ABBREVIATIONS

AEO: Area Education officer

CDC: Centre for disease control and prevention

CHC: Comprehensive Health Centre

DALYs: Disability Adjusted Life years

EKSMOH: Ekiti State Ministry of Health

FMOH: Federal Ministry of Health

HF: Health Facility

JSS: Junior Secondary School

KAP: Knowledge, attitude and practice

K: Class interval

LGA: Local Government Area

MAM: Mass administration of medicine

MDA: Mass drug administration

MPH: Master in Public Health

NFELTP: Nigeria Epidemiology and Laboratory Training Programme

NTD: Neglected tropical Diseases

OND: Ordinary national diploma

PCT: Preventive chemotherapy

PTA: Parent Teachers Association

PZQ: Praziquantel

RUWATSAN: Rural water supply and sanitation

SMOH: State Ministry of Health

SSS: Senior Secondary School

WHO: World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background:

Schistosomiasis is one of the most serious but neglected tropical diseases (NTDs) in many developing countries, particularly in sub-sahara Africa. The disease is caused by helminth in the family of the digenetic trematodae and genus Schistosoma. It has different species t with the Schistosoma *haematobium* (causes urinary schistosomiasis), Schistosoma *mansoni* and *Schistosoma japonicum* (causes intestinal schistosomiasis) being the most common species. Schistosomiasis is defined as a disease caused by a parasitic worm that primarily lives in the blood (Global Health, 2015).

Urinary schistosomiasis due to *Schistosoma heamatobium* is acquired through skin penetration by the infective larva stage following direct contact with infested fresh water. The cercariae, is the infective stage that are released by freshwater snails of the *Bulinus species*. The infection classically presents with terminal haematuria. Adult schistosomes live in the abdominal veins and vessical plexus of their vertebrate definitive hosts where they release their spinous ova known to irritate the plexus leading to erosion and bleeding that characterizes their clinical acute presentation and /fibrosis and cancerous complications in chronic cases. It is a serious debilitating and sometimes fatal parasitic disease. Engaging activities such as washing of cloths, bathing, fetching, and swimming at the rivers containing these snails are at risk of infection and encourage the transmission of schistosoma infections (USAID, 2015).

Urinary schistosomiasis is prevalent in several parts of Africa with prevalence being highest in areas with large bodies of waters (CDC, 2015). In most affected communities, the disease is often accepted as normal in childhood while some regards as sign of puberty (Midzi *et al*, 2011). In Nigeria, wide spread of urinary schistosomiasis endemicity had been reported by several communities. Various factors affect the epidemiology of the disease the major reason being the risk of reinfection following chemotherapy (Ologunde *et al*, 2012). According to Ejima *et al.*, (2010) infection is high among children 10-14 years of age, making age a contributing factor to urinary schistosomiasis disease transmission. Also, increasing incidence and prevalence of the

disease and its transmission have been linked with school children in endemic communities. Unfortunately, majority of the population at risk are usually ignorant about the disease (Balla, *et al*, 2013).

Urinary schistosomiasis has been linked with unsanitary habit, contact with stagnant water due to poor drainage and fishing activity (Adewole and Fafure, 2013). Mbata *et al.*, (2008) deduced that increased contact time with *S. haematobium* infested freshwater and presence of *Bulinus* species was responsible for the prevalence of the disease in the endemic areas.
Comparing with studies carried out in different part of Nigeria, the prevalence (75.6%) as reported by Ologunde (2010) in Ise/Orun LGA is still considered to be the highest among others. In order to minimize reinfection among students, Biu *et al*, (2009), suggested that Government should disinfect pond/streams, treat School Children and emphasize on school health education programme as an effective means of reducing urinary schistosomiasis transmission. Factors such as parental occupation and educational background, behavioural attitude such as wadding/swimming in water and many more factors contributing to the high prevalence of urinary schistosomiasis needs to be determined and documented in Ise/Orun LGA.

Mass administration of medicine (MAM) is a process by which praziquantel tablets (which is drug of choice) is distributed to the students, the most susceptible group and at risk population. The first MAM took place in 2009 but was suspended due to lack of sponsor for the activity and in 2015 another MAM was conducted. During MAM activity implementation, health education, sensitization and awareness campaign is usually carried out in addition to the medicine distribution.

1.1 Problem statement

Prevalence resume increases months after the Mass Administration of Medicine (MAM) due to frequent contact with infected water flowing through the LGA leading to increase in morbidity due to urinary schistosomiasis. Students are mostly affected by the disease due to their attitude of frequent contact with infected water bodies causing a lot of daunting effects on them (Ologunde 2010). Activities like fishing, fetching of water, swimming and bathing go on inside this

infected river on regular basis thus making the transmission impossible to be obstructed. Past studies by Midzi *et al, 2011* indicated that high risk age group is yet to be equipped with basic knowledge and skills to protect them from acquiring urinary schistosomiasis. Also, hematuria condition is viewed as a natural/normal phenomenon, normal developmental stage and also as a sign of puberty for a growing up children as it is considered a normal growing up process which the infected person outgrows (Nkechi *et.al.*, 2010, Ukwandu & Nmorsi, 2004). It has also been found that MAM is important but not sufficient approach to control the disease (Oniya and Odaibo, 2006).

1.3 Justification:

Ekiti State is one of the State in the federation with high urinary schistosomiasis prevalence rate with Ise/Orun LGA having the highest (75.6%) (Ologunde, *et al* 2010, Report on Epidemiological mapping of schistosomiasis, 2015). Re-infection of urinary schistosomiasis due to regular daily activities of students (wadding, swimming, washing and fishing) in water bodies calls for the need of routine assessment of urinary schistosomiasis (Ologunde *et al*, 2012). According to Ologunde, 2005 and 2009, he observed that most documented studies focused on prevalence, pathology and epidemiology with less attention on assessing knowledge on urinary schistosomiasis, risk factors and preventive practices among students. Students are known to be vulnerable group for urinary schistosomiasis thereby creating a gap for an effective intervention.

Efforts made by the State, Federal Ministry of Health (FMOH) and Neglected Tropical Diseases (NTD) control partners to reduce morbidity due to urinary schistosomiasis among Secondary Schools Students in Ise-Orun LGA through MAM were not yielding desired result. Also, most study conducted were on prevalence while knowledge of risk factors and preventive practices are yet to be adequately assessed hence, the need to carry out the assessment of knowledge as guidance towards planning a successful intervention programme.

Findings on the knowledge in addition to MAM will help to improve planning and implementation of Urinary Schistosomiasis control strategies to achieve a reduction of the prevalence of the disease. Adequate knowledge of the causative agent, mode of transmission and acquisition will help to achieve the disease control in Ise/Orun LGA. It is, therefore, necessary to

assess the knowledge, attitude and preventive practice of the secondary schools students in Ise/Orun LGA as this could improve planning, implementation and evaluation of urinary schistosomiasis interventions.

1.4 Research questions

1. What is the prevalence of re-infection of urinary schistosomiasis among public secondary school students in Ise/Orun LGA following MAM?
2. Do the public secondary school students in Ise/Orun LGA have good knowledge of urinary schistosomiasis?
3. What are the risk factors associated with transmission of urinary schistosomiasis among public secondary school students of Ise/Orun LGA?

1.5 Aims and Objectives

1.5.1 Aims:

To determine the prevalence and risk factors of re-infection of urinary schistosomiasis among public secondary school students of Ise/Orun LGA

1.5.2 Specific objectives:

1. To determine the prevalence of re-infection of urinary schistosomiasis among public secondary school students in Ise/Orun LGA.
2. To assess the level of knowledge of public secondary school students in Ise/Orun LGA on urinary schistosomiasis
3. To describe measures adopted by the students to prevent the spread of urinary schistosomiasis.
4. To identify factors associated with re-infection by urinary schistosomiasis among public secondary school students in Ise/Orun LGA.

CHAPTER TWO

LITERATURE REVIEW

2.1 Background of urinary schistosomiasis

Urinary schistosomiasis is endemic in Nigeria and continues to pose public health challenges especially among rural inhabitants. Urinary schistosomiasis due to *Schistosoma haematobium* is a significant cause of clinical morbidity and disability in the endemic countries particularly those living in endemic areas.

Schistosomiasis is the second most prevalent tropical disease in Africa after malaria and is of great public health importance in the developing world (WHO, 2002, 2016). Currently, about 436 million people are at risk of the infection and 112 million are infected with urinary schistosomes (WHO, 2010) and the disease remains persistent in spite of prolonged control and preventive efforts adopted for its control (Ximenes *et al*., 1989; WHO, 2001). The disease leads to chronic ill health condition and a major public health concern of rural dwellers in the tropical and sub-tropical regions of the world. It causes a daunting effects particularly among children aged 5 and 15 years old and individuals in contact with infected water bodies (WHO, 2001). The risk of acquiring the infection exist only for residents and people who visit the affected area most especially those who engage in occupational and recreational activity in the riverine areas (SANCO), 2014).

Globally, up to 120 million of the estimated 200 million infected people are believed to be symptomatic and as many as 20 million may appear well but might be suffering from severe consequences of urinary schistosomiasis infection, Also, annual deaths associated with schistosomiasis are estimated at 20,000 while about 500-600 million people worldwide are at risk (WHO, 2001 and . CDC, 2010). It was globally estimated that at least 258 million people required preventive treatment for schistosomiasis in 2014 and more than 61.6 million people were reported to have been treated for schistosomiasis in 2014 (WHO, 2016). The center for disease control and prevention, 2012 reported that more than 200 million people are infected worldwide and an estimated 85% of the world's cases of schistosomiasis are in Africa, where prevalence rates can exceed 50% in local populations

The first obvious symptom of the urinary schistosomiasis is hematuria (blood in the urine) which is terminal in nature, however, in school aged children, schistosomiasis has a detrimental effect on physical, cognitive and intellectual growth and also causes nutritional deficiencies. The early signs of morbidity common of the infection and which manifest commonly among school age children are: anemia, stunted/impaired growth, and development, reduced ability to learn, poor cognition and substandard school performance (Uneke, 2008). The late and life threatening consequences of schistosomiasis include infertility, cancer (squamous cell carcinoma) of the bladder or serious kidney malfunction caused by *S. haematobium*, and severe complications of the liver and spleen in the case of intestinal schistosomiasis (Cheesbrough, 2002).

