HEALTH OF SCHOOL-AGE CHILDREN AND FACTORS ASSOCIATED WITH NON-ENROLMENT IN SCHOOL IN RURAL AREAS OF KINONDONI DISTRICT, DAR- ES-SALAAM

BY

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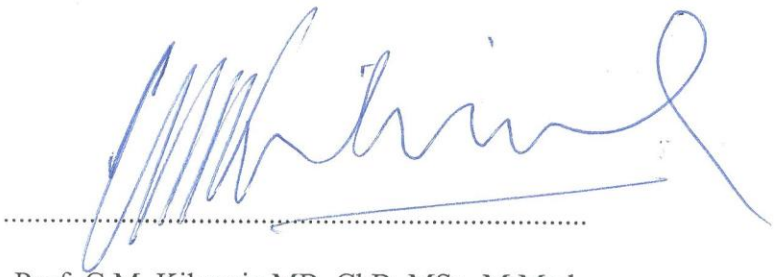
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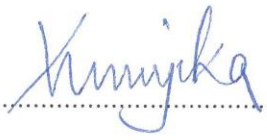
CERTIFICATION

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Date: 28th October 1999

DECLARATION

AND

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I, Rehesina Hassan Senkoro, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

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DEDICATION

This work is dedicated to my family: my husband Leonard, my two children, Arnold and Julius, and to my parents.

ABSTRACT

A population-based cross-sectional study was conducted in rural areas of Kinondoni district from February to March 1998. Kunduchi and Bunju wards were randomly selected from a list of five wards which constitute the peri-urban portion of the district. The two wards were administratively divided into eight villages out of which four were randomly selected for the study. The aim of the study was to determine the health of school-age children and the factors associated with non-enrolment among out-of-school children. The study involved 314 children aged 7-14 years who had their anthropometric measurements taken for assessment of their nutritional status. The children were also examined for *Ascaris lumbricoides,* hookworm, and *Schistosoma haematobium*. The study involved a house to house visit of households selected for the study. The visits at household level aimed at taking anthropometric measurements of the children, collection of stool and urine specimen and to conduct interviews on parents. In each household visited mother or guardian was interviewed on the socio-economic status of the household and observations were made concerning the household socio-economic indicators. In summary, the following findings were established:

Over half of the examined children had poor health. Out of 314 children examined, 3.5% had trichuriasis, 4.8% had ascariasis, 17.2% had urinary schistosomiasis 24.8 % were malnourished and 25.8% had hookworm. There was no difference in health status between enrolled and non-enrolled children in terms of urinary schistosomiasis, ascariasis and nutritional status.

The difference was observed in hookworm infection where the prevalence rate and egg output was higher in non-enrolled children 31.4% than in enrolled children 20.3% ($\chi^2 = 5.1$, 1df, $p = 0.02$).

Socio-economic and demographic factors were found to be associated with enrolment status of the children in school ($\chi^2 = 7.26$, 2df, $p = 0.03$). Reasons for non-enrolment were financial constraints 32%, pregnancy 4.5%, distance to schools 1.2%, taking care of siblings 46.1%, poor health 7.1%, poor academic performance 7.5% and attending "*madrasa*" (Muslims religion nursery school) 1.6%.

This study recommends that the existing interventions should be expanded to reach out-of-school children. The government and non-governmental organisations should be approached to provide adequate medicaments for the treatment of geohelminths and urinary schistosomiasis. Because poverty is the major factor underlying non-enrolment there is need for activities to alleviate poverty and empower people economically. There is need for vocational institutions to provide practical training for children and useful skills especially for drop-outs. Government and non-governmental organisations should assist in educating children from poor parents. This will reduce drop-out rates and non-enrolment.

