

**PARASITOLOGICAL SURVEY OF *SCHISTOSOMA*
HAEMATOBIIUM INFECTION AMONG SCHOOL CHILDREN IN
MKURANGA DISTRICT, TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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ABSTRACT

The aim of this study was to conduct a parasitological survey of *Schistosoma haematobium* infection among school children in Mkuranga District. The study has three specific objectives: First, to determine the prevalence of urinary schistosomiasis, second to determine the intensity of infection of urinary Schistosomiasis and third to assess awareness, knowledge, attitude and practices related to the occurrences of urinary schistosomiasis among school children in Mkuranga District. The data for this study were collected using a structured questionnaire that was administered to a random sample of 420 primary schools pupils within four divisions in Mkuranga District. Laboratory work was done at Mkuranga District Hospital in the parasitological department, after a single terminal urine sample collected from each participant. Descriptive statistics including means, standard deviation, frequencies ,percentage was analysed using Statistical Package for Social Science version 20 (SPSS version 20). Prevalence for urinary schistosomiasis were determined by considering number of positive urine sample collected in the study population from November to December 2014 and intensity were calculated using geometric mean intensity (GMI). After that the results were presented using tables, graphs and charts. The findings revealed that of the combined total of 420 pupils (225 males and 195 females) examined in this study an overall prevalence rate of Schistosomiasis of 9.2% was obtained. Severe infection of *S. haematobium* ova was higher for the male pupils (86 ova/10ml) compared to female (79.2 ova/10ml). Prevalence of Schistosomiasis infection was significantly higher for male pupils compared to their counterpart female pupils. Pupils of age 13 were found to have severe infection 118.2ova/10ml compared to other pupils in other age groups. Prevalence and severity or intensity of the infection was relatively higher in Mkamba division (16.1%) compared to other divisions. Overall level of awareness and knowledge about Schistosomiasis amongst school pupils in Mkuranga

was relatively high. Majority (92.4%) of the pupils in this study have knowledge on urinary schistosomiasis. Urinary Schistosomiasis is particularly common in the study area, 89% of the pupils in this study have had experience of urinating blood sometime in their life time. Pupils mentioned various ways of preventing Schistosomiasis, but the majority mentioned to continue with Praziquantel-MDA. Therefore, community-based treatment using Praziquantel should first be targeted to school-age children. This high risk group can be reached through the primary school system, in collaboration with the educational sector health education, large-scale chemotherapy and media campaign for all schoolchildren to decrease the prevalence and intensity of infection.

DECLARATION

I, Aron Nzallah, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

Aron Willison Nzallah

(MSc. Candidate)

Date

The above declaration is confirmed

Professor Ayoub Kasuku

(Supervisor)

Date

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DEDICATION

For my wife (Nasemba Kisaka) and my children Neema and Nathan. You are truly a gift from above, may this work inspire you to work hard and achieve more in your life. I Love You A Lot.

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LIST OF ABBREVIATIONS

CDC	Centre for Disease Control
DAS	District Administrative Secretary
DED	District Executive Director
DVC	Deputy Vice Chancellor
GMI	Geometric MeanIntensity
MDA	Mass Drug Admistration
MRCC	Medical Research Coordinating Committee
NTD	Neglected Tropical Disease.
RAS	Regional Administrative Secretary
SPSS	Statistical Package for Social Science version
WHO	Wold Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Human schistosomiasis or bilharzias is a chronic parasitic disease causing morbidity and mortality with over 200 million people infected worldwide (Payne *et al.*, 2013). It is estimated that 93% of human schistosomiasis occur in Sub Saharan Africa and that the United Republic of Tanzania is the second country that has the highest burden of schistosomiasis in the region, Nigeria being the first (Mazigo *et al.*, 2012). *Schistosoma haematobium* causes urogenital schistosomiasis while *Schistosoma mansoni* causes intestinal schistosomiasis. The parasite (*Schistosoma haematobium*) is found in the venous plexus draining the urinary bladder of humans. Urinary and intestinal Schistosomiasis becomes a major public health problem and was rated second to malaria in terms of human infection (Payne *et al.*, 2013).

It is possible that the number of people affected could be higher, taking into account other people who do not seek medical attention from the health facilities for various reasons such as underestimating the seriousness of the illness among other things (Champo, 2009). Approximately two-thirds of the schistosomiasis cases are a result of *Schistosoma haematobium* infection. Possible consequences of *Schistosoma haematobium* infection include hematuria, dysuria, egg granulomatous lesions in the bladder, kidney failure, and the disease if untreated it can pose a great risk to urinary bladder cancer. Other health impacts associated with the disease are risk of anaemia, stunted growth to children and impairment of cognitive development in infected individuals (Wallace, 1998).

Primary school children are particularly vulnerable to schistosomiasis because of their habit of playing, swimming and fishing in water bodies, where they may contact the infection.

As such, they are the ideal target group to investigate the prevalence and intensity of Schistosomiasis and the data collected from this age group can be used to assess whether schistosomiasis threatens the health of school children but can also be used as a reference for evaluating the need for community interventions. The prominence of infection is attributed to poor environmental sanitation and inadequate access to safe tap water; these conditions lead to continued exposure to the infective stages of parasite and thus high rates of re-infection (Catherine *et al.*, 2003).

The Government and other stakeholders have to increase number of water development projects in area with poor sanitation and running water. These projects are without doubt very important and sometimes necessary. At present there is no documented intervention measure in Mkuranga District which is among the vulnerable area being having delta many ponds. Therefore there is the need for a detailed study among school children since they are the major contaminators of surface water, have the highest prevalence and intensity of infection and hence the major reservoir of infection.

1.2 Problem Statement and Justification

Schistosomiasis is a global public health concern which requires the participation of everyone in order to mitigate its effects. Above all, it calls for will and involvement of healthcare providers and other stake holders to join efforts to try and eliminate the problem. Review of literature has shown that urinary schistosomiasis is a prevalent parasitic infection affecting millions of people worldwide (Champo, 2009).With the

current rate of global warming and population increase, there is an even greater risk of higher prevalence and mortality due to this disease.

According to the first WHO report on Neglected Tropical Disease (NTD) few countries have eradicated the disease, still many more are working towards it. However, an accurate accounting of how many Tanzanians are infected with each of the Neglected Tropical Diseases does not currently exist. Measurable estimate can be attained by extrapolating from the measured disease prevalence rates over the entire population.

