THE PREVALENCE OF URINARY SCHISTOSOMIASIS AMONG PATIENTS ATTENDING SOME HOSPITALS IN KEFFI METROPOLIS NIGERIA

BY

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DECLARATION

I hereby declare that this research project been written by me and it a report or my research work. It has not been presented in any previous application for post graduate deplorer degree all quotations are indicated and sources of information specifically acknowledge by means of reference

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ANZAKU SAMUEL DATE

CERTIFICATION

This research thesis titled "Prevalence of Schistosomiasis among Hospital Patients in Keffi metropolis, Nasarawa State' Meets the regulations governing the award of Post Graduate Diploma (PGD) of Nasarawa State University, Keffi, and is approved for its contributions to knowledge and literary presentation.

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DEDICATION

This work is dedicated to the almighty God, the creator of the universe without which there is no existence he is the source of my intellect, And to my loving parents Mr. and Mrs. Akawu Anzaku.

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My gratitude goes to almighty God for his goodness and mercy throughout my life. My profound gratitude goes to my humble and tireless supervisors Prof. O. Amali whose advice, assistance and gave immense contribution to the success of my work. May God reward you and your family in thousand folds.

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LIST OF ABBREVIATIONS

AS - Acute schistosomiais

CDC - Center for Disease Control

CNS - Central nervous system

ELISA - Enzyme linked immunosorbent assay

FGS - Female genital schistosomiasis

HIV - Human immunodeficiency virus

HPV - Human papillomavirus

PCR - Polymerase chain reaction

rpm - Revolution per minute

STIs - Sexually Transmitted Infections

US - Ultrasonography

WHO - World Health Organization

ABSTRACT

In this study, 20mls of clean early morning mid-stream catch urine samples were collected from 200 patients in four selected hospitals in Keffi metropolis. With the assistance of their medical personnel' basic epidemiological information was obtained through constructed questionnaires. The sedimentation method was used and the sediment transferred onto clean grease free glass slide, and examined microscopically. Of the 200 samples (130 males and 70 females), 39(19.5%) were infected with *Schistosoma haematobium*, out of which males had a prevalence of 14.6% compared to 28.6% among females. The statistical analysis revealed that there was significant difference ($P \leq 0.05$) in *Schistosoma haematobium* infection among males and females. The prevalence of *Schistosoma haematobium* in relation to age showed that ages 21-30 years had the highest rate (31.8%). The statistical analysis also revealed a significant difference ($P \leq 0.05$) in *Schistosoma haematobium* infection among the 4 hospitals in the study area. Prevalence of *S. haematobiun* infection in relation to occupation of Business, civil service, fishing, farming and Artisanship was highest among fishing (32.4%) followed by farming (26.3%), civic service (21.4%) Business (14.3%) lowest was in Artisanship (10.3%) Statistically there was significant association ($P \leq 0.05$) between occupation and infection. The prevalence of *S. haematobriun* in relation to source of water was high (29.8%) in River/stream followed by ponds (25.0%), wells (14.0%) Borehole (13.3%) and lowest in pipe borne (11.1%) However statically the association was significant ($P \leq 0.05$) The prevalence of the infection relation to the types of toilet facility available in homes of patients shows that highest prevalence (24.7%) was observed in patients homes where bush is used. Statistical analysis shows that there is significant association ($P \leq 0.05$) in the type of toilet facility in home of patient and the infection.

CHAPTER ONE

INTRODUCTION

1.1 Background of Studies

Schistosomiasis, also known as bilharziasis or snail fever,is primarily a tropical parasitic disease caused by eggs of adult stages of the blood fluke known as *Schistosoma.* The name bilharziasis was coined from the name of Theodor Bilharz, a German pathologist, who first identified the worms in 1851 (Nawal, 2010; WHO, 2010a).

Urinary Schistosomiasis also called Bilharzias is a parasitic disease caused by a genetic blood fluke of the genus Schistosoma called *Schistosoma haematobium*. The disease is the second most prevalent neglected tropical diseases after hookworm Hottez and Kamath, 2009) and remains an important public health problem globa lly especially in the Sub-Saharan African. Of the world's 207 million estimated cases of Schistosomiasis, 93% occur in the Sub-Saharan Africa (192 million) with largest number (29 million) in Nigeria followed by United Republic of Tanzania (19million) (Hottez and Kamath, 2009). Although *Schistosoma haematobium* infection do not always result in clinical diseases and many infections are asymptomatic, *S. haematobium* infection is said to produce bladder wall pathology in approximately 18million people in Sub-Saharan African and 10million people suffer from hydronephrosis and renal failure (Vander Werf *et al*., 2003).

Schistosomiasis is a disease caused by blood trematodes belonging to the genus *Schistosoma*. The World Health Organisation estimates that 200-300 million people in 74 countries are affected with the disease and a further 500-600 million are exposed to the risk of infection. It is primarily a rural disease affecting, agricultural communities and fishermen. There are 3 important species which affect man: *Schistosoma mansoni* causes intestinal schistosomiasis and occurs in Africa, Brazil, Venezuela, Malagasy republic, the Arabian peninsula, the West Indies and Surinam; *Schistosoma haematobium* causes urinary schistosomiasis and occurs in Africa and the Middle East; *Schistosoma japonicum* causes intestinal schistosomiasis and occurs in China, Indonesia and the Philippines. The remaining 2 species infecting humans are *Schistosoma intercalatum* found in West and Central Africa and *Schistosoma mekongi* found in the Mekong River Basin.

A significant percentage of women and men with urinary Schistosomiasis acquire genital ulcers and other lesions (Kjetland *et al*., 2006). Poor reproductive health including sexual dysfunction and infertility [4].Genital Schistosomiasis has also been incriminated to promote horizontal transmission of HIV/AIDS in Sub-Saharan African (Kjetland *et al*., 2006).

In addition to the organ-specific pathology for *S. haematobium* infections, there is also an increasing evidence for more generalized morbidity resulting from chronic inflammation of these long-standing infections (Kjetland *et al* 2006, King *et al*., 2005). The most important are anaemia of chronic inflammation and iron deficiency anaemia, growth stunting and malnutrition among children, fatigue and Diminished physical fitness and impaired cognitive developments among school children (Kjetland *et al* 2006, King *et al*., 2005).

Schistosomiasis is the second most prevalent tropical parasitic disease next to malaria, and is a leading cause of morbidity in endemic areas ofAfrica, Asia and South America (WHO, 1995). In some parts of Africa, the onset of haematuria due to urinary schistosomiasis is very common in adolescent boys, and due to lack of knowledge, it is seen as a normal phenomenon in some communities (Deswitz, 1981). It is estimated that over one third of the world's population, mainly those individuals living in the tropics and sub-tropics, are infected by parasitic worms (Schall *et al.,* 1993).

The disease is said to be responsible for the annual loss of between 1.7 and 4.5 million disability adjusted life years (DALYs),but recent meta analysis challenges these burden estimates; they could be several-fold higher (Chitsulo *et al.,* 2000). Most of the burden of schistosomiasis is concentrated in sub-saharan Africa with the highest prevalence and intensities usually found in school-age children, adolescent and young adults (Jordan *et al.,* 1993). Schistosomiasis has a negative impact on school performance of the pupils and the debilitation caused by untreated infections undermines social and economic development in heavily affected areas (Huang and Manderson, 1992).

After more than 20 years of schistosomiasis control programmes, chemotherapy has been shown to be a very important tool. Nevertheless, in medium and long term infections, good sanitary habits, good water supply, proper sewage drainage and health education seem to be the real tool in definitive schistosomiasis control (Katz *et al.*, 1998).Several environmental and socio-economic factors have been identified to be responsible for the continued persistence of intestinal parasitic infection in children. Some of these factors include poor sanitary conditions, unhygienic practices, lack of potable water, poor housing and poverty (WHO 1991, Edungbola and Obi 1992; Savioli *et al.*, 2003; Amuta *et al.*, 2004).Recent global estimate have indicated than more than a quarter of the world's populations are infected with one or more of the most common parasites; *Ascaris lumbricoides,* hookworm and *Trichuris trichuira* (Nawal 2010; WHO 2010a). Helminth infections are more prevalent among school-aged children (Bundy and Medley, 1992). Maximum prevalence and intensities for *Ascaris lumbricoides* and *Trichuris trichiura* are achieved in children from 5-15 years of age while hookworm and schistosome infections are usually at their peak in late childhood to early adulthood (Bundy and Medley, 1992).

Five species of schistosomes are pathogenic parasites of humans. Out of which *Schistosoma mansoni* and *Schistosoma haematobium* are the most common worms while *Schistosoma japonicum*, *Schistosoma mekongi* and *Schistosoma intercalatum* have a more limited distribution. Other species, such as *Schistosoma matheei* and *Schistosoma bovis* are occasional parasites of human and *Schistosoma incognitum* may also prove infective to humans. The disease caused by schistosomes, schistosomiasis *(*=bilharziasis*)*, is the most important disease of helminth origin and causes untold misery in about 75 countries (WHO, 1985).

About 200 million people are said to be infected and 500-600 million people are exposed to the infection (Webbe, 1981). The Center for Disease Control and

Prevention estimates that 150 to 200 million persons throughout the world are afflicted with schistosomiasis (CDC, 2010).

Control of schistosomiasis depends basically on the control of the snail vectors, a problem which presents an extremely complex ecological situation, and one which has been reviewed in a number of major publications (Jordan *et al.*, 1993; WHO, 1985; Nmorsi *et al.*, 2005; John *et al.*, 2008). Snails of the family planorbidae serve as intermediate hosts of *Schistosoma mansoni* and *Schistosoma haematobium. Schistosoma mansoni* is transmitted by snails of the genus *Biomphalaria* and S. *haematobium* by *Bulinus* species (Chandiwana, 1986; King *et al.*, 1988).