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LIST OF ABBREVIATIONS

AMMP	=	Adult mortality and morbidity project
BEST	=	Basic education statistics
MUCHS	=	Muhimbili University College of Health Sciences
OR	=	Odds ratio
SPSS	=	Statistical package for social sciences
SUA	=	Sokoine University of Agriculture
UNICEF	=	United Nations International Children and Education Fund
WAZ	=	Weight for Age Z score
WHO	=	World Health Organisation
WHZ	=	Weight for Height Z score

CHAPTER 1

1.0 INTRODUCTION

1.1 Factors influencing health status and enrolment of school-age children

1.1.1 Helminth diseases

Some diseases have been cited to affect the health status of school-age children as well as enrolment. These include intestinal helminths, urinary schistosomiasis and malnutrition (WHO, 1995). School children harbour the highest prevalence and intensity of helminths with adverse effect on health, growth, nutritional status, school attendance and their academic performance. Infection with *Ascaris lumbricoides* can be responsible for a decrease in growth rate, as they absorb nutrients that the body needs to grow. Infection with *Ascaris lumbricoides* affects nitrogen absorption and retention, fat absorption, D-xylose absorption and mucosa lactate activity. Structural abnormalities of the small intestine in malnourished children is caused by infection with *Ascaris lumbricoides* (WHO, 1995). They are thought to be a cause of frequent or serious pulmonary disease among children. Intestinal obstructions frequently result in the hospitalisation of children. Death is common in children when worms move to organs outside of the intestine such as the trachea, liver and heart, and when complications occur (WHO, 1996). Deworming of children can lead to increase in growth rates and mental improvements (WHO, 1995).

Hookworms (*Necator americanus and Ancylostoma duodenale*) are responsible for decreased physical fitness and activity, work capacity and productivity by loss of blood even without overt anaemia and decrease of appetite (Adams *et al.* 1994) Infection with *Trichuris trichiura* may be responsible for loss of blood, dysentry, chronic colitis and growth retardation.

In heavily infected children with schistosomiasis growth may be dramatically retarded (WHO, 1995). Severe disease (hepatosplenic enlargement with portal hypertension) is frequent in children under 15 years of age. Blood loss in urinary schistosomiasis contributes to anaemia (WHO, 1995). Morbidity due to *Schistosoma haematobium* has been studied (Rugemalila, 1985). The study showed that urinary bladder abnomalities and/or ureteric calcification and other ureteric deformities such as hydronephrosis and renal destruction, all occur frequently with the highest overall prevalence of about 20 to 50% in children. Morbidity due to *Schistosoma haematobium* including squamous and transitional cell carcinoma of the urinary bladder has also been reported (Kitinya *et al.* 1986).

Thus infection by the above mentioned parasites impair growth, since they consume nutrients from the children they infect. In doing so they bring about malnutrition and retard children's physical development. They also destroy the tissues and organs in which they live and cause abdominal pain, diarrhoea, intestinal obstruction, anaemia, ulcers and various health problems. All of these consequences of infection

compromise children's health status as well as attendance and performance at school. Heavy or long term infection can result in death, if treatment is not given in time.

1.1.2 **Inadequate meal and sanitary facilities**

The commonest meal provided by schools in the country is porridge. The nutrition value of this food is low since it is made out of maize flour, water and some sugar. Moreover, in most areas of the country, this food is provided only during the harvest period when there is plenty of food at home. This means that schools do not provide food during the period when food supplies is scarce at home. Consequently the majority of school children stay hungry in school most of the time especially during the non-harvest period. Provision of school meals may conceivably motivate pupils to go and stay in school and consequently reduce truancy and drop-out rates. It will also minimise the tendency of children buying unhygienic food sold by food vendors in the school compound.

Reports available in the ministry of health show that almost half of the schools in Tanzania do not have adequate latrines and most of the existing latrines are not in good condition. Many schools do not have running water and other facilities for washing. Lack of school facilities pose health threats to children and may affect enrolment and drop-out rates.

1.2 Drop-out and non-enrolment

Apart from health, other factors have been cited to contribute to non-enrolment and drop-out. These include economic status of parents. For instance, failure of parents to afford expenses of sending the children to school or when the children's labour is needed to assist with aspects of household economy. Desire to earn money through petty business ventures also has been found to contribute to drop-out. High socio-economic status have showed a positive correlation with school enrolment (Chenichovsky, 1985). Other contributory factors are the cultural factors where some parents prefer to send boys than girls to school.

This study intended to determine the differences in health of school-going children and out-of-school children. However, due to limited time and funds only malnutrition, geohelminths and *Schistosoma haematobium* were used as indicators to assess the health of school-age children. Children found to be infected with geohelminths, *Schistosoma haematobium* or malnourished were classified as having poor health. These helminthic infection and malnutrition were chosen instead of other diseases like malaria because they are the number one cause of disease among school-age children (WHO, 1996). School-age children carry the highest prevalence and intensity of these helminths, and they destroy the well being and learning potential of the infected children (WHO, 1996). There is availability of cost

effective and feasible interventions. These interventions are drug treatment, sanitary improvement, and health education. The available drugs are highly effective in treating intestinal helminths and schistosomiasis. The single oral dose administration and safety of drugs allow them to be delivered outside the medical settings (WHO, 1996).