The cornerstone for the control of schistosomiasis and intestinal nematodes is school-based treatment approaches where children receive single doses of praziquantel once per year (WHO, 2002). Although, chemotherapy can reduce morbidity caused by the infection, rapid re-infection usually occurs in school children, requiring repeated treatment. Thus, medical intervention alone is insufficient for the control of the disease but integration of health education and medical intervention remains the best strategy. However, cchemotherapy is generally recognized to be the most important, rapid and cheap method to reduce morbidity due to schistosomiasis (Mazigo et al., 2010).

The treatment of schistosomiasis has been transformed with the introduction of praziquantel which is effective generally in a single dose and against all species of the parasite. Study found that inclusion of focal mollusciciding, improvements in sanitation, and health education into the control scenario, may help to achieve target of reducing the level of schistosome infection to less than 1%by 2015 (McManus *et a l*, 2010. A survey was conducted in 2008 in Ekiti State by Ekiti State Government in conjunction with Federal Ministry of health., to determine the degree and pattern of urinary schistosomiasis after which praziquantel tablet (drug of choice) was administered in 2009 and 2010 to all ages with more attention given to primary and secondary schools students, The survey conducted few years after in Ogbese, a community in Ise/Orun LGA among primary and secondary school pupils discovered that there was a re-infection as a result of constant interaction with infected water bodies due to lack of adequate knowledge about the disease transmission/risk factors among the residents (Ologunde, C. A., Olaifa, A. B., and

Olowu, 2012). Some assumed it as natural/physiological phenomenon thereby leading to increase in infection rate and students generally have little information about the knowledge and preventive practices of urinary Schistosomiasis (Ologunde *et al*, 2010).

Epidemiological survey conducted in Benue State showed that the health hazards posed by urinary schistosomiasis among Children is enormous and the need for a decisive control intervention to reduce the menace was recommended (Houmsou, Amuta, & Sar, 2012). Primary and secondary school pupils in Ise/Orun LGA have little information about knowledge, associated risk factors and preventive practice about urinary schistosomiasis by Ologunde *et al*, 2010.

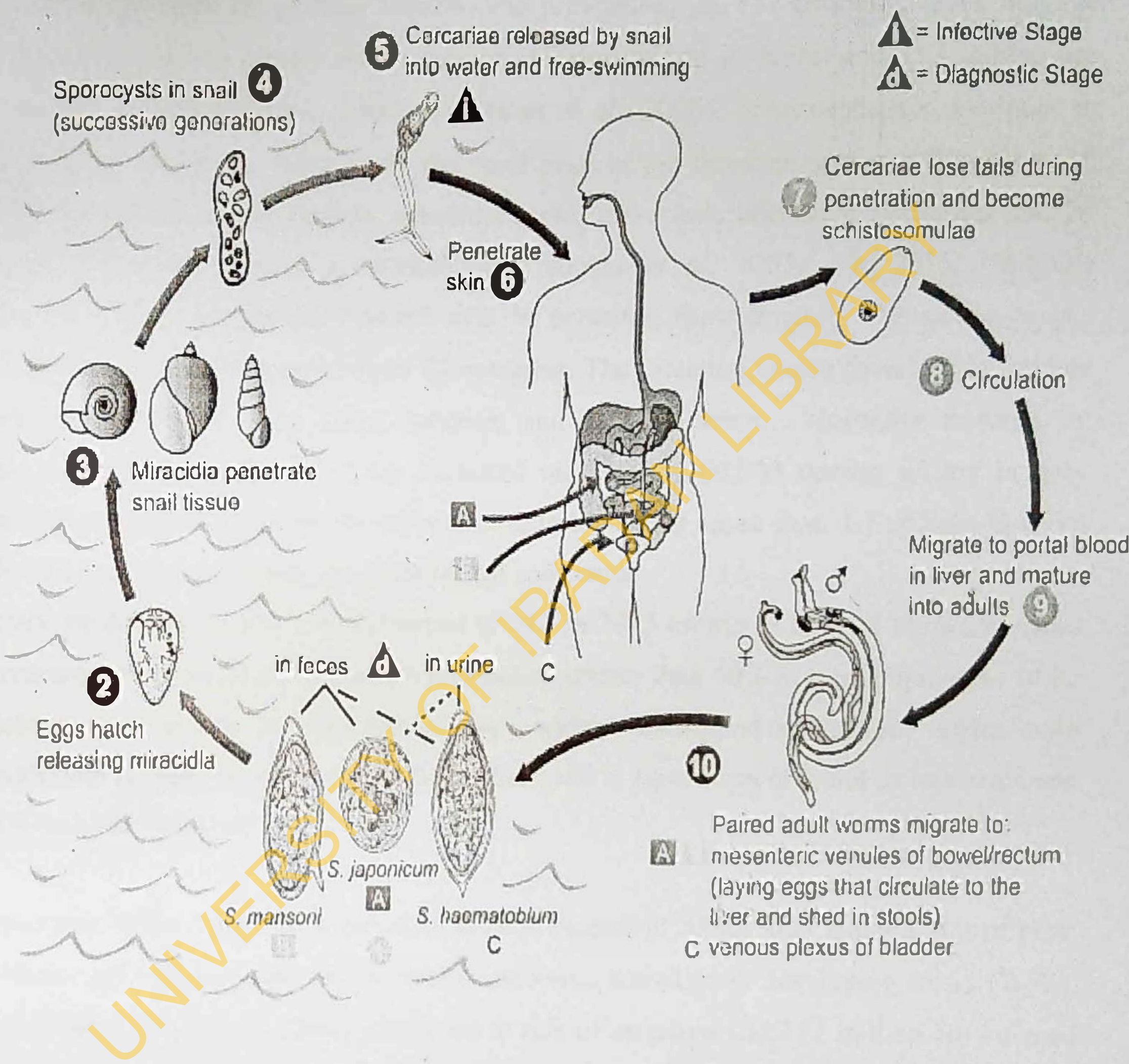
2.2 Transmission of urinary schistosomiasis

Urinary schistosomiasis caused by *Schistosoma haematobium* is most prevalent in African countries. Urinary schistosomiasis is a parasitic disease caused by the larval forms of blood flukes (schistosomes) acquired from infested freshwater snails. Cercaria is the infective stage of any Schistosoma infection.

Schistosomiasis spreads through direct contamination of water by an infected person urinating into the water. This happened as a result of people unknowingly contaminating their environment due to lack of education or an insufficient attention to hygiene. All schistosoma infections to human follow direct contact with fresh water that harbours cercariae. The cercariae penetrate the skin when in contact with infested water bodies and goes to the target organs depending on the species infested with.

The presence of many snail species especially the Bulinus species, and increased contact time with the *Schistosoma haematobium* infested freshwater habitat were responsible for the prevalence of the disease in Ogbadibo local government area, Benue State, Nigeria according to Mbata *et al*, 2008.

Schistosomiasis



Source: Centre for disease and prevention, 2012

Figure 1.1: Life cycle of Schistosomials

2.3 Burden of urinary schistosomiasis

Schistosomiasis is the second most important parasitic disease, with over 200 million people being infected in 74 countries worldwide and is the most deadly NTD (Crompton *et al.*, 2001, (USAID, 2014), (Centre for Disease Control and prevention, 2011). Globally, seven hundred and seventy nine million people are at risk of schistosomiasis infection and 193 million are already infected (Chitsulo *et al.*, 2000; Steinmann *et al.*, 2006). Schistosomiasis continues to threaten millions of people, particularly the rural poor in the developing world (Engels *et al*, 2002). Of the estimated 200 million infected people, more than half have symptoms and 20 million exhibit severe disease manifestations (Utzinger *et al*, 2003). In 2015, USAID's estimated that 240 million people infected with the parasites, approximately 779 million people at risk and schistosomiasis is endemic in 74 countries. The infection is also found in the Middle East, parts of Southeast Asia, Latin America, and the Caribbean. Morbidity measure by disability adjusted life years (DALYs) indicated more than 200,000 deaths, mostly in sub-Saharan Africa that are attributed to schistosomiasis indicating more than 1.7 million DALYs annually as a result of organ damage, hemorrhage and cancer.

The Centre for disease control and prevention (CDC) in 2015 estimated 85% of the world cases of schistosomiasis occurred in Africa with prevalence greater than 50% in local population while *Schistosoma mansoni* and *S. haematobium* are widely distributed throughout Africa only *S. haematobium* is found in areas of the Middle East; and *S. japonicum* is found in Indonesia and parts of China and Southeast Asia.

Schistosomiasis is the second most prevalent tropical disease in Africa after malaria. It is of great public health and impact negatively on socio- economic activities in developing world (WHO, 2002). Currently, about 436 million people are at risk of infection and 112 million are infected with urinary schistosomes in sub-Saharan Africa, this number underestimates the total burden, because several endemic foci are yet to be discovered (WHO, 2010). The morbidity and mortality in affected population are high with school children usually presenting the highest prevalence and intensity (WHO, 2002).

Nigeria is one of the countries known to be highly endemic and where it is reported to occur in all states of the country including the Federal Capital Territory. It is estimated that about 101.28 million persons are at risk and 25.83 million are infected (Chitsulo *et al*, 2000). Nigeria is one of

the highly endemic countries with an estimated 101.3 million at risk of infection and 29million of the people being infected (Hotez and Kamath, 2009). Finding from Ugbomoiko *et al.* in 2010 indicate that previous studies on urinary schistosomiasis in Nigeria have been concentrated in the Western and Northern areas mainly. According to USAID in 2015, patterns of sanitation, water supply, and human water use are crucial elements in determining the risk of infection of urinary schistosomiasis.