Salinity, temperature, velocity of the water and presence of aquatic vegetation support the snail colonies of the various genera. Snail population in any water reservoir starts to build up at the onset of the rainy season around May, they become abundant between October and December (Shurrock, 2001; Nmorsi *et al.*, 2005).

1.2 Statement of Research Problem

Schistosomiasis currently infects 200 million people in 74 endemic countries (WHO, 2010a). It affects primarily school – aged children. Infections occur when a person comes into contact with fresh water that is infested with schistosome cercariae and containing snail intermediate hosts. The infection can lead to stunted growth and development and in severe cases of bladder cancer and kidney, liver and spleen malfunctions (Kabatereine *et al.*, 2004). Schistosomiasis is prevalent in tropical and sub-tropical areas, especially in poor communities without access to safe drinking water and adequate sanitation. It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa (Habib *et al.,* 2000).

Schistosomiasis infection is associated with rural agricultural and other human activities around the freshwater bodies such as swimming, fishing, washing and bathing in ponds, rivers and dams, where the snail intermediate hosts breed. Construction of earthered dams to facilitate the breeding/ ground for snails. Children are more prone to schistosomiasis infection due to their exposure to water bodies, through fishing, swimming, washing and fetching water for household chores. These activities expose these children to the infective stage of the parasite from the intermediate hosts in these water bodies. Personal hygiene, attitude and play habits make children especially vulnerable to infection (John *et al.,* 2008). Women doing domestic chores, such as washing of clothes in infested water, are also at risk. Urogenital schistosomiasis is also considered to be a risk factor for HIV infection, especially in women. Approximately 10 million women in Africa have schistosomiasis during pregnancy (Mohammed *et al.*, 2007; John *et al.,* 2008).

The economic and health effects of schistosomiasis are considerable. In children, schistosomiaisis can cause anaemia, stunting and a reduced ability to learn, although the effects are usually reversible with treatment. Chronic schistosomiasis may affect people’s ability to work and in some cases can result in death. In sub-saharan Africa, more than 200,000 deaths per year are due to schistosomiasis (WHO, 2010a).

1.3 Justification

Several investigations have been conducted on the prevalence of urinary schistosomiasis in humans in several localities in Nigeria. To the best of our knowledge, no such investigation/research has been conducted in keffi Local Government Area using hospital. There are a lot of water bodies in the area where children and adult often go for fishing and swimming and can come in contact with the infective stage of the parasite. Children are at risk of the disease due to close proximity of irrigation farms and large dam reservoirs to their homes and their personal behaviours. It is with this background that the present study was designed.

1.4 Aim

The aim of this research is to determine the prevalence of urinary schistosomiasis among patients attending four different hospitals in keffi Local Government Area, Nasarawa State.

1.5 Objectives

The specific objectives are to:

i. Determine the prevalence of urinary schistosomiasis infection among patients attending hospital in keffi Local Government Area, Nasarawa State.
ii. Determine the prevalence of urinary schistosomiasis in relation to age and sex.
iii. Determine the prevalence of urinary schistosomiasis in relation to occupation, sources of drinking water and toilet facilities of patients attending hospitals in keffi Local Government Area, Nasarawa State.

1.6.1 Hypotheses

i. Urinary Schistosomiasis is not prevalent among patients attending hospitals in keffi Local Government Area, Nasarawa State.

ii. The age and sex of patients attending hospital are not associated with the prevalence of urinary schistosomiasis in the study area.

iii. There is no specific risk factor associated with the transmission of urinary schistosomiasis to patients attending hospital in keffi Local Government Area, Nasarawa State.

CHAPTER TWO
LITERATURE REVIEW

2.1 Background of Studies

Schistosomiasisis is a parasitic disea se caused by blood flukes (Trematodes) of the genus *Schistosoma*. About 700 million people are at risk of schistosomiasis infection in 76 countries. The disease is endemic among people whose agricultural work, domestic chores and recreational activities expose them to infested water (WHO, 2010a). Schistosomiasis is the third most devastating tropical disease in the world, out of which 85% of infected individuals live in Africa (WHO, 2010b). *Schistosoma* species was discovered by Theodore Bilharz, a German surgeon while working in Cairo. He first identified the etiological agent, *Schistosoma haematobium* in 1851 (Nawal, 2010).

Schistosomes are transmitted to humans through contact with water containing the snail intermediate host that habours the infective stage of the parasite i.e. the cercaria (Shurrock, 2001; Corachan, 2002; WHO, 2010a).

2.2.0 The Parasite – *Schistosoma*

2.2.1 Classification

Kingdom - Animalia
Phylum - Platyhelminthes
Class - Trematoda
Sub-class - Digenea
Order - Strigeiformes
Family - Schistosomatidae
Genus – Schistosoma

2.2.2 Diversity of *Schistosoma* Species and their Geographical Distribution

There are about fifteen species of schistosomes that are prevalent in different areas of the world and produce different symptoms. Some of the important species are: *Schistosoma mansoni, Schistosoma haematobium, Schistosoma mekongi, Schistosoma japonicum* and *Schistosoma intercalatum. Schistosoma mansoni* is widespread in Africa, the Eastern – Mediterranean, the Caribbean and South America and can only infect humans and rodents. *Schistosoma mekongi* is prevalent only in the Mekong river basin in Asia. *Schistosoma japonicum* is limited to China and the Philippines and can infect mammals, such as pigs, dogs and water buffalos, in addition to humans. As a result, it can be more difficult to control disease caused by this species. *Schistosoma intercalatum* is found in Central Africa. *Schistosoma haematobium* occurs predominantly in Africa and the eastern Mediterranean (WHO, 1995; Leder and Weller, 2009). Three out of these species are of vast medical importance; these include *S. haematobium* that causes urinary schistosomiasis and *S. mansoni* plus *S. japonicum* which cause intestinal schistosomiasis.

2.3.0 Life cycle of *Schistosoma*

The life cycle of schistosomes is different from those of other trematodes. Each of the schistosome species requires a snail intermediate host in order to complete its life cycle because humans become infected by penetration of cercaria through intact skin rather than through the ingestion of matacercaria (Fig. 1). Cercaria consists of a body containing glands whose material is used to penetrate skin and a bifurcated tail that is lost when the cercaria penetrates the skin (Fig.2). Once the cercaria have successfully entered the host, the organism is termed a schistosomulum (Sher and Moser, 1981). The schistosomulum migrates through the tissues and finally invades a blood vessel. On entry into the blood vessels, the schistosomulum is carried to the lungs and then to the liver. Once within the liver sinusoids, the worms begin to mature into adults. Adults of *S. haematobium* are found primarily in the blood vessels of the vesical, prostrate and uterine plexuses. The adults of *S. mansoni* and *S. japonicum* are found in the inferior and superior mesenteric veins respectively. The worms form pairs (male and female), with the female lying in the gynecophoric canal of the male (Fig. 3). Sexual maturity of female schistosomes depend on the presence of mature male worms. The female worm has been shown to have selective gene expression in the reproductive tract in the presence of male worms, whereas females separated from male worms lose this capability (Menrath *et al.*, 1995).

Exploitation of these genetic differences may be of value in drug research thereby reducing host morbidity (Drew and Brindley, 1995). Schistosomes have oral and ventral (acetabulum) suckers at the anterior end. The worm surface is a tegument containing a syncytium of cells. The body of the male worm, which is flattened behind the ventral sucker, appears cylindrical as it curves to form the gynecophoric canal to clasp the female worm. The female worm is long, slender, and cylindrical in cross section.

Eggs are deposited in the small venule in the intestine and rectum (*S. japonicum* and *S. mansoni)*;or the venules of the bladder (*S. haematobium).* A mature female

Worm can produce 300 to 3000 eggs per day depending on the species. The eggs are immature when first laid and takes approximately 14 days to develop into mature miracidia. The eggs are nonoperculate and contain spines characteristics of each species. Oviposition takes place intravascularly, and they find their way through the tissues either in the lumen of the bladder and urethra (*S. haematobium)* or into the intestine (*S. mansoni* and *S. japonicum)* to be released from the body in the urine or feaces.