Hence this study aimed to determine the prevalence and intensity of urinary schistosomiasis and the factors that contribute to the magnitude of the problem among schoolchildren in Mkuranga District. The results could be used to improve planning, implementing, monitoring and evaluation of Urinary Schistosomiasis interventions in the area.

1.3 Objectives

1.3.1 Overall objective

To conduct a parasitological survey of *Schistosoma haematobium* infection among school children in Mkuranga District.

1.3.2 Specific objectives

- i. To determine the prevalence of urinary schistosomiasis among school children in Mkuranga District
- ii. To determine the intensity of infection of urinary schistosomiasis among school children in Mkuranga District.

- iii. To assess awareness, knowledge, attitude and practices related to the occurrences of urinary schistosomiasis among school children in Mkuranga District.

1.4 Research Questions

- i. What is the prevalence of urinary Schistosomiasis among school children in Mkuranga District?
- ii. What is the intensity of infection of urinary Schistomiasis among school children in Mkuranga District?
- iii. What are the knowledge, attitude and practices related to the occurrences of urinary Schistosomiasis?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Current Situation and trends of Schistosomiasis

According to Engels *et al.* (2002) while the distribution of Schistosomiasis has changed over the last 50 years and there have been successful control programmes, the number of people estimated to be infected or at risk of infection has not been reduced in Sub-Saharan Africa, where the population has increased by approximately 70% over the last 25 years (Engels *et al.*, 2002). Today 85% of infected people are estimated to be on the African continent where limited control efforts are made. In terms of disease burden, there is a growing discrepancy between Sub-Saharan Africa and the rest of the world (Bergquist, 2002).

According to Mazigo *et al.*, 2001 the available evidence indicates that, both urinary and intestinal schistosomiasis are still highly endemic in Tanzania and cause significant morbidity. Mass drug administration using praziquantel, currently used as a key intervention measure, has not been successful in decreasing prevalence of infection.

In a study conducted in Unguja in 2013, found that 3.4% of the children from standard 1 had microhematuria and 5.2% had *S. haematobium* eggs diagnosed in their urine. Microhematuria was detected in 7.3% and *S. haematobium* infections in 3.8% of the school children aged 9–12 years (Knopp *et al.*, 2013). In Pemba, microhematuria and *S. haematobium* eggs in urine were diagnosed in 14.9% and 12.2% of children attending standard 1 and in 11.1% and 8.1% of school children aged 9–12 years, respectively (Knopp *et al.*, 2013).

In most parts of Tanzania where the disease prevalence were high, local people associated Schistosomiasis with urinating blood because of spending time in a dirty river. Despite this association, only a few students and teachers could describe the transmission cycle associated with a parasite and snail in studies conducted in Pemba, Unguja and Morogoro (Knopp *et al*, 2013; Zumstein, 1983).

Moreover urinary schistosomiasis is common in many parts but focally distributed within regions and districts (Kihamia, *et al.*, 1978, Brooker, *et al.*, 2001, Stothard *et al.*, 2002). The disease is concentrated in areas along Lake Victoria with the prevalence of 67% among school aged children (in the hinterland furthest from the lakeshore, and lowest along the lakeshore) and the Coastal zone of the Indian Ocean with the prevalence of 54% (Lwambo, *et al.*, 1999).

The existence of some of the hot-spots for schistosomiasis transmission on both area with high prevalence, like coast regions and islands is known from previous studies (Savioli L, Mott, 1989; Rudge, *et al.*, 2008) and the parasite have been resilient to the preventive chemotherapy campaigns over the past years, maintaining high prevalence and infection intensities. It is therefore being important to intensify control interventions particularly in these communities in future years to reduce significantly and to interrupt transmission.

2.2 Risk Factors for Schistosomiasis

Schistosomiasis is an important cause of disease in many parts of the world, most commonly in places with poor sanitation. School-age children who live in these areas are often most at risk because they tend to spend time fishing, swimming or bathing in water which may contain infectious Cercariae. According to CDC (2012), *Schistosoma*

haematobium is distributed throughout Africa. There is risk of infection in freshwater in sub-Saharan Africa—including the great lakes and rivers as well as smaller water bodies.

Schistosomiasis is prevalent in tropical and sub-tropical areas, especially in poor communities without access to safe drinking water and adequate sanitation (McCullough, 1972). It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa. The economic and health effects of schistosomiasis are considerable and the disease disables more people than it kills. In children, schistosomiasis 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. The number deaths due to schistosomiasis are difficult to estimate because of hidden pathologies such as liver and kidney failure and bladder cancer.

Generally the main factors that may influence the prevalence of schistosomiasis include low literacy levels, poverty, sub-standard hygienic practices, and inadequate public health infrastructure especially in rural communities. There is even an increased risk of higher prevalence of the infection due to global warming and increased populations. Most studies have shown that the most affected group are the school children; however, everybody else is at greater risk of contracting the disease if in contact with infested water (Champo, 2009).

2.3 Treatment and control of Schistosomiasis in Highly Endemic Areas

In Tanzania, the first cases of schistosomiasis were reported in the early 19th century (Mazigo et al., 2012). Since then, various studies have reported prevalence of up to 100% in some areas. However, for many years, there have been no sustainable control

programmes and systematic data from observational and control studies are very limited in the public domain.

The main principles of schistosomiasis control, such as the concept of morbidity control and the recommendation that it should be implemented through the primary health care system have not changed since the second meeting of the WHO Expert Committee (WHO, 1993). Nevertheless, control has changed during the last decade in that Community –based treatment should first be targeted to school-age children as they can be reached through primary school system.

According to WHO treatment guideline, the treatment of schistosomiasis has undergone a radical change in recent times. Whereas 3 anti-schistosomal drugs used globally were on the list of essential drugs, *metrifonate* has been withdrawn from the market. *Oxamniquine* is not universally available. This leaves *praziquantel* as the only widely available drug for treatment. *Praziquantel*(*Biltricide*) is the drug of choice for all *Schistosoma* species that occur in humans. A single oral dose of 40mg/kg body weight is effective in *S.haematobium* and *S.mansoni* infections.