2.4 Effects of urinary schistosomiasis on school age children

Urinary schistosomiasis can have devastating impact on the urinary tract which is often unacknowledged and unevaluated. Such omission could have implication for progressive renal damage, bladder dysfunction or liver and intestinal disease which, if not detected and treated, could lead to end stage renal failure and death depending on the species of the parasite (USAID's, 2015). Also, the disease can lead to chronic ill health condition and is considered as a major public health concern mainly among rural dwellers of tropical and sub-tropical regions of the world.

Urinary schistosomiasis causes a lot daunting effects among children between 5 and 15 years old. Effects include urinary obstruction, cancer of the bladder, infertility and anemia. It has a detrimental impact on physical, cognitive and intellectual growth as well as causing nutritional deficiencies. In older people, there is a drastic decline in intensity of infection but not in the prevalence of the disease ((USAID's, 2014). According to BIO Ventures for Global Health in 2015, it stated that majority of morbidity and mortality associated with schistosomiasis is as a result of slow damage to the host organs caused by accumulation of parasite eggs in the tissues over many years. According to Sheta and Saadamy (2006), severity of infection and disease morbidity depends on intensity of exposure, differences in parasite strains, nutritional status and presence of other infections that may involve the liver.

The parasite which causes intestinal schistosomiasis if not treated, may have more serious consequences, such as severe hepatomegaly, splenomegaly, hepatosplenomegaly, esophageal varices, bleeding and death (WHO, 2002). The effect of urinary schistosomiasis on nutritional status of school children was assessed in South-East Nigeria and find that children with lower body weight, lower height and smaller arm circumference were more likely to be infected with

urinary schistosomiasisSchistosomiasis may affect growth and nutritional status of the children adversely (Uneke, 2008).

2.5 Persons at risk of urinary schistosomiasis

S. heamatobium is one of the Neglected Tropical Diseases with increasing incidence and prevalence. Findings show that school children habour the infection and therefore contribute to the transmission in endemic communities (Balla, *et al*, 2013. Unfortunately, according to Balla *et al* 2013 emphasized that majority are still ignorant of the disease. Other persons at risk of contracting the disease include; farmers, fishermen, laundry men and those whose occupation brings them in contact with water bodies regularly (USAID's, 2015). A study conducted on urinary schistosomiasis in Southwestern Nigeria showed high prevalence of the disease among the school children particularly males and more than half suffered from the infection with a visible heamaturia. The high prevalence was an indication that most villagers still use the stream for domestic, occupational and recreational purposes (Oniya & Jeje, 2010).

A study of urinary schistosomiasis in Niger-Benue basin of Kogi State found that the infection was high among children 10-14 years of age. This suggests that age is a contributing factor to the disease transmission. Also, availability of man-made river bodies due to the activities of the defunct Lower-Benue- River Basin Development project in addition to large number of temporary and permanently natural water bodies available were contributing factors (Ejima and Odaibo, 2010).

A study conducted among boarding school students in Gusau, Zamfara State confirmed the high prevalence of urinary schistosomiasis among students. It revealed high prevalence rate among boys (81.7%) and distribution of infection depended on school location and closeness to dam/rivers. Other factors contributing to the disease included age, occupation and water contact activity (Bala, *et al*. 2012).

2.6 Factors enhancing transmission of urinary schistosomiasis

Schistosomiasis is associated with contact with water infested by fresh water snail of the Bulinus species. Therefore rate at which people visit infected water bodies, lack of toilet and non-

availability of portable water led to increase in rate of transmission. (Babatunde *et al*, 2013, Mbata *et al*., 2009, Ukwubile and Tile, 2016).

In Konduga LGA, North East Nigeria, infection was commonly to be higher during the raining season due to washing, bathing, farming and fishing activities. Biu and colleagues (2009) therefore suggested disinfection of pond/streams, treatment and health education of School children as control measures to reduce disease prevalence. Although, schistosomiasis is associated with frequent contact with infected river, Babatunde and colleagues in 2013 reported unavailability of pipe-borne water, insufficient bore as contributing to high endemicity in two communities. Other important factors reported include high level of illiteracy, ignorance and traditional beliefs (Babatunde *et al*, 2013).

2.7 Prevention, control and treatment of urinary schistosomiasis

Preventive practices that can be effective measures adopted in the control of urinary schistosomiasis include, provision of pipe borne water, wearing of protective cover while in contact with an infested water, provision/use of toilet and avoidance of urinating in water bodies. Other methods are health education about the disease, removal of water weed at the bank of the rivers and chemical control of the water snails through mollucides. Control of schistosomiasis and intestinal nematodes in school-based treatment approaches entails children receiving single doses of praziquantel once per year so as to reduce morbidity caused by the infection (WHO, 2006).

World Health Organization guidelines for preventive chemotherapy of schistosomiasis call for targeted distribution of praziquantel (PZQ) based on the prevalence of the disease in school-aged children (WHO, 2006). According to these guidelines, moderate-risk areas, where

School age children prevalence is 10–49%, should limit mass PZQ treatment to School age children, whereas high-risk areas, with prevalence of greater than 50%, should target both children and at-risk adults. Also, at-risk adults who should receive preventive chemotherapy should range "from special groups (pregnant and lactating women; groups with occupations involving contact with infested water, such as fisherman, farmers, irrigation workers, or women in their domestic tasks) to entire communities living in endemic areas.

Mazigo et al., 2010 concluded that despite sustained control efforts and intensive research actions in Sengerema district of Tanzania, prevalence of schistosomiasis was high and there was

still lack of understanding concerning schistosomiasis in many of the school children studied. Thus, it was suggested that, "combined efforts from the community, education, and health sectors are urgently needed to identify the factors which led to the apparent failure and to come up with participatory approaches which will involve all stakeholders". Although health education by itself cannot guarantee the control of schistosomiasis, it is a fundamental starting point around which other measures can be built to create a favorable environment for the promotion of higher levels of health consciousness and more critical thinking towards improving the quality of life of endemic communities' (Mazigo et al., 2010).

The study conducted in China by Stefanie Knop etal, 2013 recorded high prevalence and suggested that 'for sustainable control, interruption of transmission and finally elimination of schistosomiasis, integrated control approaches that are tailored to the local situation are necessary'. China is a trailblazer in integrated and intersectoral schistosomiasis control demonstrating that transmission can be effectively interrupted by combining preventive chemotherapy with snail control, health education, and improved sanitation and environmental and reservoir host management. Lessons from the multifaceted schistosomiasis control program implementation can guide the progression from schistosomiasis control to elimination in other endemic areas.

Other suggested preventive measures include intensive disease surveillance, chemotherapy, health education, water supply, fight against poverty, improved sanitation as a successful means of eradication urinary schistosomiasis (Bigwan, E, I., Tinja, B. and Damen, 2012).

2.8 Effect of knowledge on transmission of urinary schistosomiasis

A study of the knowledge attitude and perception of students in Malawi found alarming schistosomiasis morbidity statistics after years of chemotherapeutical intervention. It also revealed that risk factors, and knowledge, attitude and practices on schistosomiasis had not been adequately explored and (Austin et. al, 2015). Water contact activities like swimming, washing, fishing, playing in infested water bodies, irrigation and laundry are reported to put children at higher risk of infection in the area of high intensity of infection (Amuta, E. U. and Houmsou, 2014). A study conducted in Benue State found that inadequate knowledge about urinary schistosomiasis led to inability to educate children about preventive measures against schistosomiasis. Hence, ignorance/lack of knowledge has a great impact on the distribution of

urinary schistosomiasis in rural communities as also reported earlier in Cross River State (Houmsou *et al.*, 2012). Perception and risk assessment on *S. heamatobium* infection in Bukuru and Katsina-Ala of Benue State indicated that there is need to launch a schistosomiasis control programme, develop human resources and materials for health education. The study showed that community perceptions can have a marked effect on the success of scientific interventions and relief from the burden of *Schistosoma haematobium* infection could be facilitated by a better knowledge of the epidemiology of the parasite and its pathogenicity (R Houmsou, S Kela, M Suleiman, 2009). Dayem (2009) suggested that schistosomiasis control requires a combination of scientific and social method to achieve effective control of the disease due to complex ways by through which transmission occurs. It was proposed that an applied research on schistosomiasis control is required in order to develop new approaches to further reduce infection in hotspots of transmission CDC (2007).

Thus, due to the devastating effects of urinary schistosomiasis on physical and mental conditions of infected people, relief from the burden of *Schistosoma haematobium* infection could be facilitated by a better knowledge of the epidemiology of the parasite and its pathogenicity. The development of human resources and materials for health education must be ensured to decrease in the frequency of contact with water sources and encourage adherence to preventive measures. A study by Houmsou *et. al* in 2009 and 2013 found that inhabitants risky behavior such as swimming, bathing/playing, fishing cause urinary schistosomiasis.

Stefanie Knop *et al*, 2013 stated "it will be very important to tailor behavioral change and health education interventions to children's understanding, so that the goal of modifying their behavior to not urinating or defecating into open water, or be in contact with this water while playing or washing, to interrupt transmission can be met". Behavioral interventions should also target children's peers (parents, older siblings and teachers) so that they can exemplify adequate behavior through their own life. Sensitizing children, parents and teachers to the importance and benefit of periodic deworming might increase the coverage of drug intake. When constructing latrines or urinals, it is important to design them for use by children. Children might not use latrines because they do not like the smell, are afraid of darkness or of falling into too big holes. It was suggested that reduction of urinary schistosomiais transmission in endemic communities in southwest Nigeria could be through health education and provision of portable water to

minimize contact with water bodies to reduce transmission and treatment to reduce morbidity and eradicate the disease (Babatunde *et. al* 2013).