Simplified diagnostic methods for helminth infection for both individual and mass examinations are available without a need for sophisticated facilities. The above mentioned helminth infections are all preventable. An essential barrier to most helminths is to prevent human faeces from polluting the ground or surface water. The infections of the major intestinal helminths can be prevented through avoiding ingestion of or contact with the contaminated soil. To avoid entering the infested water reduces schistosomiasis. Health education highly complements the above measures. So as to enhance the health status and productivity of children, helminth infection should be controlled.

Although some research on the health of school-age children has been done, the only available information represent primary school-going children. There is little information about the health of school-age children especially out-of-school children. Thus there is need to know the health of school-age children and see if there is any significant difference in the health of school-going children and those out-of-school and the factors which are associated with non-enrolment among out-of-school children.

1.3 Statement of the problem

There is a growing interest in school-based health programmes and global commitment to improving the health and educability of school-age children. A major concern however, is that a great proportion of school-age children are not enrolled in school or are frequently absent and they may be at greater risk from health-related diseases. As a result school-based health programmes, which are directed and implemented by the community through schools, may not have great impact on health of school-age given that the greater proportion of school-age children is not in school. In addition, there are no clear guidelines developed to find out what the constraints on enrolment are nor has a strategic plan been devised to deliver health services to the out-of-school children.

Out of 1.2 billion school-age children world wide only 700 million are registered in school and each year only 400 million are present (WHO, 1995). Tanzania has about 7.2 million school-age children out of which about 53% were enrolled in 1995 (Ministry of education and culture, 1996). School drop-out is a serious problem in primary school system in the country. Follow up of the 1989 primary school cohort show that 623537 pupils were enrolled in school (Ministry of education and culture, 1994). By the time they completed school in 1995 only 420143 graduated, implying that almost one third dropped out (Ministry of education and culture, 1996). Truancy is another problem affecting the primary school system. Chronic truancy in most cases lead to drop-out. Several factors have been cited to contribute to out-of-school

children. The study conducted in rural Botswana by Chernichovsky (1985) showed a positive correlation between demographic and socio-economic status with enrolment. In Eastern Ghana the following factors were identified as helping to explain school drop-out among school children. These were home condition, peer group influence, school conditions, emotional predisposition of students and sexual relations (Fabih, 1987). Parasitic infections such as intestinal helminths and schistosomiasis are prevalent in school-age children and contribute to school absentees and may be preventing pupils from achieving their full potentials in school. Although intestinal helminths and schistosomiasis are serious public health problems in Tanzania their prevalence and intensity is not known in out-of-school children. Health of out-of-school children has had less attention from researchers and probably planner's than school-going children although their health might be worse compared to school-going children given their living condition food availability and activities they are performing. It is this gap of knowledge that has prompted the researcher to compare the health status of enrolled and non-enrolled children to see if there is difference in their health status. Another gap of knowledge that this study intends to fill includes factors associated with enrolment among out-of-school.

1.4 Rationale of the study

The true picture of health status of school-age children and constraints to enrolment in Tanzania remains inadequately studied. Most of the available data on health status of school-age children based on school-going children, which do not reflect the true picture of the situation in the general population in this age group. The poor health which has been found in school-age children by Berger *et al.* (1986); Ng'andu *et al.* (1991) and Otito (1994) in school-going children might be worse in out-of-school children given their living conditions and activities which might expose them to infection. The researcher has found it necessary to compare the health of school-age children and out-of-school to see if there is any difference in their health. The researcher intended also to find out factors associated with enrolment among out-of-school children. The result of this study may provide information on health of school-age children especially those out-of-school children and the factors which are associated with non-enrolment. This information may be used by health planners to plan interventions which will reach out-of-school children. Information on factors associated with non-enrolment may be used by education planners to plan interventions which will reduce non-enrolment and drop-out rate.