Literatures shows that large-scale implementation of anthelmintics delivered through the school system can significantly decrease infection and morbidity among school children in most part of Sub Saharan Africa (Simon *et al.*, 2001). The experience of the Uganda national control programmes confirms that the potential of helminth control, previously demonstrated through pilot programmes, can be realized at realistic geographical scale in sub-Saharan Africa.

2.5 Environmental Aspect of Schistosomiasis

The impact of environmental changes affecting most classes of human pathogens has not spared schistosomiasis. The effect of unsafe water and lack of sanitation on the distribution and transmission of schistosomiasis. Several studies have addressed the effects of ecological and environmental changes on the distribution and transmission of schistosomiasis. It has been argued that increasing human population pressure and related activities have decreased the densities of snail in water bodies, which in turn has increased the densities of intermediate host species and subsequently the transmission of *Schistosoma haematobium*.

Moreover, it has been argued that weather conditions, in terms of rainfall, wind, temperature, water bodies' level have strong influence on intermediate host densities and transmission of the infection (Makaula *et al.*, 2014, 7:570). Furthermore, the distribution of schistosomiasis is focally, since transmission depends on specific snail hosts and water contact human activities (Simon *et al.*, 2001).

The prevalence, intensity of infection, and transmission intensity of schistosomiasis is determined by numerous factors including socio-economic, human behaviour, ecology and biological factors which influence the interactions between human and animal hosts and life cycle stages of the parasites.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

The study was carried out in Mkuranga District in the Pwani Region, The district has a total area of 1533 sq. km., whereas 447 sq. km are covered by water (Indian Ocean), 52 sq. km. are forest reserve area and 1034 sq km of land suitable for cultivation.

Mkuranga District lies between latitude $6^{\circ} 35'$ and $7^{\circ} 30'$ south of the equator and between longitudes $38^{\circ} 45'$ and $39^{\circ} 30'$ to the East. The District borders with the Dar es Salaam Region to the north, Indian Ocean to the East, Rufiji District to the south and Kisarawe District to the West. Climatically, the District experiences dual rainfall. The shorter rains which start in October and end in December, and long rains covering the month of March to June. The average rain is about 800 – 1000 millimeters per annum.

The rainfall distribution however is not very reliable. It is hot throughout the year with average temperature of 28 centigrade. The District is divided into two major agro-ecological zones which differ due to land form as well as soil classification. These zones are Coast belt and Upland areas.

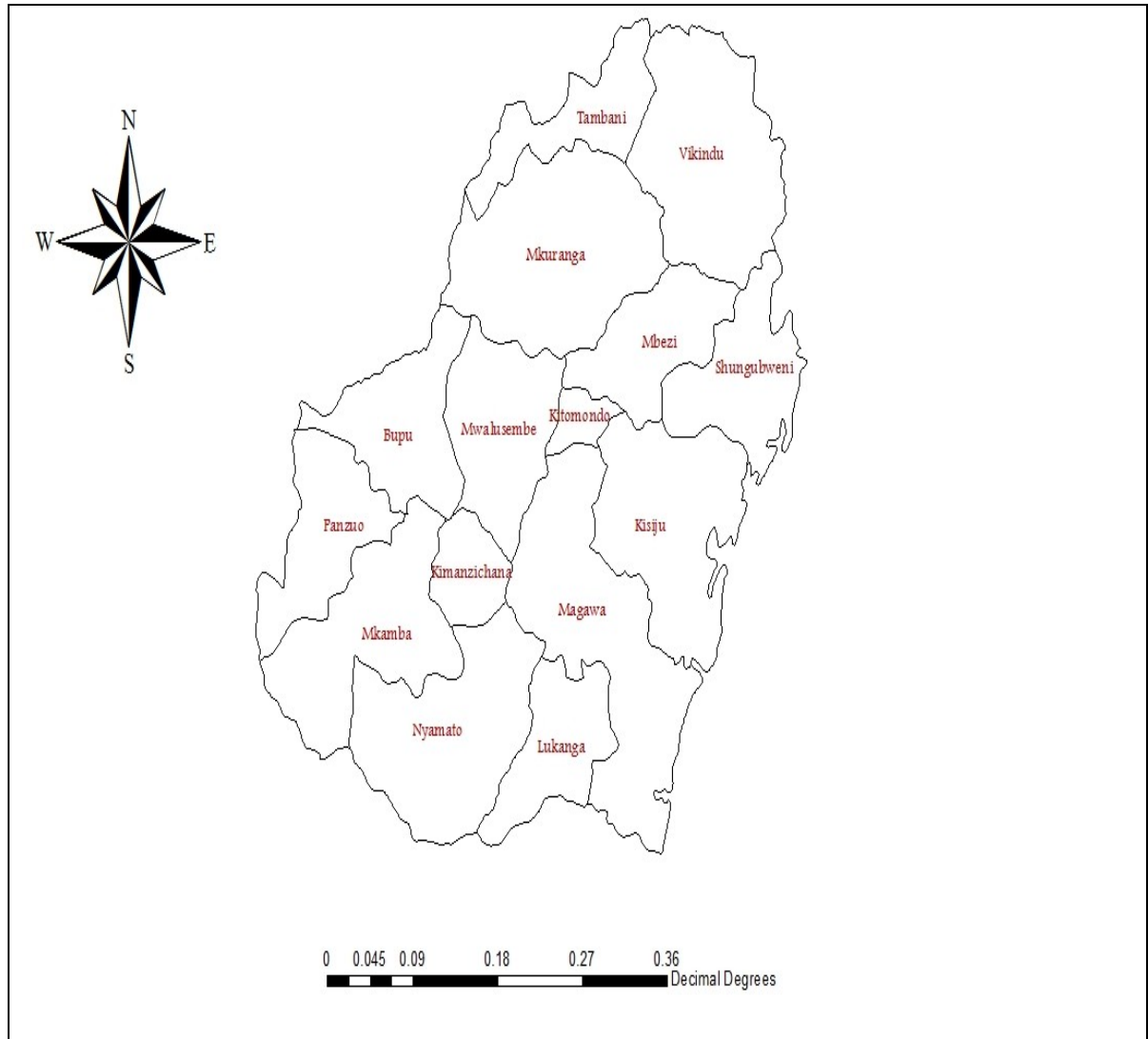


Figure 1: Map of Mkuranga District

3.2 Study Design

To obtain the desirable population, purposive sampling technique was used to select 12 primary schools from 4 divisions found in Mkuranga District. In each school 35 children aged 8-15 years by 01 March 2015 were engaged in study. This purposive technique has been generally recommended in social science research as it focuses directly on the area intended for the study (Kothari, 2009).