Reinfection pattern and predictors study conducted on urinary schistosomiasis among school pupils in a South western village in Nigeria indicated high rate of reinfection as the month progresses mainly among males thereby suggested that chemotherapy should be integrated with other control measures and not as a sole tool (Oniya and Odabio, 2006). Also, another study in Ibadan supported higher prevalence in males as a result of frequent water contact activities and the results indicated that urinary schistosomiasis is still being actively being transmitted in Ibadan (Okoli and Odaibo, 1999). In addition, a cross sectional study carried out in an endemic rural area of Nigeria confirm the active transmission of *S. haematobium* in the study area, the age-related infection pattern is similar to other studies conducted in Nigeria but differs from other studies that reported significant differences in sex-related prevalence. The study indicated that lack of association between infection and ages of the subjects could be due to equal dependent on natural water bodies in such low resource community with poor water development (Olajumoke *et al.* 2014).

There have been a number of studies on the knowledge, attitude and practice relating to schistosomiasis in different parts of the world (WHO, 2001). Many studies indicate that misconceptions on schistosomiasis still exist and practices for school control are unsatisfactory. Reasons for the persistence of the disease in spite of prolonged control and preventive efforts include wide distribution of the intermediate host, migration, the dependency of many poor populations in both rural and urban areas on schistosomes-infested water sources for their domestic, occupational and recreational needs, lack of sanitation, portable water and scarcity of and deficiencies in preventive and curative health services (WHO, 2001). Previous studies in Ekiti state based on prevalence, pathology and epidemiology found the state to has one of the highest rate of urinary schistosomiasis in the federation (Ologunde, 2005 and 2009) with Ise/Orun LGA recording a prevalence of 75.6% in 2010 (Ologunde, *et al.* 2010).

Studies in other rural settings also recorded high prevalence among school children for example Midzi *et al.* in 2011 reported 77.8% prevalence among school children in Zimbabwe while a study by Sady and colleagues among rural population of Yemen reported a prevalence of 22.5%

and demonstrated inadequate knowledge on the prevention of schistosomiasis (Sady *et al.*, 2015). Therefore, any meaningful control of schistosomiasis will require targeting health messages through school children who are most susceptible to this infection. . This will empower high risk age group with the basic knowledge and skills for protection against urinary schistosomiasis and possibly other parasitic infections.

CHAPTER THREE

METHODOLOGY

3.1 Study Area: The study was carried out in Ise/Orun LGA in Ekiti South Senatorial district of Ekiti State. Ise/Orun LGA is a rural community composed of ten political wards with a total population of 142,063. It is a fairly populated LGA with seven major communities and several villages. It has seven public secondary schools and numerous primary schools. There are 28 functioning public basic health facilities widely spread across the LGA, one secondary facility and 8 private health facilities. Record obtained from the LGA indicates that, there is at least one health facility (HF) per ward with both skilled and unskilled health personnel.

There is a wet season (April-October) characterized by heavy rains with occasional flooding of river banks in few communities in the LGA and a dry season between November and March when there is very little or no rainfall. During this period, the river dries up with little stagnant water along their course. Community members depend on this big flowing river for domestic purposes due to shortage in access to portable water which permits the disease to be on increase despite MAM. The raining season is the peak period for farming and planting of various crops by most of the inhabitants. Background information obtained from the LGA shows that the inhabitants are mainly farmers and fishermen who depend on these Ogbese rivers in carrying out their daily occupational and recreational activities.

Most of the inhabitants are Ekitis of Yoruba origin, other Yoruba speaking tribes, Hausa/Filanis, Tivs, Igbira and Idomas. They engaged in both cash and food crops production like Cocoa, Kola, Oranges, plantain, pine apple, yam, maize, cassava in a commercial quantity.

3.2 Study Design: A descriptive cross sectional study design was adopted in four randomly selected public secondary schools.

3.3 Study Population: The study population was public secondary school students of Ise/Orun LGA. This involved children in both junior secondary schools (JSS) and senior secondary schools (SSS) classes.

3.4 Sample size estimation:

Sample size was estimated using the formula;

$n= (Z\alpha + Z\beta)^2 \, p \, (1-q)/d^2$

Where;

n is the sample size

$Z\alpha$= confidence level (usually 95%= 1.96)

$Z\beta$ = power (usually 80% = 0.84)

P= prevalence of urinary schistosomiasis in Ogbese, Ise/Orun LGA (75.6%) (Ologunde *et al.* 2010)

d=precision (significance level) = 5% = 0.05

$n= (1.96 + 0.84)^2 \text{ X } 0.756 \text{ X } 0.244/(0.05)^2 = 7.84 \text{ X } 0.18446/0.0025$

n=1.4462/0.0025, n=579

Adjusting for non-response rate = n/1-f,(where f is non-response rate=10%)

Sample size (n) =579/1-0.1, n=579/0.9=643,

n= 643

However, a total of 635 secondary school students were interviewed for the study.

This was proportionally allocated as follows:

S/N	Name of school	Community	Number of respondents
1	Ogbese community High School	Ogbese	37
2	United Comprehensive High school	Ise-Ekiti	215
3	Obada High School	Obada	61
4	Orun Community High School	Orun -Ekiti	272
	Total		635

3.5 Sampling Technique:

Multi stage sampling technique was used to select respondents.

Stage 1: The list of major communities in Ise/Orun LGA was obtained from the LGA authorities from which four (4) communities were selected through simple random sampling by balloting. The four selected communities were; Ogbese Ekiti, Orun Ekiti, Ise Ekiti, and Obada Ekiti

Stage 2: From each of the four selected communities, one public secondary school was selected using simple random sampling strategy by balloting.

Stage 3: The list of students in the selected secondary schools was obtained from the school authority, stratified sampling and proportional allocation to size was adopted to determine number of respondents to be selected from each school. Proportional allocation to class size was used in determining number of respondents per class at the selected school.

Step 4: The class registers were collected and systematic random sampling method adopted in determining the number of respondents per class by determining the class interval (k). Respondents were interviewed from the selected classes

3.6 Data collection methods:

3.6.1 The study instruments:

Prior to questionnaire administration, advocacy visits were paid to the community leaders, principals and Chairman of the parent teachers association (PTA) of selected schools to solicit for their support for the study. Following this, town hall and PTA meetings were organized where the purpose of the study was explained to reassure the parents.

Data were collected using a semi- structured interviewer administered questionnaire with the following sections (appendix 2):

Section A: socio-demographic characteristics of respondents- age, sex, class, community, parent occupation, length of time in the community and ethnicity.

Section B: Knowledge on urinary schistosomiasis- heard information about schistosomiasis, source of information, how it could be contacted, local name known, causes, transmission, sign/symptoms and treatment of urinary schistosomiasis.

Section C: Risk factors associated with urinary schistosomiasis- swim or wadding in water, urinate in water while swimming, types of water frequently contacted, ever passed blood in urine, currently passing blood in urine and seek medical treatment for schistosomiasis.

Section D: Treatment, prevention and control of urinary schistosomiasis- Ever had about praziquantel tablets, ever taken praziquantel tablets and how urinary schistosomiasis could be prevented in their community.

The designed questionnaire contained sections/information on demographic data (sex, age, class, name of school), water contact activities, knowledge (transmission, signs/symptoms, treatment, prevention/control), and preventive practices about urinary schistosomiasis among public secondary school students in Ise/Orun LGA. Questionnaire was administered to the students by trained research assistants under the supervision of the researcher after terminal urine collection. Eight research assistants were trained by the principal investigator over two days to assist with data collection. Day one for indoor training and the second day was used to pretext the questionnaire in a secondary school in Ado LGA.

3.6.2 Training of the research assistants:

Eight OND holders in science laboratory technology were trained as research assistants. The training was done principal investigator and was on questionnaire administration in order to get acquainted with the terms, how to administer the questionnaire, consistency, full interpretation and issues of confidentiality. The training included pretest of the data capturing tools in a secondary school in Ado LGA and lasted for two days. Two laboratory technicians and four (4) laboratory scientists were engaged during the study.

3.6.3 Pre-test of the study instruments:

The Questionnaire was pre- tested in Ado Ekiti LGA on 100 students in order to ascertaining its consistency and appropriateness to the study. After the pre-test, ambiguous questions were

corrected in order to obtain the information required for the study for example, local name, how it could be contacted and water bodies in constant with.

3.6.4 Data collection:

Activities on the field lasted for 9 days between 9th and 20th 0f May, 2016 for the collection and examination of terminal urine for *S. heamatobium* in the selected communities. Activities carried out. during the study on the field included; collection of terminal urine, microscopic analysis of urine specimens for ova of *S. heamatobium* and administration of the questionnaire. The questionnaires were spot checked for correctness, completeness and then collected.

3.6.5 Urine Collection/analysis:

Terminal urine samples were collected in a clean and sterile transparent universal plastic container. The containers were accurately labelled with a number corresponding to the number on the questionnaire administered to each respondent. All the urine samples were transported within two hours of collection, at atmospheric temperature to the Laboratory.

Laboratory analysis of the collected urine samples were carried out by microscopic examination of the sediments for ova of *S. heamatobium* following centrifugation. The procedure (Chugh et al, 1986, Balla and Jabbo, 2013) is briefly stated as follows: 10 ml of each urine sample was collected into a 10 ml centrifuge tube and centrifugated at 2000 rpm for 5 minutes. The supernatant was decanted and sediment was transferred to a clean, grease free microscope slide covered with cover slip and examined under X10 objective of a microscope for the presence of terminal spined ova of *S. heamatobium*. The characteristic egg of *S.haematobium* was sought for by examining 40 fields of view per slide and three slides were prepared for each sample. The final report was based on presence of ova in any of the three slides and reported as positive or negative as appropriate.