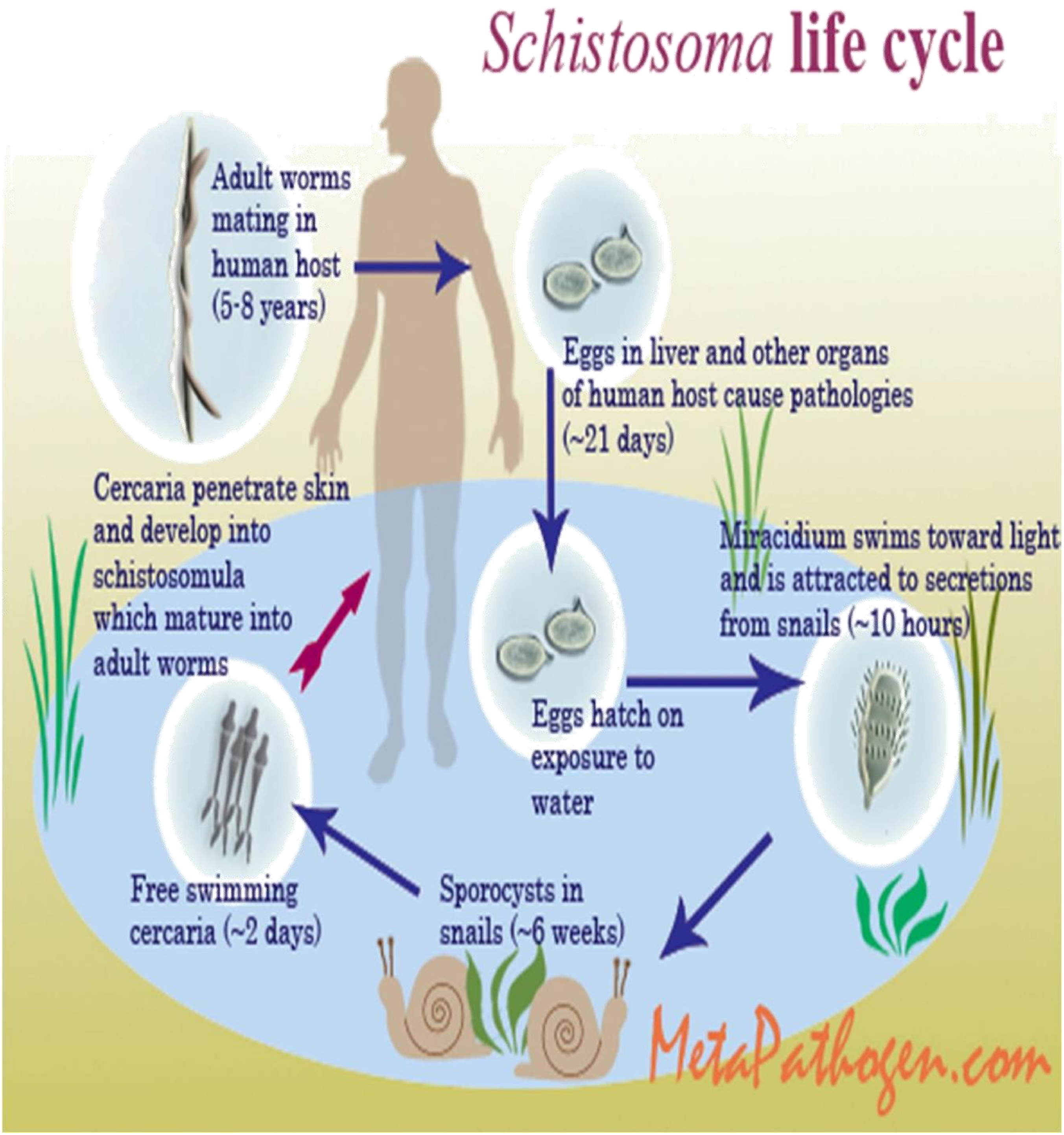

Fig.1. Life cycle of *Schistosoma*

Source: Centre for Disease and Control (CDC 2010).

Egg migration is through the tissues and is facilitated by the release of enzymes through the eggshell by the miracidium. These enzymes help digest the tissues. Eggs making their way through the tissue into the lumen contain a mature miracidium that is released when the egg is in contact with water. The actively swimming miracidium seeks a suitable snail host, which it penetrates. Within the snail, the miracidum develops into a mother sporocyst, which in turn produces daughter sporocysts. The daughter sporocysts develop in the pancreas of the snail and produce cercariae. The miracidium, which may be either female or male, gives rise to cercariae, which are of the same sex as the miracidium. The cercaria is released from the snail into freshwater, where they may infect humans by penetrating the skin.

Although the basic life cycles of schistosomes are similar, there are many species differences that allow one to easily differentiate among them. These differences include; morphological differences, development, and differentiation; intermediate snail host species; and pathologic changes.

Fig. 2: Cercaria of *Schistosoma* specie

*Fig 3.*Adults male and female
Schistosoma species *in copula.*

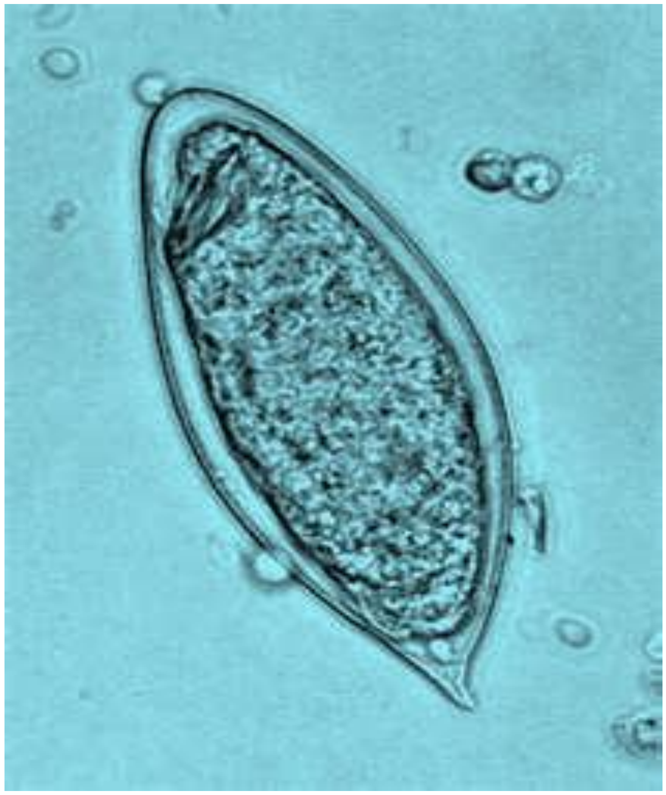

*Fig 4.*Egg of *Schistosoma haematobium*

*Fig 5.*Egg of *Schistosoma mansoni*

2.4 Diagnosis of schistosomiasis

Diagnosis of schistosomiasis is established by demonstrating the eggs in urine or faeces microscopically. Detection of haematuria by reagent strip testing, the main symptom of urinary schistosomiasis due to *S. haematobium* infection, may be a simpler and cheaper alternative for identifying communities in need of treatment (Lengeler *et al.*, 1991). Macrohaematuria can be detected with the help of a questionnaire by asking individuals if they pass blood in urine or by visual examination of urine samples (Friedman *et al.*, 2007). Since 1970, ultrasonography has been applied to visualize lesions in bladder wall caused by trapped *S. haematobium* eggs (Abdel – Wahab *et al.*, 1992). Imaging methods have also been found to be very useful in the diagnosis of schistosomiasis. Ultrasonography is a sensitive means of assessing hepatosplenic disease with periportal fibrosis or urinary obstruction. It can also demonstrate spleenomegaly and urethral obstruction. This method is not suitable for large scale use in control, but it is accepted as a relatively simple non-invasive method in hospitals or research settings (Hatz *et al.*, 1992).

Chest radiographs may show patchy infiltrates in acute schistosomiasis and can indicate pulmonary hypertension and corpulmonale in end-stage chronic infection, if present. Scanning may be useful in the evaluation of CNS disease or in the detection of periportal fibrosis.

The finding of *Schistosoma* eggs in the stool and urine supports a definitive diagnosis. Urine samples can be examined qualitatively after centrifuging. However, eggs are not shed at a steady rate during the day, and quantitative egg counts are useful for determining the degree of infestation and response to therapy. Therefore, 24-hour urine collections may be recommended. Stool specimen may be examined in a thick smear clarified with glycerol (Kato-Katz technique) or by formol-ether concentration technique. Quantitative evaluation allows assessment of the degree of infection and treatment response. Hatching assays may be performed on fresh stool specimens to distinguish active from treated infection because dead eggs may be shed for up to 1 year after treatment.

There are several immunological methods for the diagnosis of Schistosomiasis and these include: The enzyme-linked immunosorbent assay (ELISA) which is helpful in the diagnosis of infection. The test requires the services of highly trained personnels and is specific and sensitive. Polymerase chain reaction (PCR) is another useful serological technique for the diagnosis of schistosomiasis.

2.5 Prevalence of schistosomiasis in Nigeria and other parts of the world

Schistosomiasis is endemic in Nigeria. Studies on Schistosomiasis have been conducted in all parts of the country. Research in Nigeria on schistosomiasis shows that *S. mansoni* and *S. haematobium* are the parasites prevalent in the country. In Edo State, Nigeria, Ugbomoiko (2000) conducted a study on urinary schistosomiasis and observed 30.5% prevalence of haematuria in the population. The prevalence of infection in the derived savannah zone was said to be completely higher than in other geographical zones. It was shown that the peak of transmission of *Schistosoma haematobium* occurred during the dry season (December to May) and lowest during the peak of heavy rains (June to September).The marked reduction in transmission, observed during the rains was said to be due to either the suppressive effect of low temperature condition on the biological productivity of the schistosome infective stage in the snail host or reduction in human water contact activities.

A survey on urinary schistosomiasis was conducted among 180 pupils in three schools in Belwa Local Government Area of Adamawa State, Nigeria and an overall prevalence of 49 (27.2%) was recorded (Duna and Bristone, 2000).

Mbah and Useh (2008) studied a relationship between the transmissions of urinary schistosomiasis and prevailing socio-economic factors in some villages in Lagdo District of the Republic of Cameroon and *Schistosoma haematobium* was confirmed amongst 39.2% of the study population. Mixed infections of *S. mansoni* and *S. haematobium* occurred in only 4.5% of the pupils. Luka *et al.* (2001) studied the prevalence of schistosomiasis among primary school pupils in Lere Local Government Area of Kaduna State. total of 142(12.3%) and 132 (11.3%) pupils had eggs of *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Adeoye and Akabogu (1996) recorded 40% prevalence of *S.haematobium* in urine samples collected from the people of Ado odo / Ota area of Ogun State, Nigeria.

Agbolade *et al.* (1996) carried out studies on the prevalence of urinary schistosomiasis in 356 pupils from Ago – Iwoye in Ogun state. Prevelance of 6.5% was recorded in the study population.