Then in school, those pupils aged 8-15 years who were available were involved on the study based on the questionnaire developed and were requested to bring urine for laboratory analysis and the samples taken to the District Hospital.

3.3 Population to be Studied

All primary school children aged 8-15 years period form the study population. Inclusion criteria and exclusion criteria, all primary school children aged 8-15 years who were available during data collection were included in the study and those who were aged below 8 years or above 15 years including those who were absent were excluded from the study.

3.4 Sample Size

According to Tamil (2012) in cross sectional study the outcome being measured was taken as prevalence of the disease/risk factor .Therefore sample size was calculated using the formula:-

$$\text{Sample size number; } n = \frac{Z_{1-\alpha}^2 * P * (1-P)}{D^2} = \frac{Z^2 * P * Q}{D^2}$$

Where: Z = Confidence interval (95%) 1.96, P = Prevalence proportion 0.5, Q = 1-Prevalence proportion 0.5 and D= Standard errors 5%. Therefore the calculated sample size was:

$$\text{Sample size number; } n = \frac{1.96^2 * 0.5 (1-0.5)}{(0.05)^2} = 384$$

The buffer sample which is 10% was included; therefore the sample size for this study was taken as 424.

3.5 Sample Collection and Handling

Urine samples and Analysis

Laboratory work was done at Mkuranga District Hospital in the parasitological department, after a single terminal urine sample was collected from each participant. Ten millilitres of each of the well-mixed urine samples was poured into a quantitative centrifuge tube used specifically for counting cells or parasites in urine and the samples centrifuged at 2,000 rpm for 3 minutes.

The supernatant was discarded, but about 0.6ml of residual urine was retained at the bottom of tube. Then placed into a counting chamber and the number of *S.haematobium* ova present in the chamber counted under the microscope at 40×magnification.

Finally, the number obtained was multiplied by 12 to determine the total number of ova present in a 10-ml urine sample. And any sample that contained less than 50ova/10ml was considered as an indication of a mild infection; however, if the figure was equal to or more than 50ova/10ml, (geometric mean intensity). It was considered an indication of a severe infection as defined by the WHO (Liao *et al.*, 2011).

3.6 Ethical Considerations

The permission to carry out this study was obtained from the ethics review subcommittee of the National Research Coordinating Committee (MRCC) before any of the human sampling started. The Vice-Chancellor-Sokoine University of Agriculture granted a letter to RAS-Pwani, DAS-Mkuranga and DED –Mkuranga before conducting the study. Participation in the study was on voluntary bases. Verbal consent was obtained from each

of the selected participating pupils following explanation of the purpose and importance of the study prior to sample collection. Health education teachers from the selected schools signed the consent form which abides to the rules and regulations of research in human subjects from MRCC to participate in the study.

3.7 Data Management and Analysis

Descriptive statistics including means, standard deviation, frequencies ,percentage was analysed using Statistical Package for Social Science version 20 (SPSS version 20). Prevalence for urinary schistosomiasis were determined by considering number of positive urine sample collected in the study population from November to December 2014 and intensity were calculated using number geometric mean intensity (GMI). After that the results were presented using tables, graphs and charts.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic and Social-economic Characteristics of the Respondents

This section discusses the background variables of the respondents. The variables involved are demographic which include age and sex, social ones, which include education, school name and area of residence.

4.1.1 Demographic variables of the respondents

The findings revealed that the age of the respondents ranged from 8 years to 15 years old among the 420 respondents. Specifically majority of the respondents in this study were of age 11 (18.8%). Very few respondents were of age 8 years (4.8%) and 15 years (3.8%). Over half (53.6%) of the participants were males and females were 46.4%.

Respondents participating in this study were primary school pupils in which standard one were 4.3%, standard two were 13.3%, standard three were 21.7%, Standard four were 21.4%, standard five were 19.5% and standard six were 19.8% .About 25% of respondents were from each division in Mkuranga District (Table 3).

Table 1: Percentage distribution of respondents according to age, sex and level of education (n=420)

Demographic variables	Frequency	Percentage
Age (years)		
8	20	4.8
9	52	12.4
10	62	14.8
11	79	18.8
12	72	17.1
13	64	15.2
14	55	13.1
15	16	3.8
Sex		
Female	195	46.4
Male	225	53.6
Education level		
Standard I	18	4.3
Standard II	56	13.3
Standard III	91	21.7
Standard IV	90	21.4
Standard V	82	19.5
Standard VI	83	19.8
Division		
Kisiju	105	25.0
Mkamba	105	25.0
Mkuranga	106	25.2
Shungubweni	104	24.8
Total	420	100.0

4.2 Prevalence of urinary Schistosomiasis among School Children in Mkuranga

District

Of the combined total of 420 pupils (225 males and 195 females) examined in this study and the overall prevalence rate of schistosomiasis was 9.2%. Table 2 shows that prevalence of schistosomiasis infection was twice as high for male pupils compared to their counterpart female pupils, 13.8% and 5% respectively. This result showed that the males were generally more infected than female pupils as also put forward by Ndyomugenyi (1992). A National School Based Survey conducted by the National Schistosomiasis School Control Programme (NSSCP) (2004) in all regions of Tanzania mainland, showed that the presence of blood in urine (haematuria) was reported high among boys than girls of the same age profiles (MOHSW, 2010).

This is presumably due to higher water contact activities by male pupils particularly in the swampy-rice farming areas and fishing, where fathers engage every male in their household in this economic activity. In addition, other regular water contact activities such as swimming and bathing infested streams and rivers are male dominated; besides, females in the area are usually restricted from swimming and bathing in the rivers on religious and socio-cultural grounds. This is similar to the previous studies done in other parts of Africa (Shehata, 2000).

Table 2 show that prevalence rate of Schistosomiasis infection varies among the pupils with different ages, in this study the highest prevalence occurring among pupils aged 11 years with the prevalence rate of 14.2%, followed by pupils in age 13 years, prevalence rate 12.2%. The lowest prevalence rate (0%) was observed in pupils with 8 and 15 years of age at the time of this study. These findings concur with other previous bivariate analysis

studies that show pupils of age 11–13 years were significantly associated with schistosomiasis infection compared to other age groups (Helen *et al.*, 2001).