3.7 Data Management and Analysis

3.7.1 Dependent variable:

The dependent variables were knowledge of transmission and prevention of the disease. These were visits to the river, wadding/swimming, urinating and fishing in streams and river. Others included, washing inside water, bathing in the rivers and locations where one can get infected.

Knowledge on transmission of urinary schistosomiasis transmission assessed was on its causes, signs/symptoms and consequence of urinary schistosomiasis. Knowledge on preventive practice assessed were; avoid bathing in water, provision of tap water, use of toilet, use of drug and health education of the students on urinary schistosomiasis.

3.7.2 Independent variables:

The following variables were the independent variables: sex (male and female), age (<12,13-14, 15-16 and >16), religion (Christianity, Muslim, traditional religion), class (JSS1-SSS2), name of school, parent educational status (no formal education, primary, secondary and tertiary) and parent occupation (farming, fishing, civil/public servant). Others were source of water (well, borehole, tap water and river), toilet facilities (open defecation, water closet, pit latrine, bucket latrine) and water source visitation (river, stream, dam, spring, pond).

3.7.3 Data analysis:

Data obtained were manually checked for errors or omissions and then entered into a computer and analyzed using Epi Info 7 and Microsoft excel. Frequency and proportion, tables and charts were generated for univariate analysis while the chi square test was used for the cross tabulations to compare proportions for bivariate analysis of blood in urine, level of knowledge, determinants factors and socio-demographic/health related characteristics (α=0.05). Multivariate analysis was carried out using logistic regression to identify predictors of urinary schistosomiasis (α=0.05). Knowledge about urinary schistosomiasis was graded as good for scores above 70%, fair for scores between 40 and 70 % while poor for scores below 40%.

3.8 Ethical considerations: Ethical approval to conduct the study was obtained from Ekiti State ethical review committee (ref no: MOH/PRS/15/76). The Area Education officer was visited to inform her about the study. Advocacy visits were paid to the community leaders, school Principals and PTA chairman of the four schools to explain the purpose of the study and seek for cooperation towards the success of the study. Finally, written informed consentswas obtained from PTA chairman and accent from the students before the commencement of specimens' collection and questionnaire administration.

Confidentiality was maintained by interviewing respondents privately. Respondents were identified by study numbers and the study did not inflict any harm on the respondents as new and sterile bottles were used for the terminal urine collection. The right of all the participants was not violated as only voluntary participation in the study was encouraged and no punishment was inflicted for refusal to participate. Respondents with positive urine samples were referred for treatment at the community health centre. The final report will be submitted with the state Neglected Tropical Disease (NTD) control unit of Ekiti State Ministry of Health (EKSMOH) for planning mass administration of medicine (MAM) and intervention design purpose.

CHAPTER FOUR

RESULT

A total of 650 respondents were sampled out of which 635 (98%) provided responses required and these were included in the final analysis. Tables 3.1 and 3.2 show the respondents' sociodemographic and household characteristics.

4.1 Sociodemographic characteristics of the respondents:

The students aged ranged between 9 and 18 years, with 42.5% being in age group bracket 13-14 years. The respondents consisted of 309 boys and 326 girls (M: F = 1: 1.01). Majority (54%) of the parents were farmers with 28.7 % (182) had no formal education. Out respondents, 67.1% had lived for over 5 years in the communities while 76.2% were Yoruba ethnic group and 78.0% in JSS classes (Table 1 and figure 2).

Water for domestic use was mainly from wells (55.3%) and majority (48.4%) of the respondents practiced open defecation (Table 3.2).

Table 3.1: Socio-demographic characteristics of respondents on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

Characteristics	Frequency	Proportion (%)
Age (Years) (Median age 14 years, IQR 14)		
<12	161	25.4
13-14	270	42.5
15-16	176	27.7
>16	28	4.4
Sex		
Male	309	48.6
Female	326	51.4
Level of education		
JSS 1	238	37.4
JSS 2	174	27.4
JSS 3	83	13.1
SSS 1	81	12.8
SSS 2	59	9.3
Community		
Orun	272	42.8
Ise	215	33.9
Ogbese	87	13.7
Obada	61	9.6
Parental level of education		
No formal education	182	28.7
Primary	140	22.0
Secondary	195	30.7
Tertiary	118	18.6
Parental occupation		
Farming	343	54.0
Civil/public servant	156	24.6
Fishing	5	0.8
Others(specify)	131	20.6
Staying in the community(Years)		
<= 5	209	32.9
>5	426	67.1
Ethnicity		
Yoruba	484	76.2
Ibo	59	9.3
Hausa	14	2.2
Others(specify)	78	12.3

Table 3.2: Household characteristics of respondents among public secondary school students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

Characteristics	Frequency	Proportion (%)
Source of water for domestic use		
Well	351	55.3
Bore hole	134	21.1
Tap water	91	14.3
River	59	9.3
Type of toilet facilities		
Open defecation	307	48.4
Water closet	191	30.1
Pit latrine	118	18.5
Bucket latrine	19	3.0

4.2 Prevalence of urinary schistosomiasis by communities;

Sixty five (10.2%) out of 635 samples collected were positive for ova of *S. heamatobium.* Prevalence in boys was 13.3% while prevalence in girls was 7.4%. 41. Ogbese and Obada communities were the most affected with 32.2% and 14.8% community specific attack rate respectively as shown in figure 3.1.

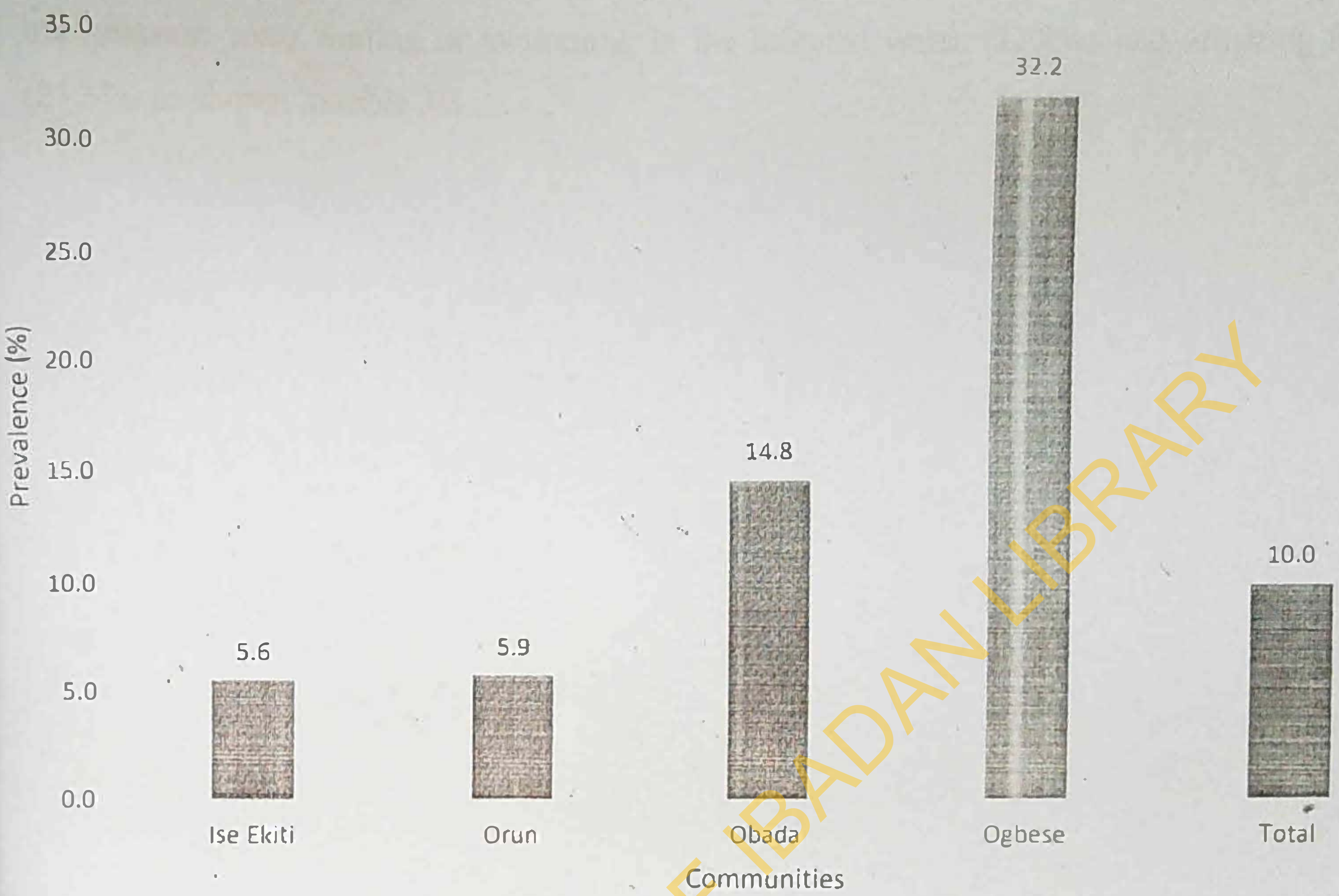


Figure 3.1: Prevalence of urinary schistosomiasis in communities in Ise/orun LGA Ekiti State, May 2016.

Out of the 635 respondents, 93 (14.7%) agreed to had ever passed bloody urine but 54 (8.5%) were currently passing bloody urine (Table 3.3). Activities that enhance schistosomiasis transmission were wading or swimming in the infected water (52.8%) and urinating in water (23.6%) as shown in table 3.3.