Akogun and Obadiah (1996) recorded a 65.8% prevalence of *S. haematobium* compared with the prevalence of proteinuria (62.8%) and the history of previous haematuria (65.8%). More than 87.8% of those with ova of *S. haematobium* could recall previous cases of haematuria while 83.7% of pupils with protenuria had history of heamaturia.

Ofoezie *et al.* (1996) studied the status of schistosomiasis and some other helminth infections in eight irrigation schemes in Sokoto, Katsina and Kebbi states. They recorded an overall prevalence of 22.3% for *S. haematobium* and 14.5% for hookworm infection. The intensity of *S. haematobium* ranged from 20 to 8,142 eggs / 10ml urine.

Agbolade *et al.* (2007) recorded a 66.2% prevalence of intestinal helminthes in Southwest of Nigeria out of which *Schistosoma mansoni* was recorded in 2.3% and *Schistosoma haematobium* was recorded in 0.6% of the study population.

Arinola (2007) studied the epidemiology of *Schistosoma haematobium* in Ilie village, Osun State. The study showed that few class teachers habour the eggs of *S. haematobium* while in all classes of at least 40 pupils, all the pupils had *S. haematobium.*

Okpala *et al.* (2004) conducted a study on the prevalence of schistosomiasis in

300 apparently healthy primary school pupils in Apata and Laranto areas of Jos. They recorded an overall prevalence of 0.67%. Students that got their water supply from the river and pond were mostly infected, while lower prevalence was recorded among those that use tap water.

Marieke *et al.* (2004) carried out a baseline prevalence study of *S. haematobium* infection based on bladder pathology by ultrasound. The calculated baseline prevalence was 13% in school children and 3% for other members of the community. Apparently, school children had more problems with the bladder.

Currently, about 120 million people are symptomatic with severe clinical schistosomiasis (WHO, 2010a). More than 200,000 deaths are recorded per year due to schistosomiasis in sub-Saharan Africa (Corachan, 2002). Women washing clothes in infested water are at risk of infection (Houston *et al.*, 2007). Poor personal hygiene and the attitude of children in playing and swimming in water have made the children to be more vulnerable and susceptible to infection. Statistics has shown that about forty million women of child bearing age are infected.

The prevalence and intensity of infection rises with age and peaks usually between 15 to 20 years. In adults, there is no significant change in the prevalence of the disease, but the parasite burden or the intensity may decrease (Leder and Weller, 2009; Shurrock, 2011). Worldwide, 1 in every 30 individuals has *Schistosoma* infection (Leder and Weller, 2009). Urogenital schistosomiasis is considered to be a risk factor for HIV infection, especially in women (WHO, 2010a).

In Brazil and Africa, the movement and migration of refugees to urban areas introduces the disease to new locations. Increasing population size and corresponding needs for power and water have led to increased transmission. Infections are not uniformly distributed within communities. It has been estimated that 5-10% of an endemic community may be heavily infected, and the remainder may have mild-to-moderate infections. The risk of infection is highest amongst those who live near lakes or rivers. In Uganda, transmission does not occur at altitudes greater than 1,400m or where the annual rainfall is less than 900 mm (WHO, 2010b).

2.5.2 Age and sex specific prevalence of schistosomiasis

The age and sex specific prevalence of schistosomiasis varies from one area to the other. In a study conducted on schistosomiasis, the pattern of infection was found to be similar in both male and female with peak of prevalence and intensity occurring in 11-15 years (Ugbomoiko, 2000). The infection varied with age reaching the peak among children aged 11-13 years old and dropping sharply thereafter. Males are found to be mostly infected than their female counterparts. This is due to their exposure to outdoor activities like swimming and fishing in water bodies where the snail intermediate hosts are found.

Galadima *et al.* (1992) carried out a survey in Kore, a small agricultural village situated close to the Ahmadu Bello University dam and waste treatment plant, in Zaria emirate, northern Nigeria and showed that 8 out of 34 males (23.53%) and 4 out of 26 female (5.38%) were infected with *S. mansoni*.

Mbah and Useh (2008) conducted a study on schistosomiasis in Cameroon and reported the highest prevalence in the 5-9 years age group (45.7%). The highest prevalence was recorded among the male (23.5%) than the females (15.7%). Luka *et al.* (2001) showed that the highest prevalence (19.6%) of *S. haematobium* infection was observed in the age group 13 years and above while *S. mansoni* prevalence was high (18.2%) in the age group 10 – 12 years. The prevalence of the disease was significantly higher among males than females ($p < 0.05$). Adeoye and Akabogu (1996) conducted a survey among residents of Ado /Ota area of Ogun State and recorded a prevalence of 48.6% in the age group 11 – 20 years followed by 43.2% in 1-10 years age group. The females had higher prevalence of infection compared to males. The mean intensity in the population was 8 eggs per 10ml of urine, intensity in males almost doubled that of females. In a similar study conducted in Sokoto, Katsinaand Kebbi states, the peak prevalence of schistosomiasis among males was 39.3% in the 10-26 years age group and 19.4% for females in the 30-31 years age group (Ofoezie *et al.*, 1996).

2.5.3 Intermediate hosts of schistosomes

Schistosoma mansoni is transmitted by *Biomphalaria* snails while *S. haematobium* is transmitted by *Bulinus* species. Ekwunife *et al.* (2008) investigated some aspects of the biology and population parameters of *Bulinus* *globosus* and *Bulinus truncatus* which are snails implicated in the transmission of urinary schistosomiasis in Agulu Lake Area of Anambra State, Nigeria. The incubation period for the two species was 7-14 days while 21% of the eggs were for both species. The highest rate of ovipositon by *B. globosus* was 261.64 ± 52.84 at week 18.

The snail intermediate host of *Schistosoma haematobium*, i.e. *Bulinus globosus*, were found attached to water hyacinth *(Eichornia crassipes)* in Era stream at the project site (Adeoye and Akabogu, 1996).

Four freshwater bodies in parts of Southwest Nigeria selected on the basis of water contact activities were investigated for aquatic snails, *Bulinus globosus, Bulinus senegalensis* and *Biomphalaria pfeifferi* were found to support bifurcated cercariae (Agbolade *et al.,* 1996). Nwabueze and Opara (2007) encountered four species of snails in riverine communities of Delta State, Nigeria where *Bulinus (Physopsis) globosus* predominated Luka *et al.* (2005) studied the ecology and distribution of snail intermediate host of schistosomiasis in three districts of Lere Local Government Area of Kaduna State. The number and percentages of the snails collected from the nine villages were: 920 (20.1%) *B. forskali; 1310* (28.7%)*B. globosus;* 1110 (24.3%) *B. pfeifferi* and 1215 (26.6%) *Lymnaea natalensis.*

2.6.0 Pathology of Schistosomiasis

2.6.1 Acute phase of Schistosomiasis

Tissue migration of *Schistosoma* larvae may cause a hypersensitivity reaction. Although most clinical manifestations are benign, some maybe severe and may require hospitalization. If acute Schistosomiasis (AS) is not suspected clinically and treated appropriately, it can result in severe morbidity or death. Nonimmune travelers are especially prone to this disease manifestation. After a single exposure to a freshwater pond in Tanzania, 86% of tourists developed AS. Symptoms of AS include cough, fever, and fatigue (King *et al.,* 1988). Symptoms usually appear 2-12 weeks after exposure.

The eggs of schistosomes cause Katayama fever and schistosomiasis. The exact pathophysiology is not known. It occurs 4-6 weeks after infection, at the time of the initial egg release. It is reported most commonly with *S. japonicum* but also has been reported with *S. mansoni.* Katayama fever is believed to be due to the high worm and egg antigen stimuli that result from immune complex formation and lead to a serum sickness—like illness (Badmos *et al.,* 2006).This syndrome is due to immunological reactions to *Schistosoma* eggs trapped in tissues not granuloma formation. Antigens released from the eggs stimulates a granulomatous reaction comprises of T cells, macrophages, and eosinophils that results in clinical disease. Symptoms and signs depend on the number and location of eggs trapped in the tissues. Initially, the inflammatory reaction is readily reversible. In the latter stages of the disease, the pathology is associated with collagen deposition and fibrosis, resulting in organ damage that may be only partially reversible. Eggs can end up in the skin, brain, muscle, adrenal glands and eyes. As the eggs penetrate the urinary system, they can find their way to the female genital region and form granulomas in the uterus, fallopian tube, and ovaries. CNS involvement occurs because of embolization of eggs from the portal mesenteric system to the brain and spinal cord via the paravertebral venous plexus (Friedman *et al.*, 2007).