The prevalence was relatively higher for the pupils in standard four and five compared to other classes, 14.4% and 10.5% respectively. However the prevalence was relatively lower to standard one and two pupils, 0% and 6.5% respectively. Table 2 shows the prevalence of the infection was relatively higher in pupils from Mkamba division (16.1%) compared to other divisions, i.e. Mkuranga division (0%), Shungubweni division, (8.5%) and Kisiju division (12.3%). This finding suggest that Mkamba division is traversed by streams and rivers which constitute the major source of water supply to all the communities in the areas compared to Mkuranga division which is mostly urban. Water contact activities like bathing, swimming, and washing are generally the norm in Mkamba division. Agriculture, especially swamp-rice cultivation and fishing are the main stay of the economy of the inhabitants of this division. Educational status of most of the inhabitants is generally very low particularly at Mkamba division and systematic helminthic deworming exercise has been not effectively practiced.

Table 2: Prevalence of urinary Schistosomiasis in the study area

Variables	Examined	Infected	Prevalence rate
Sex			
Male	225	28	13.8
Female	195	11	5
Age(years)			
8	20	0	0
9	52	2	3.7
10	62	5	7.1
11	79	11	14.2
12	72	10	11.3
13	64	7	12.2
14	55	4	11.7
15	16	0	0
Primary School Class			
Level			
Standard I	18	0	0
Standard II	56	4	6.5
Standard III	91	5	5.8
Standard IV	90	13	14.4
Standard V	82	10	10.5
Standard VI	83	7	9.8
Division			
Mkuranga	106	0	0
Shungubweni	104	9	8.5
Kisiju	105	13	12.3
Mkamba	105	17	16.1

4.3 Intensity of Urinary Schistosomiasis among School Children in Mkuranga District

The urine sedimentation technique described previously was used to detect the presence of *Schistosoma* ova in the urine samples and to determine the intensity of the infection in each case. Intensity was reported as the number of ova/10ml of urine and was categorized as moderate (< 50 ova/10ml of urine) and severe (≥ 50 ova/10ml of urine). Finding in Table 3 show among the infected pupils in the study area the Geometric mean intensity was above 50 ova/10ml of urine which suggests severe infection of *S.haematobium* among the pupils found with infection.

Findings in table 3 show that infection of *S.haematobium* was more severe in the male pupils (86 ova/10ml) compared to female (79.2 ova/10ml) for, the pupils who had the infection (Table 3). Pupils of age 13 years were found to have severe infection (118.2ova/10ml) compared to other pupils in other age groups. Pupils in standard three had severe infection (127.2/ ova/10ml) and the pupils who were in standard one had no infection. Kisiju and Mkamba divisions were the places with severe infection for the pupils found with infection of *S.haematobium* compared to other places in the study area. This result clearly points to intense transmission and probability of high levels of morbidity in Kisiju and Mkamba divisions. As put forward by Chipeta *et al* 2013 fishing and working in gardens along water bodies were potential risk factors for *S.haematobium* intensity.

As put forward by King (2010), that severe urinary schistosomiasis adversely affects human performance, reduces physical and intellectual functions, and may cause renal dysfunction, bladder outlet obstruction, bladder cancer and infertility. In this study, both prevalence and intensity of infection appeared to be intimately associated with school children aged 13 and location i.e. Makamba and Kisiju divisions (Table 2 and 3).

Table 3: Intensity of urinary Schistomiasis in the study area

Variables	Examined	Infected	Geometric mean intensity
Sex			
Male	225	28	86
Female	195	11	79.2
Age(yrs)			
8	20	0	0
9	52	2	87
10	62	5	86.4
11	79	11	69.8
12	72	10	85.2
13	64	7	118.2
14	55	4	91.2
15	16	0	0
Primary School			
Class Level			
Standard I	18	0	0
Standard II	56	4	78
Standard III	91	5	127.2
Standard IV	90	13	83
Standard V	82	10	79.3
Standard VI	83	7	89.1
Division			
Mkuranga	106	0	0
Shungubweni	104	9	37.3
Kisiju	105	13	101.2
Mkamba	105	17	101.2

4.4 Pupil's Knowledge, Attitude and Practices Related to the Occurrences of Urinary Schistosomiasis in the Study Area

4.4.1 Pupil's Knowledge on Urinary schistosomiasis

This study found out that the overall level of awareness and knowledge about schistosomiasis amongst school pupils in Mkuranga was relatively high. Majority (92.4%) of the pupils in this study had knowledge on urinary schistosomiasis (Table 4). More than half (58%) of the pupils that participated in this study got information of the disease at their schools, 19% said they got this information at health facility, 18% at their home places and very few (5%) from media (Fig. 2). There were various causes of schistosomiasis mentioned by the participants (Fig. 3). Majority (60%) said that the disease was caused by swimming in the stagnant water; about 15% said that the transmission is through drinking dirty water with microorganism, and some thought that transmission was through shaking hands.

The water bodies provide natural water sources and also serve as habitats to intermediate hosts (*Bulinus africanus* group of snails) and schistosome parasites. These water bodies constitute the main transmission of *S. haematobium* in this community and are distributed throughout the area. These conditions make it certain that the children will continue be infected and re-infected because no intervention strategy against the intermediate hosts has been implemented in the area. The general understanding of the snails and poor sanitation in contribution to spread of this disease and transmission cycle has not been given to the community.