Table 3.3: **Activities enhancing transmission of urinary schistosomiasis among public secondary school students in Ise/orun LGA Ekiti State, May 2016.**

Variables	Frequency	Proportion (%)
Swim or wade in rivers		
Yes	335	52.8
No	300	47.2
Type of water frequently contacted		
River	365	57.5
Others	133	21.0
Spring	70	11.0
Pond water	44	6.9
Dam	23	3.6
Urinate in rivers while swimming		
Yes	150	23.6
No	485	76.4
Ever seen someone passing bloody urine		
No	479	75.4
Yes	156	24.6
Relationship with person passing bloody urine		
Friend	99	63.5
Neighbours	21	13.5
Siblings	16	10.3
Family member	8	5.0
Others	12	7.7
Ever passed bloody urine		
Yes	93	14.7
No	542	85.3
Currently passing bloody urine		
Yes	54	8.5
No	581	91.5
Seek medical treatment for schistosomiasis		
Yes	82	12.9
No	553	87.1

4.3 Awareness on urinary schistosomiasis

Of the 635 population sampled, only 429 (67.6%) were aware about schistosomiasis. Of these, only 21.1% had good knowledge on schistosomiasis transmission and 74.6% on how to contact it (Table 3.4). However the commonest source of information on schistosomiasis was the school (68%) while magazine/newspaper had the least 1%.

Table 3.4: Knowledge about urinary Schistosomiasis among public secondary school students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

Variables	Frequency	Proportion
Heard information on schistosomiasis in last 6 months		
Yes	429	67.6
No	206	32.4
Source of information		
School	434	68.3
Health center	16	2.5
Home	63	9.9
Magazine/newspaper	6	0.5
Radio	90	14.2
Television	26	4.1
Know local name of Schistosomiasis in the community		
Yes	416	65.5
No	219	34.5
Causes of Schistosomiasis		
"Atosi aja" germ	450	70.9
Don't know	59	9.3
Eating unripe fruit	61	9.6
Maturity	33	5.2
Witchcraft	31	4.9
Transmission of schistosomiasis		
Swimming in infected water	384	60.5
Passing urine in water by infected person	134	21.1
Drinking dirty water	44	6.9
Shaking hands	12	1.9
Don't know	61	9.6
How one can contact schistosomiasis		
Body contact with infected person	33	5.2
Crossing somebody urine	18	2.3
Mosquito bite	12	1.9
Sexual contact	96	15.1
Swimming/wadding in water	474	74.6
Signs and symptoms of schistosomiasis		
Blood in urine (Heamaturia)	509	80.2
Don't know	77	12.1
Frequent thirsty	14	2.2
Headache	19	3.0
Sweating	16	2.5
Treatment of Schistosomiasis		
Doing nothing	11	1.7
Don't know	53	8.3
Herbs	108	17.0
Use praziquantel	441	69.5
Religious activity	22	3.5

Table 3.5 shows the knowledge grading of schistosomiasis where 41 (6.4%) of the respondents had good knowledge. Table 3.6 shows respondents' knowledge on the signs and symptoms, mode of contact and treatment of schistosomiasis. Of the 635 respondents, 65.5% mentioned the local name for urinary schistosomiasis as "Atosi aja" and 60.5% knew that swimming in the infected water was mode of schistosomiasis transmission.

Table 3.5: Knowledge grading on urinary Schistosomiasis among public secondary school students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

Grading	Frequency	Proportion (%)
Good (>50%)	404	63.6
Poor (<50%)	231	36.4

635

Table 3.5: Knowledge grading on urinary Schistosomiasis among public secondary school students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

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Table 3.6: Determinants of knowledge about urinary Schistosomiasis among students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

What is blood in urine called in your community?	Knowledege grade Good	Poor	Total	Chi-Squared	p value
Atosi aja	338	77	416	186.5	0
Don't know	38	122	160		
Iba aponju	21	21	42		
Iba orere	2	0	2		
Majata	4	11	15		
What is the cause of passing blood in urine?					
Atosi aja	372	78	450	247.9	0
Don't know	13	46	59		
Eating unripe fruit	11	50	61		
Maturity	5	28	33		
Witchcraft	2	29	31		
How is the disease transmitted?					
Don't know	19	42	61	223.5	0
Drinking dirty water	13	31	44		
Passing urine in water by infected person	109	25	134		
Shaking hands	4	8	12		
Swimming in infected water	259	125	384		
How is the disease contacted?					
Body contact with infected person	4	29	33	128.0	0
Crossing somebody urine	7	11	18		
Mosquito bite	2	10	12		
Sexual contact	31	65	96		
Swimming/wadding in water	359	115	474		
What are the signs/symptoms of the disease?					
Blood in urine (Heamaturia)	373	136	509	107.3	0
Don't know	16	61	77		
Frequent thirsty	3	11	14		
Headache	6	13	19		
Sweating	6	10	16		
How can atosi aja be treated?					
Doing nothing	6	5	11	157.7	0
Don't know	10	43	53		
Herbs	36	72	108		
Praziquantel	348	93	441		
Religious activity	4	18	22		

Table 3.6: Determinants of knowledge about urinary Schistosomiasis among students on urinary schistosomiasis in Ise/orun LGA Ekiti State, May 2016.

	Knowledege grade				
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Herbs	36	72	108		
Praziquantel	348	93	441		
Religious activity	4	18	22		

4.4 Preventive methods;

Suggested ways to prevent schistosomiasis transmission in the communities was shown in Table 3.7. The use of drug by respondents was 352 (55.4%) and 75 (11.8%) suggested behavioural change by stop urinating in rivers as some of the schistosomiasis control measures. Others suggested measures include; provision of portable water by 49 (7.7%) and health education by 23 (3.6%) respondents.

Also, table 3.8 indicates the analysis of re-infection rate following series of MAM implementation. Nineteen (4.5%) respondents were currently passing blood out of the 427 respondents that had ever taken PZQ tablets while 35 (16.8%) respondents out of 208 that had never taken PZQ tablets were currently passing blood in urine.

Table 3.7: Knowledge on treatment, prevention and control of urinary schistosomiasis among public secondary school students in Ise/Orun LGA, Ekiti State, May 2016.

Variables	Frequency	Proportions %)
Heard of praziquantel tablet		
Yes	481	75.8
No	154	24.2
Ever used praziquantel tablet		
Yes	427	67.2
No	208	32.8
When used praziquantel last		
<=3months	390	91.3
> 3 months	37	8.7
Perceived ways to prevent schistosomiasis in the community		
Use drug	352	55.4
Stop urinating into the river, avoid swimming in the river	75	11.8
Don't know	63	9.9
Providing bore-holes/Tap water	49	7.7
No response	39	6.1
Health education	23	3.6
Environmental Sanitation	19	3.0
Use herbs	15	2.4

Table 3.8: Analysis of re-infection rate of urinary schistosomiasis among public secondary school students in Ise/●run LGA, Ekiti State, May 2016.

Ever used PZQ	Passing blood in urine presently		
	Yes	No	Total
Yes	19	408	427
No	35	173	208
Total	54	581	635

4.5 Factors associated with of urinary schistosomiasis infection:

Risk factors that were associated with urinary schistosomiasis infection were shown in table 3.9. The use of open defeacation, ever or currently passing bloody urine, swim or wade in river, urinate in the river, not seek treatment for schistosomiasis and having below junior secondary schools (JSS 3), and living at Ogbese were significant factors.

Table 3.9: Factors associated with urinary schistosomiasis infection among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Variable	Schistosomiasis Yes (%)	Schistosomiasis No (%)	OR	95% CI Lower	95% CI Upper	p-value
Knowledge of schistosomiasis						
Poor	42 (65)	350 (61)	1.1	0.7	2.0	0.7
Good	23 (35)	220 (39)				
Use "open defeacation" as toilet						
Yes	44 (68)	263 (46)	2.4	1.4	4.2	<0.05
No	21 (32)	307 (54)				
Swim or wade in water						
Yes	50 (77)	285(50)	3.3	1.8	6.1	<0.01
No	15) (23)	285 (50)				
Urinate in river/stream during visit						
Yes	26 (40)	124 (22)	2.4	1.4	4.1	<0.05
No	39 (60)	446 (78)				
Ever seen anyone passing bloody urine						
Yes	26 (40)	130 (23)	2.3	1.3	3.8	< 0.05
No	39 (60)	440 (77)				
Ever passed bloody urine						
Yes	21 (32)	72 (13)	3.3	1.9	5.9	<0.01
No	44 (68)	498 (87)				
Currently passing blood in urine						
Yes	11 (17)	43 (8)	2.5	1.2	5.1	0.02
No	54 (83)	527 (92)				
Seek treatment for bloody urine						
No	49 (75)	504 (88)	0.4	0.2	0.7	<0.05
Yes	16 (25)	66 (12)				
Level of education						
Below JSS 3	50 (77)	362 (64)	1.9	1.0	3.5	0.04
JSS 3 or more	15 (23)	208 (36)				
Community					Chi square	
Ise Ekiti	12 (18)	203 (36)	1.0		44.4	< 0.01
Orun	16 (25)	256 (45)	1.057			
Obada	9 (14)	52 (9)	2.928			
Ogbese	28 (43)	59 (10)	8.028			

Table 3.9: Factors associated with urinary schistosomiasis infection among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Variable	Schistosomiasis Yes (%)	Schistosomiasis No (%)	OR	95% CI Lower	95% CI Upper	p-value
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Use "open defeacation" as toilet						
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No	21 (32)	307 (54)				
Swim or wade in water						
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No	15) (23)	285 (50)				
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Currently passing blood in urine						
Yes	11 (17)	43 (8)	2.5	1.2	5.1	0.02
No	54 (83)	527 (92)				
Seek treatment for bloody urine						
No	49 (75)	504 (88)	0.4	0.2	0.7	<0.05
Yes	16 (25)	66 (12)				
Level of education						
Below JSS 3	50 (77)	362 (64)	1.9	1.0	3.5	0.04
JSS 3 or more	15 (23)	208 (36)				
Community						Chi square
Ise Ekiti	12 (18)	203 (36)	1.0			44.4 < 0.01
Orun	16 (25)	256 (45)	1.057			
Obada	9 (14)	52 (9)	2.928			
Ogbese	28 (43)	59 (10)	8.028			

Determinants of poor knowledge of schistosomiasis was age of respondents not <= 14 years (OR 1.5, (95% CI.1 – 2.1)), level of education not below JSS 3 (OR 1.7, 95% CI. (1.2 – 2.4)). Others were if the respondents had sought treatment for bloody urine, had not heard or use praziquantel. Also, among the communities living at, Ise and Ogbese are significant to having poor knowledge of schistosomiasis. (Table 3.10).