2.6.2 Chronic schistosomiasis

Chronic schistosomiasis results mostly from host responses to eggs retained in tissues. Most patients are asymptomatic or mildly symptomatic and do not require medical attention. Only a small proportion of the endemic population harbor a heavy worm burden that later leads to clinical complications (Terada, 2009).

a. Gastrointestinal Schistosomiasis

The most common complication is periportal fibrosis, also termed Symmers clay pipestem fibrosis. This leads to portal hypertension and gastrointestinal hemorrhage. Liver failure is uncommon, except in persons with concomitant chronic hepatitis or cirrhosis. Of those with *S. mansoni*, *S. japonicum,* and possibly *S. mekongi,* 4-8% develop shepatosplenic disease (Badmos *et al.,* 2006).A co-infection of either Hepatitis B and C and *S. mansoni* have been shown to give rapid progression of liver disease.

b. Urinary tract Schistosomiasis

This can lead to renal failure due to obstructive uropathy, pyelonephritis or bladder carcinoma (occurring usually 10- 20 years after the initial infection). In addition, immune complexes that contain worm antigens may deposit in the glomeruli, leading to glomerulonephritis and amyloidosis (Terada, 2009).

c. Female genital Schistosomiasis

Schistosoma haematobium causes lesions in the female lower genital tract (i.e. cervix, vulva, vagina). Female genital schistosomiasis (FGS) has been identified as a major social and medical problem that may facilitate the spread of some sexually transmitted diseases such as HIV and human papillomavirus (HPV) (Terada, 2009).

a. Coexistence of sexually transmitted infection and urogenital Schistosomiasis

One study found that, in women with *Schistosoma haematobium* infection in Madagascar, 35% have co-existing sexually transmitted infections (STIs) like *Neiserria gonorrheae, Chlamydia trachomatis*, *Mycoplasma genitalium* and *Trichomonas vaginalis*, as compared with 17% of the men. This is found to be more common in younger populations (15-24 years) than older populations. The association becomes stronger with greater parasite burden (Argemi *et al.,* 2009).

d. Pulmonary arterial hypertension in schistosomiasis

This is an important complication that develops in about 7.7% of patients with hepatosplenic disease in *S. mansoni, S. japonicum*, and possibly *S. mekongi* infections. The prevalence of the disease worldwide is estimated to exceed 270,000 individuals (Badmos *et al.,* 2006).

e. Central Nervous System (CNS) Schistosomiasis

Most cases of cerebral schistosomiasis are observed with *S japonicum.* Central nervous system (CNS) involvement occurs in 2-4% of all *S. japonicum*infections. One million people in China are estimated to be infected with *S. japonicum.* Lapa *et al.,* 2009) Cerobellar nodular enhancing lesions can occur with *S. japonicum*. *S. japonicum* causes 60% of all *Schistosoma* brain infections because of its smaller egg size (Nmorsi *et al.*, 2005). However, CNS schistosomiasis can also occur with other species. Spinal schistosomiasis usually presents as transverse myelitis and is primarily due to *S. mansoni* infection because of the larger egg size (Nmorsi *et al.,* 2005). *Schistosoma haematobium* can infect the brain or the spinal cord. The distribution of *S. mekongi* is limited to the Mekong River basin in Laos and Cambodia, where some 140,000 people are estimated to be at risk for this infection. Temporal mass causing paraesthesias of the arm and leg with dysphasia has been described with *S. mekongi* infection (Friedman *et al.*, 2007). Neurologic symptoms can develop months after the infection. Cauda equina syndrome, anterior spinal artery syndrome and quadriparesis can occur. Most of the lower spinal cord is affected (Nmorsi *et al.*,2005).

2.7 Socioeconomic Importance of schistosomiasis

Schistosomiasis is the second most socio-economically devastating parasitic disease after malaria in terms of socio-economic and public health importance in tropical and subtropical areas. Schistosomiasis is a good example of an environmental danger to older children. At least 100 million children aged 5 – 14 years are infected with schistosomiasis (WHO 1991). These children tend to wash and bath in canal or pond water infested with the parasites, because their families lack clean water.

Several environmental and socio-economic factors have been identified to be responsible for the continued persistence of intestinal parasites in children some of these include poor sanitary conditions, unhygienic practices, absence of portable water, poor housing and poverty (WHO 1991, Edungbola and Obi 1992; Crompton and Savioli, 1993; Amuta *et al.*, 2004; Nwoke 2004).

2.8 Treatment of schistosomiasis

Several medications have been developed against schistosomiasis, such as praziquantel (Biltncide), oxamniquine and metrifonate and have been shown to be safe and effective. Praziquantel is effective against all forms of schistosomiasis and has few side effects. This drug is given in either two or three doses over the course of a single day. Oxamniquine is typically used in Africa and South America to treat intestinal schistosomiasis. Metrifonate has been found to be safe and effective in the treatment of urinary schistosomiasis. Patients are typically checked for the presence of living eggs at three and six months after treatment. If the number of eggs excreted has not significantly decreased, the patient may require another course of medication (King, 2009).

2.9 Prognosis of schistosomiasis

If treated early, prognosis is very good and complete recovery is expected. The illness is treatable, but people can die from the effects of untreated schistosomiasis. The severity of the disease depends on the number of worms, or worm load, in addition to how long the person has been infected. With treatment, the number of worms can be substantially reduced, and the secondary conditions can be treated. The goal of the World Health Organization is to reduce the severity of the disease rather than to completely stop transmission of the disease. There is, however, little natural immunity to reinfection.

Treated individuals do not usually require retreatment for two to five years in areas of low transmission. The World Health Organization has made research to develop a vaccine against the disease one of its priorities.

2.10 Prevention and control of Schistosomiasis

Prevention of the disease involves several targets and requires long term community commitment. Infected patients require diagnosis, treatment and education about how to avoid reinfecting themselves and others. Adequate healthcare facilities need to be available, water systems must be treated to control snail populations, and sanitation must be improved to prevent the spread of the disease.

After more than 20 years of schistosomiasis control programmes, chemotherapy has been shown to be a very important tool. Nevertheless in medium and long term control programmes, sanitation, water supply, sewage draining and health education seem to be the real tools when the aim is persistent and definitive (Katz *et al.,* 1998).

To avoid schistosomiasis in endemic areas the Centre for Disease Control of the United States of America gave the following advice for personal protection:

i. Contact the CDC for current health information on travel destinations.

ii. Upon arrival, ask an informed local authority about the infestation of Schistosomiasis before being exposed to freshwater in countries that are likely to have the disease.

iii. Do not swim, stand, wade, or take baths in untreated water.

iv. Treat all water used for drinking or bathing water can be treated by letting it stand for three days, heating it for five minutes to around 122°F (around 50°C), or treatment drinking water chemically, with chlorine should accidental exposure occur, infection can be prevented by hastily drying off or applying alcohol to the exposed area.

CHAPTER THREE
MATERIALS AND METHODS

3.1 Study Area

This cross-sectional study was carried out in Keffi town, Keffi Local Government Area of Nasarawa state, Nigeria.

The town is 68km from Abuja, the Nation's Federal Capital Territory and 128Km from Lafia, the Nasarawa State Capital. Keffi is located between latitude 80 5, North of the above sea level (Lyam, 2006). According to the 2006 National Census, Keffi has an estimated population of 6700 in which more than 60% reside in the rural areas (Ekpo et al., 2010). From North to South of Keffi, runs the River Antau that provides water for drinking, washing and the outlet of some marshy places for rice farming. Keffi also experience a raining season that lasts from April to October and a dry season from November to March. (Ishaleku *et al*., 2012).

3.2 Study Population

The study population comprises among patients attending hospital in keffi Local Government Area, Nasarawa State.

Four (4) hospital patients were selected randomly for the study. Ethical clearance was sought and received from ERCC, Shukura, Jama'ah and Kowa hospital

Permission was sought from the district head of the study area. The head of laboratory of the selected hospital were visited and briefed on the purpose of the research and dates were fixed for sample collection.

The study population comprised of 100 male and 100 female aged between 1 – 40 years. Each patient selected for the study was given a labeled specimen bottles for urine collection.

Ethical issues

Approval for this study was obtained from the Ethical Committee on Infectious Disease of the shukura Medical Centre, Keffi. Approval was also obtained from the Local Government Council Education Authority, the Authorities of the various hospitals as well as from the patients used for the study. The approval was on the agreement that participants' anonymity must be maintained, good laboratory practice/quality control ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only.

3.3 Determination of Sample Size

Sample size was calculated based on the previous study done using single proportion formula. Sample size will be calculated with confidence interval of 95% and precision of 5%. $N = \frac{(z^2pq)}{d^2}$

Where N = sample size

Z = level of statistical certainty chosen, or confidence interval: 95 % => Z = 1.96

q = 1-p

d = degree of accuracy desired 5 % to the maximum tolerable error for the prevalence estimate 0.05

3.4 Collection of Samples

Urine samples were collected separately in specimen bottles from hospital patient.

Twenty (20) militre of clean mid-stream catch of early morning urine samples used for this study were collected from 200 patients in 4 hospitals in Keffi town from 10am-12noon daily from October to December 2016. Individuals were given cleaned, autoclaved wide mouthed universal bottles and instructed by demonstration on how to provide urine for the study. Structured questionnaires requesting some basic epidemiological information with the assistance of the hospital staff were also used. The specimens were labeled appropriately for laboratory for analysis.

3.5 Administration of Questionnaires

Structured questionnaires were administered to the patients from as samples were collected. Demographic data obtained were name of hospital, sex and age of the patients, sources of water for drinking and household activities, housing sanitation, individuals' occupation and types of toilets.

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3.6 Laboratory Analysis of Samples

The sedimentation method was used by centrifuging 10ml of the urine sample at 5000rpm for 5minutes.

The supernatant was then discarded and the sediment transferred unto clean grease free glass slide, covered with a cover slip and examined microscopically using x40 objective to identify *Schistosoma haematobium* ova which is characterised by the presence of a terminal spine. Eggs were counted and recorded as eggs/10ml of urine. (Ishaleku *et al*., 2012).

3.7 Statistical Analysis

The Chi-squares (X2) test and Correlation analysis (r) were used to compare the percentage infections of S. haematobium in different categories.

CHAPTER FOUR

RESULTS

4.1 Microscopic

Table 1 shows prevalence of *S. haematobium* infection among the four hospitals in the study areas. Overall prevalence made was (19.5%) shukura hospital had the highest prevalence of (22.0) while Jama'ah and Kowa had the least each (18.0%) The statistical analysis also revealed that there was significant difference ($P \leq 0.05$) in *Schistosoma heamstobium* infection between males and females among the Hospital patient.