Table 4: Pupil's knowledge on urinary schistosomiasis

Do you have any knowledge on urinary schistosomiasis?		
	Frequency	Percentage
Yes	388	92.4
No	31	7.4
No response	1	.2
Total	420	100.0

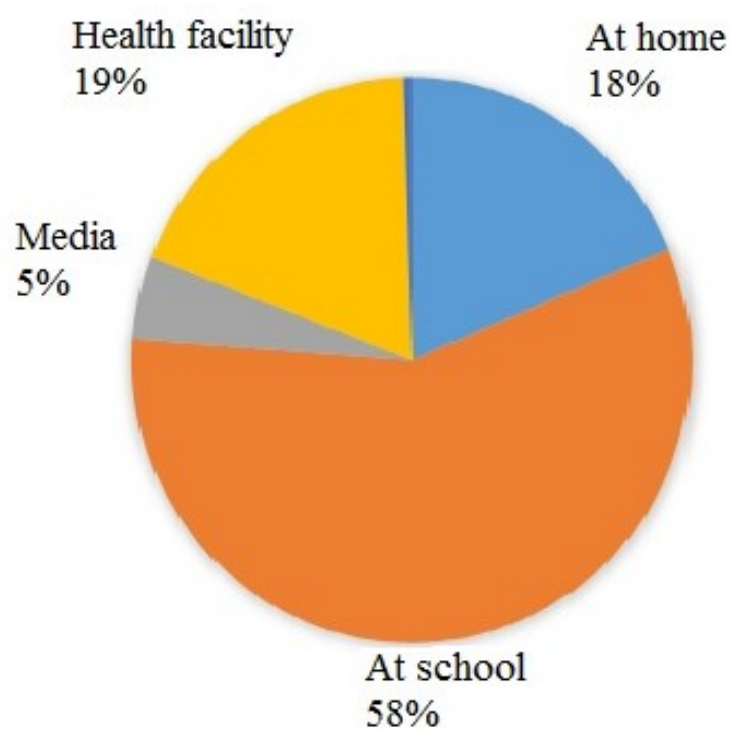


Figure 2: Source of information about urinary Schistomiasis among the Mkuranga pupils

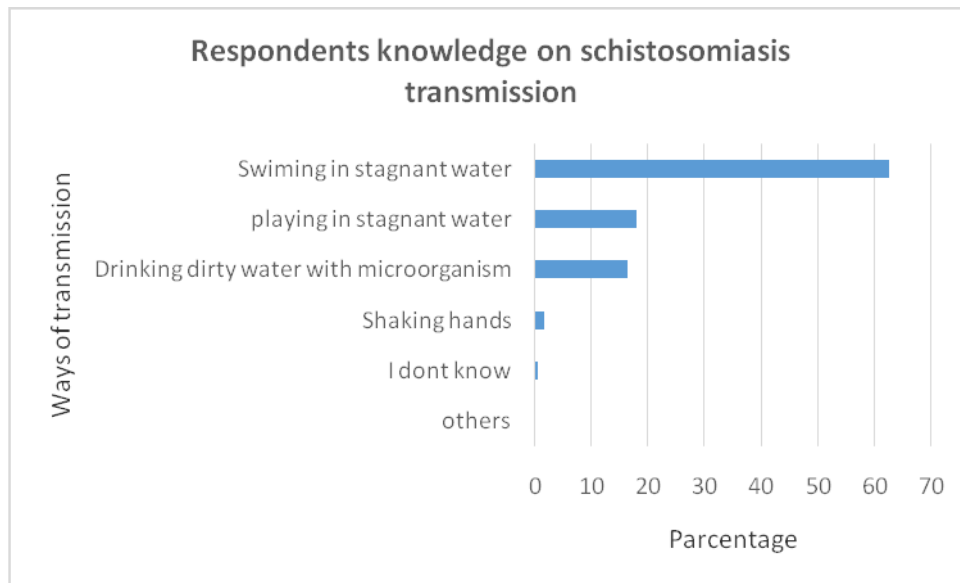


Figure 3: Respondents Knowledge on schistomiasis transmission

4.4.2 Pupils' attitude and practices related to Urinary schistosomiasis

In Table 5, Participants highlighted that the hospital is the place that someone with bilharziasis can surely go and be treated. Still some few (5.2%) pupils did not know where exactly one can seek for medication. Majority (93%) of pupils who participated in this study said that they don't have enough latrines at their school. Only 7% of the pupils who participated in this study thought that their school has enough latrines (Fig. 4).

Table 5: Place where Schistomiasis can be treated according to respondents

Where do you think Schistomiasis can be treated?	Frequency	Percentage
Hospital	394	93.8
I don't know	22	5.2
Traditional healer	4	1.0
Total	420	100.0

It appears that urinary Schistosomiasis is particularly common in the study area. Respondents were asked if they ever noticed urinating blood tinged urine, 89% of the pupils in this study had experienced urinating blood tinged urine in their life time. And for

those that had urine with blood, 91.2 % sought for medical treatments, this study revealed that some (8.8%) of the pupils who experienced urinating blood didn't seek for health treatment (Table 6).

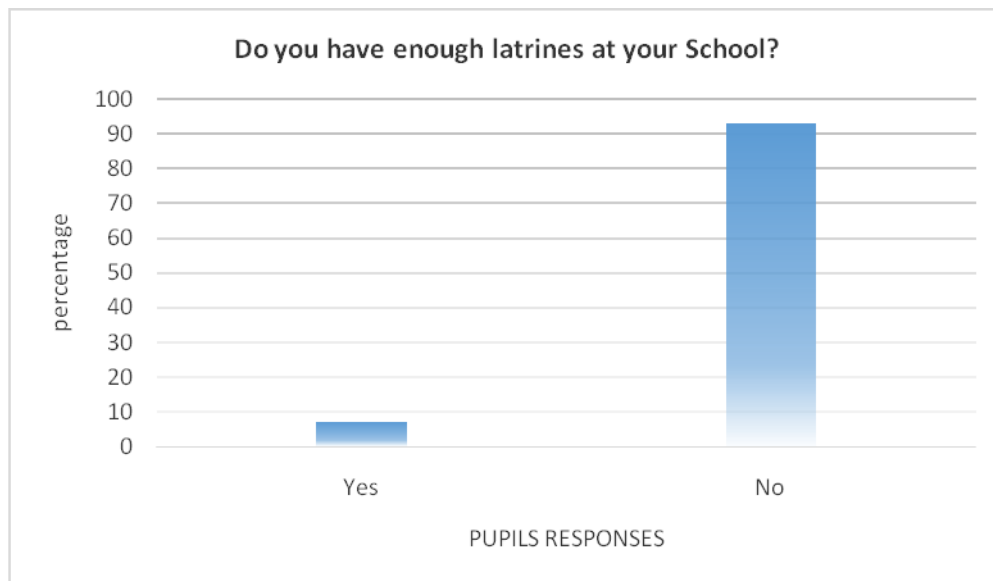


Figure 4: Availability of school latrines in the study area

Table 6: Health practices related to Urinary schistosomiasis infection among Mkuranga pupils

	Pupil's responses	Percentage
Have you ever urinated blood urine?	Yes	89.0
	No	11.0
Did you seek for treatment?	Yes	91.2
	No	8.8

Table 7 shows that majority of ordinary pit latrines were found in Kisiju and Shungubweni divisions, 93% and 91% respectively which the Urinary *Schistosoma* infection in this two divisions may be contributed by presence of these types of latrine. Generally this finding suggest that water supply in Mkuranga division is better compared to the rest of the divisions in the study area as it was revealed to have other types of latrines such as water closet..