Table 3.10: Determinants of poor knowledge on urinary schistosomiasis among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Variable	Knowledge		95% CI			
	Poor (%)	Good (%)	OR	Lower	Upper	p-value
Age <=14 years						
No	137 (35)	65 (27)	1.5	1.0	2.1	0.04
Yes	255 (65)	178 (73)				
Level of education < JSS3						
No	155 (40)	68 (28)	1.7	1.2	2.4	< 0.05
Yes	237 (60)	175 (72)				
Seek medical treatment for bloody urine						
Yes	60 (15)	22 (9)	1.8	1.1	3.0	0.03
No	332 (85)	221 (91)				
Heard of praziquantel						
No	118 (30)	36 (15)	2.5	1.6	3.7	< 0.01
Yes	274 (70)	207 (85)				
Took praziquantel						
No	150 (38)	58 (24)	2.0	1.4	2.8	< 0.01
Yes	242 (62)	185 (76)				
Community			**Chi square**			
Orun	141 (36)	131 (54)	1.0	19.5		< 0.01
Obada	39 (10)	22 (9)	1.7			
Ise	149 (38)	66 (27)	2.1			
Ogbese	63 (16)	24 (10)	2.4			

Predictors of schistosomiasis infection in the Ise/Orun LGA communities were respondents residing at Ogbese community (AOR 10. 95% C.I., (5 – 50)), not seeking treatment for schistosomiasis (AOR 4.3., 95% CI. (1.3 – 14.4)), and heard of schistosomiasis (bloody urine) was a protective factor for schistosomiasis transmission (table 3.11).

Table 3.11: Predictors of urinary schistosomiasis among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Multivariate regression		95% CI		
Term	AOR	Lower	Upper	P-Value
Open defeacation	1.4	0.8	2.6	0.20
Heard of bloody urine	**0.3**	**0.2**	**0.8**	**0.01**
Ever seen someone passing bloody urine	1.2	0.5	2.8	0.70
Ever passed bloody urine	2.6	0.9	7.3	0.07
Currently passing bloody urine	1.2	0.4	3.7	0.80
Did not seek medical treatment	**4.3**	**1.3**	**14.4**	**0.02**
Community (Obada vs Ise-Ekiti)	**3.3**	**1.1**	**10.0**	**0.02**
Community (Ogbese vs Ise-Ekiti)	**10.0**	**5.0**	**50.0**	**< 0.01**
Community (Orun vs Ise-Ekiti)	1.0	0.5	2.5	0.90

Table 3.11: Predictors of urinary schistosomiasis among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Multivariate regression		95% CI		
Term	AOR	Lower	Upper	P-Value
Open defeacation	1.4	0.8	2.6	0.20
Heard of bloody urine	**0.3**	**0.2**	**0.8**	**0.01**
Ever seen someone passing bloody urine	1.2	0.5	2.8	0.70
Ever passed bloody urine	2.6	0.9	7.3	0.07
Currently passing bloody urine	1.2	0.4	3.7	0.80
Did not seek medical treatment	**4.3**	**1.3**	**14.4**	**0.02**
Community (Obada vs Ise-Ekiti)	**3.3**	**1.1**	**10.0**	**0.02**
Community (Ogbese vs Ise-Ekiti)	**10.0**	**5.0**	**50.0**	**< 0.01**
Community (Orun vs Ise-Ekiti)	1.0	0.5	2.5	0.90

The predictors of poor knowledge were the use of praziquantel (AOR 1.9, 95% CI. (1.3 – 2.7)), and residing at Orun community (AOR 2. 95% CI.,(1.4 – 3.0) as shown in table 3. 12. Took praziquantel tablets and living in Orun Ekiti community were the two significant variables.

Table 3.12: Predictors of poor knowledge of urinary schistosomiasis among public secondary school students in Ise/Orun LGA, Ekiti State, May, 2016

Multivariate regression

Term	AOR	95% C.I. Lower	95% C.I. Upper	P-Value
Seek treatment for bloody urine	1.5	0.6	3.7	0.4
Took praziquantel	**1.9**	**1.3**	**2.7**	**< 0.01**
Community (Obada vs. Ise-Ekiti)	1.2	0.7	2.3	0.5
Community (Ogbese vs. Ise-Ekiti)	1.1	0.5	2.2	0.8
Community (Orun vs. Ise-Ekiti)	**2.0**	**1.4**	**3.0**	**< 0.01**

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Prevalence of re-infection:

The prevalence of urinary schistosomiasis from the study was high (10%). However, it was far below prevalence reported by Ologunde *et al* (2010) in Ogbese, one of the communities where the present study was conducted in Ise/Orun LGA. The lower prevalence from the study might be a result of several intervention programmes adopted for the control of the disease in the study area. Also, larger coverage in terms of sample selection can explain the difference compared to 172 sampled by Ologunde *et al.* in 2010.

The present study further revealed that both prevalence and intensity of infection were associated with age and gender. Females were less infected than males. The prevalence was found to be higher among males particularly those in junior classes. These outcomes are consistent with the study conducted by Oniya and Odaibo, 2006 in a south western village in Nigeria which indicated that infection rate is higher in male. In contrast, finding from Mbata *et al*, 2009 study conducted in Ogbadibo LGA Benue State, Adewole and Fafure (2012) in pre-school children in Lagos, Nigeria show no observed significant difference in infection among sexes. The difference found in the current study might be attributed to the possibility of males and younger children visit to water bodies than the females and older children.

5.2 Risk factors of re-infection:

High proportion engaged in wadding and swimming in rivers while some do urinate in water bodies while swimming. This finding corroborates the outcome of a similar research conducted in Yemen by Hany et al, (2015) and Amuta & Housmou, (2013) in Guma LGA of Benue State.

Parental occupation (farming) of most respondents exposed them to contact with water bodies frequently putting them at higher risk. Thus in this study, parental occupation was identified as a risk factor for contacting urinary schistosomiasis by school children. This finding is in agreement with the study by Amuta and Houmsou (2014).

Rate of the respondents who never took PZQ tablets and were infected with schistosomiasis is twice those that were re-infected after treatment with the tablets.

This support the WHO 2006 report on control of schistosomiasis that testified to the efficacy of praziquantel tablets as an effective drug towards the control of urinary schistosomiasis.

5.3 Awareness:

School was identified as major source of information about urinary schistosomiasis. The ongoing school health programme in Ise/Orun LGA can explain this finding. However, Biu *et al.*in 2009 have reported similar finding from their study. Generally, most respondents had average knowledge about urinary schistosomiasis and its preventive strategies but poor knowledge about its transmission. Poor knowledge on epidemiology and pathogenicity of urinary schistosomiasis found in Houmsou *et al*, (2013) study in Benue State, Nigeria support finding from this study. Inadequate sensitization about the transmission of the disease among the school children in the LGA may be reason for the transmission.

In this study, parental level of education was a contributory factor to knowledge about urinary schistosomiasis preventive measures among public secondary school students in the study area. Educational backwardness of parents has contributed to inability to properly educate children about preventive measures against urinary schistosomiasis. Children whose parents had no formal/primary education were at disadvantage in this regard (Houmsou *et al.*, 2012). Also, in this study, lack of awareness by the people was a contributory factor to knowledge about urinary schistosomiasis. The poor knowledge found in this study is in agreement with findings from Bala *et al.*, 2012.

Poor knowledge about urinary schistosomiasis as some respondents viewed it as a natural phenomenon that could be outgrown was found to be one of the major contributory factors towards urinary schistosomiasis transmission in the LGA. This was also in accordance with the studies conducted by Nkechi *et. al* (2010) in Delta state and Ukwandu and Nmorsi (2004) in Edo/Delta states in South Eastern Nigeria.

5.4. Conclusion:

Urinary schistosomiasis is a common health problem among public secondary school students in Ise/Orun LGA. High spread and transmission of the disease greatly depend on several factors

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5.4. Conclusion:

Urinary schistosomiasis is a common health problem among public secondary school students in Ise/Orun LGA. High spread and transmission of the disease greatly depend on several factors

ranging from lack of awareness, personal hygiene, parental occupation and some behavioural traits.

5.4.1 Prevalence of re-infection of urinary schistosomiasis among public secondary school students in Ise/Orun LGA.

Ise/Orun LGA was found to be endemic of urinary schistosomiasis. However, the prevalence had been reduced when compared with the prevalence of study from Ologunde *et. al.* in 2010 due to MAM. Males and children in junior classes (JSS) were mostly affected by the disease. This could be attributed to frequent visit to water bodies and parental occupation

5.4.2 Level of awareness on urinary schistosomiasis among public secondary school students in Ise/●run LGA

The children predominantly had little knowledge about the treatment and perceived ways to control/prevent schistosomiasis in the community. School was the major source of information about urinary schistosomiasis and such information were obtained through school health programme. Inadequate knowledge and practices concerning urinary schistosomiasis were found among public secondary school students of Ise/Orun LGA. Low level of awareness could be to low level of parental educational background as some viewed hematuria as normal phenomenon/sign of puberty.

5.4.3 Measures adopted by the students to prevent the spread of urinary schistosomiasis

Several methods were adopted by Ise/Orun LGA to prevent the spread of urinary schistosomiasis. This include: use of drug, stop urinating into the water bodies, avoid swimming/wadding in water and provision of portable water to discourage visitation to rivers and streams. Others were; environmental sanitation, personal hygiene and health education/ awareness creation. Majorly, use of drugs, avoid swimming/wadding in water and stop urinating in water were major preventive means adopted for preventing urinary schistosomiasis in Ise/Orun LGA.