Table 2 shows prevalence of the infection among sex the prevalence were higher in female (28.6%) and male (14.6%).

The prevalence of *Schistosoms haematobium* infection among patient from the four (4) Hospital in relation ages (Table 3) showed that ages 21-30 years has the highest rate (31.8%) and ages 11-20 years has rate (19.6%) ages >10 years has the rate (18.5%) and yes < 31 years had the last (8.7%) Statistically there was significant association ($P \leq 0.05$) between occupation and infection.

As shows in (table the 4) prevalence of *S. haematobiun* infection in relation to occupation of Businessmen, civic servant, fishermen farmers and African was highest among fishermen (32.4%) followed by farmers (26.3%), civic servant (21.4%) Businessmen (14.3%) lowest was in Artisand (10.3%) Statistically there was significant association ($P \leq 0.05$) between occupation and infection.

The prevalence of *S. haematobriun* in relation to source of water is presented in

(Table 5.) of the 200 respondents a higher prevalence (29.8%) was observed in River/stream as source of water follow by ponds (25.0%), wells (14.0%) Borehole (13.3%) and lowest in pipe borne (11.1%) However statically the association was significant (P ≤o.o5)

The prevalence of the infection relation to the types of toilet facility available in homes of patient in Keffi is presented in (table 6) the higher prevalence (24.7%) was observed in patient homes where bush is used. For pit latrine the Prevalence was water closet system as their toilet facility? Statistical analysis shows that there is significant association ($P \leq 0.05$) in the type of toilet facility in home of patient and the infection.

Table 1 prevalence of *S. haematobium* infection among patients attending selected hospital in Keffi metropolis

Hospital facility	No Examined	No infected	Prevalence (%)
ERCC	50	10	20.0
Shukura	50	11	22.0
Jama'ah	50	9	18.0
Kowa	50	9	18.0
Total	200	39	19.5

$X^2 = 0.2345, P \leq 0.05$

Table 2 prevalence of S. *haematobium* infection among patients attending selected hospital in relation to gender in Keffi metropolis

Gender	No Examined	No infected	Prevalence (%)
Mates	130	19	14.6
Females	70	20	28.6
Total	200	39	19.5

$X^2 = 5.1538, P \leq 0.05$

among patients attending selected hospital in relation to Age, in Keffi metropolis
Table 3 prevalence of S. *haematobium* infection

Age years	No Examined	No infected	Prevalence (%)
>10	54	10	18.5
11-20	56	11	19.6
21-30	44	14	31.8
< 31	46	4	8.7
Total	200	39	19 .5

$X^2 = 0.2345, P \leq 0.05$

Table 4 prevalence of S. *haematobium* infection among patients attending selected hospital in relation to occupation, in Keffi metropolis

Occupation	No Examined	No infected	Prevalence (%)
Business	42	6	14.3
Civic service	28	6	21.4
Fishing	34	11	32.4
Faming	38	10	26.3
Artisanship	58	10	10 .5
Total	200	39	19.5

X^2 = 5.7087., $P \leq 0.05$

Table 5 prevalence of S. *haematobium* infection among patients attending selected hospital in relation to sources of water in Keffi metropolis

Source of water	No Examined	No infected	Prevalence (%)
Pipe borne	27	3	11.1
Well	43	6	14.0
Pond	28	7	25.0
River stream	57	17	29.8
Borehole	45	6	13.3
Total	200	39	19.5

X^2 = 4.9942, $P \leq 0.05$

Table 6 prevalence of S. *haematobium* infection among patients attending selected hospital in relation to types of toilet in Keffi metropolis

Types of toilet	No Examined	No infected	Prevalence (%)
Water system	62	8	12.9
Pit latrine	49	9	18.4

Bush	89	22	24.7
Total	200	39	19.5

$X^2 = 2.2495$, $P \leq 0.05$

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

Urinary schistosomiasis is generally endemic in Nigeria (Hottez and Kamath, 2009). Although there is no current estimate of the disease in the country; past estimates have put the infection at about 25million people and 101 million at risk of infection. The result of this study shows a prevalence of 19.5% of urinary schistosomiasis among the four hospitals in Keffi metropolis.

This result is however; lower as compared to that observed 30.5% of urinary schistosomiasis among schools children in Keffi town (Ishaleku *et al.*, 2012) and (58.1%) among school children in Ilewo-Orile a rural community near Abeokuta, Nigeria (Anosike *et al.*, 2001). 71.8% in settlements near a dam reservoir in Ogun State, Nigeria and that observed (79.4%) in Ezza-North LGA of Ebonyi state, Nigeria (Uneke *et al.*, 2010). These differences in prevalence among these studies could be attributed to the types of water bodies and water contact practices by the hospitals patient in the study areas. All the ages (>10-< 31years) were infected indicating that urinary Schistosomiasis occurs early in life through exposures to contaminated water bodies by the hospitals patient since it is difficult or impossible to prevent patient in this area from visiting the streams for various activities such as bathing, and washing.

There is significant difference in the prevalence of urinary schistosomiasis among gender. This is an indication that all gender was equally exposed to water bodies as contact with the stream by hospitals patient remain unabated throughout that age.

The prevalence of *S. haematobiun* infection in relation to occupation of Businessmen, civic servant, fishermen farmers and African was highest among fishermen (32.4%) followed by farmers (26.3%), civic servant (21.4%) Businessmen (14.3%) lowest was in Artisand (10.3%) Statistically there was significant association ($P \leq 0.05$) between occupation and infection.

The prevalence of *S. haematobriun* in relation to source of water of the 200 respondents a higher prevalence (29.8%) was observed in River/stream as source of water follow by ponds (25.0%), wells (14.0%) Borehole (13.3%) and lowest in pipe borne (11.1%) However statically the association was significant ($P \leq 0.05$) The source of water for drinking, bathing and household use exposes the patient to intermediate hosts that aids in the transmission of the infection (Amuta *et al.,* 2004; Nwoke 2004). Those who solely depend on water from the wells and river/stream were highly infected as compared to those who rely on borehole and pipe-borne water

The higher prevalence recorded among individuals that use water from streams / rivers is due to the fact that the intermediate hosts of the parasites are found in such water bodies. The inability of government to provide clean safe water exposes them to these intermediate hosts. The people living in poor unhygienic conditions may not be informed or aware of the transmission routes of the disease and may not have received any form of health education talk on the transmission and control of Schistosomiasis therefore, they are likely to continuously contaminate the water bodies by indiscriminate defecation or urination, this agreed with the findings of Luka *et al.,* 2001; Amuta *et al.,* 2004; Mbah *et al.,* 2008; Leder *et al.,* 2009 and others.

The prevalence of the infection relation to the types of toilet facility available in homes of patient in Keffi metropolis the higher prevalence (24.7%) was observed in patient homes where bush is used. For pit latrine the Prevalence was water closet system as their toilet facility? Statistical analysis shows that there is significant association ($P \leq 0.05$) in the type of toilet facility in home of patient and the infection.

5.2 Conclusion

In conclusion, the study had provided an idea on the prevalence of Schistosomiasis infection among hospital patient examined showed that schistosomiasis is a serious public health problem; the prevalence rate is higher in males than in females.

This study has shows a 19.5 prevalence of *Schitosoma Haematobium* infection among ages 21-30 years is an relocation that at this age, the patient are highly exposed to *Schistosoma hatobium* infection forms a major public health problem and may be reason for sexual dysfunction and infertility in the community. This age group may also engage in interpersonal social activities that may enhance the transmission of the parents. The community health persona, parent and we the undivided should therefore be aware of this parasite as a potential cause of illness in the society and they can play a major role in promoting hygiene practices and educating the patient on the danger of the parasite and swimming in rivers farming and humoring so that the risk of actuary the parasites during activities and from childhood of this may be reduced. Furthermore, the treatment and control of this parasitic infection among Hospitals parents is of public health concern and should start from the Hospital patient even at the time of delivery to an adult stage.

5.3 Recommendations

Therefore to reduce the morbidity of schistosomiasis in these areas, target or selective chemotherapy should be carried out using praziquantel. A community health eradication campaign and adequate health education should be promoted on the control of the disease. Since this is a predominantly childhood infection, children should be educated on the mode of transmission of the disease and the pathology of the disease and therefore encourage them to adopt control measures. Portable water should be provided in the community with other basic amenities to promote the level of good living in the rural communities, thereby avoiding the use of pond, river and stream water.

These findings have public health implication in the study area beyond therefore following recommendation are suggested.

- Improvement of sanitation, provision of portable water and good toiletry habits should be providul by Government and individuals in Keffi
- Public health campaign programmes should be general towards a better knowledge of the sources and adverse effects of the infection among patients
- Government at all levels should ensure that there is deliberate policy for regular mass treatments of Hospital patient

- Proper and reliable diagriosis techniques such as, the use of sensitive and specific methods examination

REFERENCES

Abdel – Wahab, M.F., Esmat, G., Farran, A., el-Boraey, Y.A. and Strickland, G.T. (1992). Grading of hepatic schistosomiasis by the use of ultrasonography. *American Journal of Tropical Medicine and Hygiene*,**46**(4): 403 – 408.

Adeoye, G.O. and Akabogu, O.A.S. (1996). Occurrence of Urinary schistosomiasis among residents of Ado Odo/Ota area of Ogun State, Nigeria. *Nigerian Journal of Parasitology*,**17**:23-30.

Adewunmi, C.O., Furu, P., Chistensen, N. and Oborunmola, F. (1991). Endemicity, focality, and seasonality of transmission of human schistosomiasis in three communities in South Western Nigeria. *Tropical Medicine and Parasitology*,**43**: 332 – 334.