Table 7: Distribution of latrine type by division

Division	Frequency	Percentage
Shungubweni		
Ordinary pit latrine	91	91.9
VIP latrine	8	8.1
Mkuranga		
Ordinary pit latrine	55	54.4
Others	11	10.8
VIP latrine	35	34.6
Kisiju		
Ordinary pit latrine	89	93.6
VIP latrine	6	6.3
Mkamba		
Ordinary pit latrine	81	77.1
VIP latrine	24	22.8

4.4.3 Pupils' opinion on prevention of Schistosomiasis

Participants mentioned various ways of preventing Schistosomiasis, these included; Availability of clean and safe water (1.9%), avoiding swimming in stagnant water (44.3%) and improve health services (6.4%). Moreover, majority (45.5%) of the respondents also thought that Praziquantel- MDA (Table 8) should be continued.



Figure 5: Pupils of Kilimahewa Kusini Primary school playing in a water body after class hours

Table 8: Pupils' opinion on prevention of Schistosomiasis

	Frequency	Percentage
Availability of clean and safe water	8	1.9
Avoid swimming on stagnant water	186	44.3
Continue with praziquantel- MDA	191	45.5
Other	8	1.9
To improve health services	27	6.4
Total	420	100.0

CHAPTER FIVE

5.0 CONCLUSION AND RECCOMENADCTIONS

5.1 Conclusion

The findings revealed that the age of the respondents ranged from 8 years to 15 years old among the 420 respondents. Of the combined total of 420 pupils (225 males and 195 females) examined in this study, the overall prevalence rate of schistosomiasis was 9.2%. Prevalence of schistosomiasis infection was significantly higher for male pupils compared to their counterpart female pupils. The prevalence was relatively higher for the pupils in standard four and five compared to other classes, 14.4% and 10.5% respectively. Prevalence of the infection was relatively higher in Mkamba division (16.1%) compared to other division, the high prevalence in Mkamba division reflects the higher level of exposure and dependence of these inhabitants on water contacts activities such as farming, fishing and livestock keeping.



Figure 6: Rice farming in Njopeka village near Water River

Findings show that severe infection of *S.haematobium* was higher for the male pupils (86 ova/10ml) compared to female (79.2 ova/10ml) for pupils who had infection. Pupils of age 13 years were found to have severe infection 118.2ova/10ml compared to other pupils in other age groups. Pupils in standard three had severe infection (127.2/ ova/10ml). Mkamba division was the place with severe infection for the pupils found with infection of *S.haematobium* compared to other places in the study area. This result clearly points to intense transmission and probability of high levels of morbidity in Mkamba division.

This study found out that the overall level of awareness and knowledge about schistosomiasis amongst school pupils in Mkuranga was relatively high. Majority (92.4%) of the pupils in this study have knowledge on knowledge on urinary schistosomiasis. Urinary schistosomiasis is particularly common in the study area, 89% of the pupils in this study have experienced urinating blood in their life time.

Pupil's mentioned various ways of preventing schistosomiasis such as; availability of clean and safe water, avoiding swimming on stagnant water and improving health services. Moreover, majority of the respondents thought that praziquantel- Mass Drug Administration should be continued with other interventions such snail control, training is essential because experience is limited and the priority is to ensure that Molluscides are available.

Furthermore, the poverty, ignorance, poor living conditions, inadequate sanitation and water supplies as well as deplorable personal and environmental hygiene characteristic of many rural communities in Tanzania as in other developing tropical countries are identified as important factors contributing to increasing transmission of Schistosomiasis.

Instructing children to correct personal habits which are conducive to infection and practice good personal hygiene can be an effective and safe substitute for repeated deworming, reducing the opportunity for the emergence of drug-resistance, which should prolong the time anthelmintic drugs such as Praziquantel may be used for treatment of urinary Schistosomiasis.

5.2 Recommendations

Therefore, community-based treatment using praziquantel should first be targeted to school-age children. This high risk group can be reached through the primary school system, in collaboration with the educational sector health education and large-scale chemotherapy for all schoolchildren to decrease the prevalence and intensity of infection. Primary health care services should also be strengthened at community level so that they are capable of dealing with control of schistosomiasis infection.

All the villages within Mkamba and Kisiju divisions need access to piped water to reduce contact with *Schistosoma* infested waters; this is because communities with high infection rates are usually clustered around contaminated water sources. Mkamba and Kisiju division were found to have limited access to safe water supply and poor environmental sanitation compare to Mkuranga division. Furthermore, a control program, including control of intermediate snails, to decrease the prevalence and intensity should be implemented in these areas to improve community health.

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APPENDICES

Appendix 1: Questionnaire for *schistosoma haematobium* infection among school children

BASIC INFO

1. Questionnaire number

2. Division Name

3. School Name

4. Sex

5. Age

6. Standard

KNOWLEDGE ABOUT SCHISTOSOMIASIS

1. Do you have any knowledge on schistosomiasis? if not go to question number 6

☐ Yes ☐ No

. If yes, where did you get those information about schistosomiasis?

. If you know, how does this disease transmitted?

. What are the signs of Schistosomiasis

. Do you know that Schistosomiasis can be treated?

. In your opinion, how can schistosomiasis be prevented?

. Where do you think Schistosomiasis can be treated?

. Do you wear shoes when walking?

. Do you have enough latrines at your school?

Where do you go for urination/ defecation during break time?

Did you ever urinate a urine with blood?

Did you seek for the treatment?

What do you think should be done to prevent schistosomiasis?

PRACTICES TOWARD SCHISTOSOMIASIS

Where do you get water for domestic purposes?

Do you have latrine at home?

If yes, what its type?

Do you wash your hands after visiting toilet?

Did you ever taken praziquantel during the last MDA?