5.4.4 Factors associated with urinary schistosomiasis infection among public secondary school students in Ise/Orun LGA

Wadding/swimming, frequent contacted with river, urination in water bodies, parental occupation and non-seeking of medical treatment were associated with the occurrence of urinary schistosomiasis in Ise/Orun LGA.

5.5. Recommendation

In addition to regular surveillance towards effective reduction in prevalence and elimination of urinary schistosomiasis in Ise/Orun LGA, the following recommendations are necessary.

1. Surveillance of urinary schistosomiasis prevalence should be carried out in the LGA regularly by the LGA and state government. This will assist to monitor the trend of urinary schistosomiasis reduction and efficacy of interventions.

2. Behavioural changes should be promoted and awareness creation strengthened on avoidance of swimming and wading in water through health education by school health programme and NTD control units both at State and LGA level to improve students' knowledge about urinary schistosomiasis and its health implications.

3. Improvement in knowledge on urinary schistosomiasis among the students and community members with emphasis on mode of transmission during planning of MAM activities by the LGA, state and supporting partners.

4. Regular visits to schools by the LGA school health programme and NTD control units to health educate them on the transmission and prevention of urinary schistosomiasis.

5. Development, printing and distribution of information, education and communication materials by the LGA, state and NTD supporting partners for awareness creation among the students.

6. Production and airing of jingles in local language by the state and supporting partners on transmission and prevention of urinary schistosomiasis.

7. Provision of more portable water and repair of bore hole by the RUTTWATSAN to reduce visitation to the rivers.

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Appendices 1: Consent letter

Knowledge of urinary schistosomiasis among Secondary School Students in Ise/Orun LGA, Ekiti State

I am Ojo Herbert kayode, a postgraduate student of University of Ibadan. I am working on this research topic with the objective to determine the prevalence and knowledge of urinary schistosomiasis among public Secondary School Students in Ise/orun LGA, Ekiti state.

This questionnaire is aimed to assess the knowledge of urinary schistosomiasis among Secondary School Students in Ise/orun LGA, Ekiti State and findings will be used to write a dissertation as a partial fulfillment of MPH in Epidemiology and Medical statistics. The knowledge about the disease and identification of associated risk factor(s) will help in instituting prevention and control measures.

If you will be willing to participate in this research you will be required to answer the questions asked from the questionnaire and provide terminal fresh urine. There are no risks associated with the study and your participation and information supplied will be treated with utmost confidentiality. Your participation is voluntary as refusal or withdrawal will have no negative impacts on you.

If you have any further questions, suggestions or opinions about this study, contact the principal investigator, **Ojo Herbert Kayode (0806 037 1850).**

If you will like your child to participate kindly append your signature below after reading or listening and understood the contents of this form.

Name/Signature of participants parent ..... Date .....

Name/Signature of research assistant..... ..... Date.....

Appendices 1: Consent letter

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Appendices 2: Questionnaire on Knowledge of urinary schistosomiasis among Secondary School Students in Ise/Orun LGA, Ekiti State

Questionnaire ID_____ Date of interview_____

Section A: Socio-demographic characteristics

1. Name of Community: .....
2. Name of School: ..... 3. Sex: .....
4. Age (at last birthday) :..... 5. Class: .....
6. Religion (a) Christianity (b) Muslim (c) Traditional (d) Others (Specify).....
7. Residential status: (a) Day student (b) Boarding
8. How long have you been living in this community? (a) <1 year (b) 1 year (c) 2 -3 years (d) 4-5 years (e) > 5 years
9. Did you have your primary education in this community? (a) Yes (b) No
10. If No, where (community and LGA name)? .....
11. Parent educational status (a) No formal education (b) Primary (c) Secondary (d) Tertiary
12. Parent occupation (a) Farming (b) Fishing (c) Laundry service (d) Civil/Public servants (e) Others (Specify).....
13. Tribe (a) Yoruba (b)Ibo (c) Hausa (d) Others (Specify).....
14. Source of water for domestic activities (a) Tap water (b) river (c) well (d) bore hole
15. Which type of toilet facility do you use? (a) pit latrine (b)open defecation (c) water closet (d) bucket latrine

Section B: Knowledge about urinary schistosomiasis

16. Have you heard about anybody (friend or family) passing blood in urine before? (a) Yes (b) No
17. If yes, how long? (a) >1 year (b) 2 years ago (c) 3 years ago (d) >4 years (e) Don't remember
18. Where did you heard about blood in urine? (a) School (b) Home (c) Television (d) Radio (e) Health Center (f) Magazines/Newspaper
19. What is blood in urine called in your community? (a) Atosi Aja (b) Iba aponju (c) Majata (d) Iba orere (e) Don't know

20. What is the cause of passing blood in urine? (a) Eating unripe fruit (b) Atosi aja (c) Maturity(d) Witchcraft (e) Don't know

21. How is the disease transmitted?

    (a) Drinking dirty water (b) Swimming in infected water (c) Shaking hands (d) Passing urine in water by infected person (e) Don't know

22. How the disease (blood in urine) is contacted (Do not read options)? (a) Sexual contact (b) Swimming or wading in water (c) mosquito bite (d) Crossing somebody urine (e) Body contact with infected person

23. What are the signs/symptoms of the disease (Do not read options)? (a) Blood in urine (Heamaturia) (b) Headache (c) frequent thirsty (d) sweating (e) don't know

24. How can Atosi aja be treated? (a) Herbs (b) praziquantel (c) religious activity (d) doing nothing (e) don't know

25. Towards extend did you agree with the following statement:

	Agree	Disagree
Blood in urine is normal while growing up		
There is no need bothering to treat urinary schistosomiasis		
One outgrows urinary schistosomiasis infection		
Urinary schistosomiasis infection reoccurs		
Blood in urine is normal and indicate maturity		
Urinary schistosomiasis affects male only		
Urinary schistosomiasis could affects mental and physical development		
The disease is sexually transmitted		
Urinary schistosomiasis is better treated with herbs		
Its better treated with medicine (drugs)		

Section C: Activities that enhance transmission of urinary schistosomiasis:

26. Do you swim or wade through rivers? (a) Yes (b) No
27. If yes, how often do you swim/wade through water bodies? (a) Daily (b) Once a week (c) more than one/week (d) rarely (e) Never
28. Which type of water body do you come in contact with frequently?

(a) Dam (b) Pond water (c) River (d) spring (e) others (specify)……

29. Do you urinate in water when you visit? (a) Yes (b) No
30. Have you ever seen anyone passing blood in urine? (a) yes (b) No
31. Who is he/she to you? (a) ……
32. Have you ever passed blood in urine? (a) Yes (b) No. If yes,
33. Are you passing blood in urine presently (a) Yes (b) No
34. If yes, for how long? (a) 1 month (b) 3 months (c) 6 months (d) 1 year (e) > 1 year
35. Did you seek for medical treatment? (a) Yes (b) No
36. What did you use to treat yourself? ……

Section D: Treatment, prevention and control of urinary schistosomiasis

37. Have you had of Praziquantel tablet before? (a) Yes (b) No
38. Have you taken Praziquantel tablet before? (a) Yes (b) No
39. How did you think urinary schistosomiasis (Atosi aja) could be prevented/control in this community?

……

……

……

Thank you.

Appendices 3: Ethical Approval

GOVERNMENT OF EKITI STATE NIGERIA

MINISTRY OF HEALTH

Phase III, State Secretariat Complex, Ado - Ekiti, Ekiti State Nigeria.

Our Ref. NO: MOH/PRS/15/76

Date: 5th November, 2015

Ojo Herbert Kayode
Department of Epidemiology and Medical Statistics.
Faculty of Public Health
University of Ibadan
Nigeria.

RE: APPLICATION FOR APPROVAL

Further to your application dated 12th October, 2015 seeking approval to conduct a research titled: **Prevalence and Knowledge of Urinary Schistosomiasis among Secondary Schools in Ise – Orun LGA, Ekiti State,** I wish to convey the position of the State Ministry of Health.

2. Sequel to the request and having studied your proposed research methodology, I am pleased to inform you that your request has been approved. You may wish to liaise with the Administrative Heads of the selected Secondary Schools to assist in any areas of need

3. You are to note that, the national code for health research requires compliance with institutional guidelines, rules and regulations as it is expected that, a copy of the research report be forwarded to the State Ministry of Health while the Ministry also reserves the rights to conduct compliance visits to your facility as at when necessary.

Dr. O O. Alabi (DDPRS)
For: Permanent Secretary

Appendices 4: Letter of Introduction

DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS

FACULTY OF PUBLIC HEALTH
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN, NIGERIA.

Telephone: +234-0-7029271592
(Direct Lines)
(234)-2-2410088 Ext. 2661
Email: emseh@comui.edu.ng

Ag Head: Dr. Olufunmilayo I. Fawole

12th October, 2015.

The Permanent Secretary
Ministry of Health
State Secretariat
Ado-Ekiti
Ekiti State.

Dear Sir/ma,

LETTER OF INTRODUCTION – OJO Herbert Kayode

I write to introduce to you Ojo Herbert Kayode who is a student doing his Masters programmes in Public Health in the discipline of Field Epidemiology Practice in the Department of Epidemiology and Medical Statistics.

His work has been reviewed and approved by me and he requires an ethical approval for his project titled;

> *"Prevalence and Knowledge of Urinary Schistosomiasis among Secondary School Students in Ise-Orun LGA, Ekiti State."*

Kindly give him all necessary assistance.

Thank you.

Yours sincerely,

Dr. Olufunmilayo I. Fawole.

DEPT OF EPID & MEDICAL STAT. COLLEGE OF MEDICINE DATE TIME UNIVERSITY OF IBADAN