Agbolade, O.M., Akinboye, D.O., Fajebe, O.T., Abolade, O.M. and Adebambo, A.A. (1996). Human urinary schistosomiasis transmission foci and period in an endemic town of Ijebu North, Southwest Nigeria. *Tropical Biomedicine,* **21**:15-22.

Agbolade, O. M., Agu, N.C., Adesanya, O. O., Odejayi, A. O., Adigun, A. A., Adesanlu, E. B., Ogunleye, F. A., Sodimu, A. O., Adeshina, S. A., Bisiriyu, G. O., Omotoso, O. I., Udia, K. M. (2007). Intestinal helminthiases and schistosomiasis among school children in an urban center and some rural communities in Southwest Nigeria.*Korean Journal of Parasitology*,**45**(3):233 – 238.

Akogun, O.B., and Obadiah, S. (1996). History of Haematuria Among School-Aged Children for Rapid community Diagnosis of urinary Schistosomiasis. *Nigerian Journal of Parasitology*,**17**:11-15.

Amuta, E. U., Omudu, E.A. and Ahmed, A.S. (2004). Bacteriological and parasitological evidence of soil contamination in relation to sanitary facilities in selected schools in Makurdi, Nigeria. *Journal of pest, diseases and vector management*, **5**:337 – 347.

Anosike, JC, Nwoke, BEB, Njoku, AJ (2001). The validity of haematuria in the community diagnosis of urinary schistosomiasis infections. J Helminthol. 75: 223-225.

Argemi, X.,Camuset, G. and Abou-Bakar, A. (2009). Case report: Rectal perforation caused by *Schistosoma haematobium*. *American Journal of Tropical Medicine Hygiene*,**80**(2):179-181.

Arinola, A.G. (2008). Department of chemical pathology and immunology College of Medicine, University College Hospital, Ibadan, Nigeria.

Badmos, K.B., Komolafe, A.O. and Rotimi, O. (2006). Schistosomiasis Presenting as acute appendicitis. *East Africa Medical Journal*, **83** (10): 528-532.

Bundy, D.A. and Medley, G.F. (1992). Immuno-epidemiology of human helminthiasis: ecology and immunological determinants of worm burden. *Parasitology*, **104**:105-119.

Bundy, D.A., Hall, A., Medley, G.F. and Savioli, L. (1992). Evaluating measures to control intestinal parasitic infections. *World Health Statistics Quarterly*, **45**:168-179.

Centers for Disease Control (2010) http://www.cdc.gov.

Chandiwana, S.K., Woolhouse, M.E. and Bradlye, M. (1986). Factors affecting the intensity of reinfection with *Schistosoma haematobium* following treatment with praziquantel. *Parasitology,* **1**: 73-77

Chitsulo, L., Engels, D., Montressor, A. and Savioli, L. (2000). The global status of schistosomiasis and its control. *Acta Tropica*, **77**:41-51.

Corachan, M. (2002). Schistosomiasis and International travel. *Clinical Infectious*

Disease, **35**(4):446-450.

Crompton, D.W.T. and Savioli, L. (1993) Intestinal parasitic infection and Urbanization. *Bulletin of the World Health Organization*, **71**(1): 1– 7.

Deswitz, R.S. (1981). Controlling the schistosomiasis at a snails' face. In Deswitz, R.S. (ed), *New Guinea Tapeworms and Jewish Grand Mothers: Tales of Parasites and People.* Norton, New York. p. 2.

Drew, A.C. and Brindley, P.J. (1995). A male specific sequences isolated from *Schistosoma mansoni* by representational difference analysis, *Molecular Biochemical Parasitology,* **29**: 1483 – 1495.

Duna, C.S. and Bristone, A. (2000). Urinary schistosomiasis among primary school pupils in Belwa Local Government of Adamawa State. *Nigerian Journal of Parasitology,* **21**:3

Edungbola, L.D. and Obi, A.A. (1992). A review of human intestinal parasites in Nigeria. Challenges and prospects for integrated control. *Nigerian Journal of Parasitology*, **13**:27-37.

Ekwunife, C.A.,Ozumba, N.A. and Eneanya, C.I. (2008). Studies on the biology and population parameters of *Bulinusglobosus and Bulinustruncatus* in the laboratory. *Nigerian Journal of Parasitology,* **29**:11-14.

Ekpo, UF, Deile, AL, Oluwale, AS, Sam-Wobo, SO, Mafiana, CF (2010). Urinary schistosomiasis among preschool children in a rural community near Abeokuta, Nigeria. Parasites and Vectors, 3: 58. Hottez, PJ, Kamath, A (2009). Neglected tropical diseases in Sub- Saharan Africa: Review of their prevalence, distribution and disease burden. Plos Negl Trop Dis. 3(8):412

Emejulu, C.A., Alabaraonye, F.F., Ezenwaji, H.M. and Okafor, F.C. (1994). Investigation into the prevalence of Urinary schistosomiasis in the Agulu Lake area of Anambra State, Nigeria. *Journal of Helminthology*, **68:**119-123.

Epidemiological Situation. http://www.who.int/schistosomiasis/ epidemiology/e.

Friedman, J.F., Mital, P., Kanzaria, H.K., Old, G.R, and Kurtis, J.D. (2007). Schistosomiasis and Pregnancy. *Trends in Parasitology,* **23** (4):159-164.

Galadima M., Dada, O.O., Maiganda, N.A. and Ahmodu, O.S. (1992). Preliminary survey of schistosomiasi in Kore village of Zaria emirate. *Savanna,* **13** (2):19-25.

Habib, M., Abdel Aziz, F.,Gamil, F. and Dine, B. (2000). The Epidemiology of Schistosomiasis in Egypt. Qalyubia Governorate. *American Journal of Tropical Medicine and Hygiene,* **62**:49-54.

Hagan, P. and Gryeels, B. (1994). Schistosomiasis research and the European Community. *Tropical Geography Medicine* ,**46**:256.

Hatz, C., Murakam, H. and Jenkins, J.M. (1992). A review of literature on the use of ultrasonography in schistosomiasis with special reference to its use in field studies. *Acta Tropica,* **51**(1): 29 – 36.

Houston, S., Koalewska-Grochowska, K., Naiks, McKean, J., Johnson, S. and Warren, K. (2007). First Report of *Schistosoma mekong*i Infection with brain involvement. *Clinical Infection Diseases,* **38**:1-6. http://infection.thelancet.com. Vol. 6, July 2006.

http://medical-dictionary. The freedictionary.com/Schistosomiasis

http://medical-dictionary.thefreedictionary.com/schistosomiasis.

Huang Y.X. and Manderson, L. (1992). Schistosomiasis and the Social Patterning of Infecton. *ActaTropica,***51**: 175-194.

Ishaleku D, Yako A.B, Usman D and Azamu S.A (2012). *Scholarly Journal of Medicine*, Vol. 2(7) pp. 104-107 October, 2012 Available online at http:// www.scholarly-journals.com/SJM ISSN 2276-7134

John, R., Ezekiel, M., Philbert, C. and Andrew A. (2008). Schistosomiasis Transmission at high altitude crater lakes in Western Uganda. *BMC infectious Disease*,**8**:110.

Jordan, P., Webbe, G. and Shurrock, R.F. (1993). *Human schistosomiasis* Wallingford, Oxfordshire: CAB International. © *Royal Society of Tropical mediums* of Hygiene Published by Elsevier Ltd.

Kabatereine, N.B., Brooker, S.,Tukahebwa, E.M.,Kazibwe F. and Onapa, A.W. (2004). Epidemiology and geography of *Schistosoma mansoni* in Uganda: Implications for planning control. *Tropical Medicine International Health,* **9**:372-380.

Kanwai, S., Ndams, I.S., Kogi, E., Abdulkadir, J.S., Gyam, Z.G. and Bechemagbor, A. (2010). Cofactors influencing intensity of *Schistosoma haematobium* infection in sedentary Fulani settlement of Dumbi. 6th Annual Conference of the Zoological society of Nigeria, Pp. 50 – 51.

Katz, N., Chaves, A. and Pellegrino, J. (1998). A simple device for quantitative stool thick – smear technique in Schistosomiasis *mansoni*. *Revistodo Institute de medicina tropical de sao Paulo,* **14**:397 – 400.

King, C.H., Keating, C.E., Muruka, J.F., Ouma, J.H.V., Houser, H. and Siongok, T.K. (1988). Urinary tract morbidity in *Schistosoma haematobium*: association with age and intensity of infection in an endemic area of Coast Province, Kenya, *America Journal of Tropical Medicine and Hygiene*, **39**(4):361-368 (Medline).

King, C.H. (2009). Toward the elimination of Schistosomiasis, *England Journal of Medicine*, 8, **260**(2): 106-109.

King, CH, Dangerfield-Cha, M (2008). The unacknowledged impact of chronic schistosomiasis, Chronic Illn. 4(1): 65.

King, CH, Dickman, K, Tisch, DJ (2005). Reassessment of the cost of chronic helmintic infection: a meta-analysis of disability-related outcomes in endemic schistosomiasis. Lancet, 365(9470): 156.

Kjetland, EF, Ndhlovu, PD, Gorno, E, Mduluza, T, Midzi, N, et al (2006). Association between genital schistosomiasis and HIV in rural Zimbabwean women. AIDS. 20: 593. Scholarly J. Med. 107

Lapa, M., Dias, B., Jardim, C., Femendes, C.J., Dourado, P.M. and Figuciredo, M. (2009). Cardiopulmonary Manifestations of hepatosplenic Schistosomiasis. *Circulation*, **119**(11):1518-1523.