Appendix 2: NIMR -Clearance certificate for conducting research in Tanzania



THE UNITED REPUBLIC OF
TANZANIA



National Institute for Medical Research
P.O. Box 9653
Dar es Salaam
Tel: 255 22 2121400/390
Fax: 255 22 2121380/2121360
E-mail: headquarters@nimr.or.tz
NIMR/HQ/R.8a/Vol. IX/1878

Ministry of Health and Social Welfare
P.O. Box 9083
Dar es Salaam
Tel: 255 22 2120262-7
Fax: 255 22 2110986

29th December 2014

Mr Aron Wilson Nzallah
Sokoine University of Agriculture
Faculty of Veterinary Medicine,
Dept. of Veterinary Medicine and Public Health
P O Box 3085, MOROGORO

CLEARANCE CERTIFICATE FOR CONDUCTING MEDICAL RESEARCH IN TANZANIA

This is to certify that the research entitled: Parasitological survey of *Schistosoma haematobium* infection among school children in Mkuranga district, (Nzallah A W *et al*), has been granted ethical clearance to be conducted in Tanzania.

The Principal Investigator of the study must ensure that the following conditions are fulfilled:


1. Progress report is submitted to the Ministry of Health and the National Institute for Medical Research, Regional and District Medical Officers after every six months.
2. Permission to publish the results is obtained from National Institute for Medical Research.
3. Copies of final publications are made available to the Ministry of Health & Social Welfare and the National Institute for Medical Research.
4. Any researcher, who contravenes or fails to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine. NIMR Act No. 23 of 1979, PART III Section 10(2).
5. Sites: Mkuranga, Mkamba, Kisiju, and Shungubweni wards in Mkuranga district, Coast Region

Approval is for one year: 29th December 2014 to 28th December 2015.

Name: Dr Mwelecele N Malecela

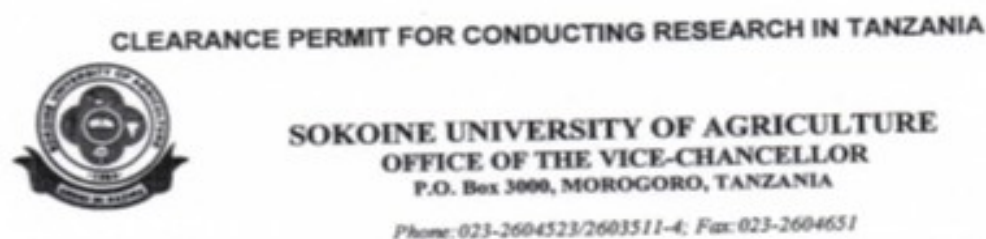
Name: Dr Margaret E Mhando

Signature 
CHAIRPERSON
MEDICAL RESEARCH
COORDINATING COMMITTEE

Signature 
Ag CHIEF MEDICAL OFFICER
MINISTRY OF HEALTH, SOCIAL
WELFARE

CC: RMO
DED
DMO

**Appendix 3: University staff, students and Researchers clearance- Sokoine university
of Agriculture**



Our Ref. SUA/ADM/R.1/8

Date: 6th June, 2014

Secretariat
National Health Research Ethics Review Committee
2448 Barack Obama Drive
P.O. Box 9653
DAR ES SALAAM

Re: UNIVERSITY STAFF, STUDENTS AND RESEARCHERS CLEARANCE

The Sokoine University of Agriculture was established by Universities Act No.7 of 2005 and SUA Charter of 2007 which became operational on 1st January 2007 repealing Act No.6 of 1984. One of the mission objectives of the University is to generate and apply knowledge through research. For this reason the staff, students and researchers undertake research activities from time to time.

To facilitate the research function, the Vice-Chancellor of the Sokoine University of Agriculture (SUA) was empowered to issue research clearance to both, staff, students and researchers of SUA on behalf of the Government of Tanzania and the Tanzania Commission for Science and Technology.

The purpose of this letter is to introduce to you **Aron Wilson Nzallah** a bonafide MSc. **Public Health and Food Safety** student with registration number **HD/T/SUA/VET/30/2013** of SUA. By this letter **Mr. Aron** has been granted clearance to conduct research in the country. The title of the research in question is **"Parasitological Survey of Schistosoma Haematobium infection among school children in Mkuranga District Tanzania"**

The period for which this permission has been granted is from **July 2014** to **September 2015**. The research will be conducted in **Mkuranga District, Pwani Region**.

Should some of these areas/institutions/offices be restricted, you are requested to kindly advice the researcher(s) on alternative areas/institutions/offices which could be visited. In case you may require further information on the researcher please contact me.

We thank you in advance for your cooperation and facilitation of this research activity.

Yours sincerely,


Prof. Gerald C. Monela
VICE-CHANCELLOR


Copy to: Student – **Mr. Aron Wilson Nzallah**

VICE CHANCELLOR
SOKOINE UNIVERSITY OF AGRICULTURE
P. O. Box 3000
MOROGORO, TANZANIA

Appendix 4: Research clearance-Mkuranga District

THE UNITED REPUBLIC OF TANZANIA
PRIME MINISTER'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

Telegrams: "Admin",
Telephone: 023-240 2741/ 2402742
Fax No. 023-2402743
In reply please quote:



DISTRICT COMMISSIONER'S OFFICE,
P. O. Box 1,
MKURANGA,
TANZANIA.

Ref. No. AB.220/260/01/125

11 September, 2014

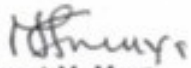
District Executive Director,
P. O. BOX 10,
MKURANGA.

RE: RESEARCH CLEARANCE

This is to introduce to you Aron Wilson Nzallah a bonafide Msc Public Health and Food Safety Student with registration number HD/T/SUA/VET/30/2013 of SUA. Mr. Aron has been granted clearance to conduct research in the country. The title of the research in question is **"Parasitological Survey of Schistosoma haematobium infection among school children in Mkuranga District – Tanzania"**.

The period for which this permission has been granted is from July 2014 to September 2015. The research will be conducted in Mkuranga District – Coast Region.

Will you please provide him with all necessary assistance so that he may accomplish his research study successfully.


Clement M. Muya
**Ag. DISTRICT ADMINISTRATIVE SECRETARY
MKURANGA.**

✓ **Copy:-** Mr. Aron Wilson Nzallah