Leder, K. and Weller, P. (2009). Epidemiology. Pathogenesis, and Clinical Features of *S*chistosomiasis. http://www.uptodate. com.

Lengeler, C., De Savigny, D.O., Mshinda, H., Mayombana, C., Tayari, S., Hatz, C., Degremont, A. and Tanner, M. (1991). Community based questionnaires and Health statistics as tools for the cost efficient identification of communities at risk of urinary schistosomiasis. *International Journal of Epidemiology*, **20**(3): 796–807.

Luka, S.A., Ajogi, I., and Umoh, J.U. (2001). Schistosomiasis among school children in Lere Local Government Area in Kaduna. Nigeria. *Journal of Tropical Biosciences*, **1**(1): 106-111.

Luka, S.A., Ajogi, I.,Audu, P.A. and Umoh, J.U. (2005). Ecology of the intermediate snail host of schistosomiasis in Lere Local Government Area, Kaduna state, Nigeria. *Journal of pest disease and vector management*, **6**:398-403.

Lyam, A (2006). Nasarawa State. In: Mamman, A. B; Oyebanji, J. O. and Fetters, S. W. (ed2s) Nigeria: A people united; A future assured, survey of States. Mellennium edition, Gabumo Press Nigeria, 2000; pp383-385

Mafiana, CF, Ekpo, UF, Ojo, DA (2003). Urinary schistosomiasis in preschool children in settlement around Oyan Reservoir in Ogun State, Nigeria: implication for control. Trop.Med Int Health. 8(1): 78- 82. Nigeria Population Commission (NPC).

Marieke, J., Van Der Werf., Sake, J. and De Vlas (2004). Diagnosis of Urinary schistosomiasis: A novel approach to compare bladder pathology measured by ultrasound and three methods for hematuria detection. *American Journal of Tropical Medicine and Hygiene,* **71**(1):98-106.

Mbah, M. and Useh, M.F. (2008). The relationship between Urinary schistosomiasis and the prevailing socio-economic factors of a rural community in Cameroon. *Nigerian Journal of Parasitology,* **29**(1):5-10.

Menrath, M., Michel, A. and Kuman, W. (1995). A female – specific cDNA sequence of *Schistosoma mansoni* encoding a mucin-based protein that is expressed in the epithelial cells of the reproductive duct. *Parasitology,* **11**:477 – 483.

Mohammed, A. Z., Edino, S.T. and Samaila, A.A. (2007). Surgical pathology of schistosomiasis. *Journal of National Medicine Association,* **99**(5):570-574. National Population Commission of Nigeria 2006.

Nawal, M.N. (2010). Schistosomiasis: Health effects of Women. *Reviews in Obstetrics and Gynecology,* **3**:28-32.

Nmorsi, O., Ukwandu, N. Egwunyenga, O. and Obliemi, N. (2005). Evaluation of CDH, CDH(+)/CD8+) status and urinary schistosomiasis among some rural Nigerians. *African Health Science,* **5**(2):126-130.

Nwabueze, A.A. and Opara, K.N. (2007). Outbreak of Urinary schistosomiasis among school children in Riverine communities of Delta State, Nigeria: impact of road and bridge Construction. *Journal of Medical Science*, **7**:572-578.

Nwoke, B.E.B. (2004). The impact of changing human environment and climate change on emerging and re-emerging parasitic diseases. 28th Annual Conference of Nigerian Society for Parasitology, **23**:3-10.

Ofoezie, I.E., Bolton, P.,Imevbore, A.M.A. and Christensen, N.O. (1996). Schistosomiasis and Other Helminth infections in irrigation schemes in Sokoto, Katsina and Kebbi States of Nigeria. *Nigerian Journal of Parasitology*, **19**:31-37.

Okpala, O., Herbert, E., Agwu, A.I., Mathaias, C.R., Onyirioha, N.O. and Gilbert, O.A. (2004). A survey of the prevalence of schistosomiasis among pupils in Apata and Laranto areas in Jos, Plateau State. *Online Journal of Health and Applied Sciences* (unpaginated).

Parker, M. (1992). Re-Assessing disability: the Impact of Schistosoma infection on daily activities among women in Gezira Province, Sudan. *Social Science Medicine,* **35**:877-890.

Sarmukaddan S.B. and Garad, S.G. (2006). On Validity of Assumptions While Determining Sample Size. *Indian Journal of Community Medicine,* **29**(2): 2004 – 2006.

Savioli L., Crompton D.W. and Neira M. (2003). Use of anthelminthic drugs during pregnancy. *American Journal of Obstetric Gynecology,* **188**(1): 5 – 6.

Schall, V.T., Dias, A.G., Malaguias, M.L. and Dos-Santos, M.G. (1993). Health Education in 1st grade public schools at the periphery of BeliHorzonte, Brazil. *Revista do Institute de Medicinia Tropical de Sao Paulo,* **35**:563 – 572.

Sher, A. and Moser, G. (1981). Schistosomiasis immunologic properties of developing schistosomule. *American Journal of Pathology,* **102**:121 – 126.

Shurrock, R.F. (2001). The schistosomiasis and their intermediate hosts. In: Mahmood, AAF (Ed) *Schistosomiasis*. Imperial College. London, 7-83.

Swai, B, Poggensee, G, Mtweve, S, Krantz, I (2006). Female genital schistosomiasis as an evidence of a neglected cause of productive ill- health: A retrospective histopathological study from Tanzania, BMC infect. Dis. 6: 134.

Terada, T. (2009). Schistosomal Appendicitis: incidence in Japan and a case report. *World Journal Gastroenterology*,**15**(13): 1648-1649.

Ugbomoiko, U.S. (2000). Urinary schistosomiasis in Edo State. *Nigerian Journal of Parasitology,* **21**:3 – 14.

Ugbomoiko, U.S. and Obiamime, B.A. (1993). Evidence of depression in Parasitic gastrointestinal tract infection by a concurrent *Schistosoma haematobium* infection in man. *Medicus,* **2**(1):19-23.

Ukaga, F.N., Onyeka, P.I.K. and Nwoke, B.E.B. (2002). *Practical medical parasitology for biological and medical students.* Avan Global Publication. Owerri, Nigeria. 341pp.

Useh, M.F. and Ejezie, G.C. (1999). Modification of behaviour and attitude in the control of behavior and attitude in the control of schistosomiasis and perception of infections. *Annal Tropical Medicine and Parasitology*, **93**:711 – 720.

Utzinger, J. and Keiser, J. (2004). Schistosomiasis, and Soil Transmitted helminthiasis: Common drugs for treatment and control. *Expert OpinPharmacother*,**5**:263-285.

Uneke, C, Ugwuok-Adibuah, S, Nwakpu, K, Ngwu, B (2010). An assessment of Schistosoma haematobium infection and Urinary tract bacterial infection amongst school children in rural eastern Nigeria. The internet jou. of Laboratory medicine, 4:1

Van der Werf, MJ, de Vias, SJ, Brooker, S, Looman, CW, Nagelkerke, NJ, et al (2003). Quantification of clinical morbidity associated with schistosoma infection in Sub-Saharan Africa. Acta trop. 86(2-3): 125.

Webbe, G. (1981) Schistosomiasis. Some Advances. *British Medical Journal,***283**:1-8.

Wentworth, B.B. (1988). Diagnostic procedures for myocotic and parasitic infections. *American public health association publication.* Maryland, U.S.A. 639pp.

Woodhouse M. (1998). Patterns in parasite epidemiology; The peak shift. *Parasitology Today*, **14**:428-434.

World Health Organization (1985). The control of schistosomiasis. *Technical Report Serie*s, **728**:113pp.

World Health Organization (1991). The Control of schistosomiasis: Second report of the WHO Expert Committee. P.4 *WHO, Geneva,* Switzerland.

World Health Organization (1995). The Control of Schistosomiasis. *Technical Report Series* No. 830, Geneva.

World Health Organization(2002). Prevention and Control of Schistosomiasis and Soil-Transmitted Helminthiasis: Report of a WHO expert committee. WHO *Technical Report Series:***912**: 1-57.

WHO. World Health report 2004. Changing history. Geneva: WHO, 2004.

World Health Organisation (2010a). Schistosomiasis, Fact Sheet, No. 115. http://www.who.int/mediacentre/facesheet/fs115/ en/indexhtml.

World Health Organisation (2010b).Weekly epidemiology record. http://ww.who.int.luck

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APPENDICES

Appendix I

QUESTIONNAIRE

Kindly complete the following question. The questionnaire seek to determine the prevalence of schistosomiasis among patient attending hospital in Keffi metropolis.

It is strictly for academic purpose. Results obtained will be treated with absolute confidentiality.

Hospital ____

Individual number____

Kindly tick the correct options or fill in the spaces where necessary. Place of residence:

1. occupation____

2. Sex____

3. Date of birth / age____

4. Source of drinking water. a. Pipe-borne [ ] b. Well [ ] c. Pond/rain [ ] d. River / stream [ ] e. Borehole [ ]

5. What are the methods of feacal disposal? a. Bush [ ] b. Pit latrine [ ] c. Water – closet toilet [ ]

6. Is any pond present around the house? a. Yes [ ] b. No [ ]

7. Does the patient go there to play or goes to:

i.	Play	a. Yes [ ] b. No [ ]
ii.	Wash	a. Yes [ ] b. No [ ]
iii.	Swim	a. Yes [ ] b. No [ ]
iv.	Fishing	a. Yes [ ] b. No [ ]
v. Both fishing and swimming		a. Yes [ ] b. No [ ]
vi. None of the above		a. Yes [ ] b. No [ ]

. Any treatment administered? a. Yes [ ] b. No [ ]