1.5 Hypothesis

1.5.1 There is no difference in health status between school-going children and out-of-school children.

1.5.2 More heavily infected and malnourished children are not out-of-school.

1.5.3 Non-enrolment is not associated with poor socio-economic status of the parents.

1.6 Objectives

1.6.1 Broad Objective

To determine the difference in health status between enrolled and non-enrolled children and factors for non-enrolment among out-of-school children in selected areas of Kinondoni district.

1.6.2 Specific Objectives

1.6.2.1 To determine the prevalence of urinary schistosomiasis, ascariasis, hookworm infection among out-of-school and school-going children in rural areas of Kinondoni district.

1.6.2.2 To determine the intensity of infection with *Schistosoma haematobium, Ascaris lumbricoides*, and hookworm among school-age children.

1.6.2.3 To determine the nutritional status of children by anthropometric measurements of height and weight.

1.6.2.4 To determine socio-economic factors for non-enrolment among out-of-school children.

CHAPTER 2

2.0 REVIEW OF LITERATURE

2.1 Health status of school-age children

In general the school-age period is considered to be one of low mortality relative to infant and pre-school-age years. Ayeni (1980), in Lagos, found accidents and violence, diarrhoea and malaria to be the major causes of death. Hospital based death records Asindi *et al.* (1991) and Akang *et al.* (1993) have revealed greater variations on causes of death in school-age children and suggested septicaemia, pneumonia and tuberculosis as ranking high among death-causing diseases. Berger *et al.* (1986) reported that in central Tanzania, 80% of school children were anaemic, 18% had *Schistosoma haematobium*, 14% had hookworm, 7% had scabies, 7% had malaria and virtually none had ascariasis or trichuriasis. Ng'andu *et al.* (1991) in central Zambia assessed the health of 528 school children. He found that undernutrition was prevalent possibly due to having very little food while at school or from parasitic infections. Eighteen percent of children were infected with *Schistosoma haematobium,* 33% with hookworm and 43% with malaria. Study on children infected with parasites such as *Ascaris lumbricoides, Giardia lamblia, Trichuris trichiura* and hookworm has demonstrated growth reduction, malabsorption of nutrients and damaged intestinal mucosa (Sawaya *et al.* 1990). They observed that when *Ascaris lumbricoides* and hookworm are of high intensity the normal growth of children is retarded and contributes to malnutrition. Physical activity, growth, and appetite have been impaired in school children affected with *Ascaris lumbricoides* and hookworm (Stephenson *et al.* 1993).

2.2 Factors affecting health of school-age children and schooling.

2.2.1 Diseases

Diseases in general have been found to differ in their prevalence and intensity from one area to another. This depends on different factors. For instance, in the tropics, the lowlands areas are likely to have more malaria and water-borne diseases than mountainous areas. Availability of national data indicates malaria to be the most prevalent health problem in the general population this is followed by upper respiratory tract infections, diarrhoea diseases, pneumonia and intestinal worms. Unfortunately the available data do not show the prevalence of these diseases by age and sex and consequently it is difficult to see the extent of mortality and morbidity of these diseases among school-age children. The only mortality data available came from the Ministry of Health which indicates that acute febrile illness including malaria is the number one cause of mortality in the age of 5-18 years. In Dar es Salaam injuries were the second cause of mortality for both males and females. AIDS, anaemia, diarrhoea diseases and malnutrition are among the top ten causes of mortality in school-age. In Tanzania causes of death in school-age children differ from region to region. The mountainous area of Hai District having a drastically lower proportion of deaths due to febrile illness, presumably due to absence of malaria, compared to Dar es Salaam and Morogoro rural lowland which has a higher proportion of deaths due to gastro-enteritis (Ministry of Health, 1992). According to Kalokola (1982), absenteeism and failure rates have been observed in many primary schools, particularly those in areas of nutritional deficiencies, and infections which impair growth and development.

2.2.2 Helminth Diseases

Urinary schistosomiasis is caused by *Schistosoma haematobium* which is a trematode. Human exposure may be through such activity as swimming, bathing, washing, water collection, or through occupational activities for agriculture, animal husbandry and fishing. Human water contact and hence its role in schistosomiasis transmission may be related to such socio-economic factors as lack of supervised water supplies for domestic and recreational needs, indiscriminate excreta disposal due to lack of sanitary facilities, inadequate health care resources or their improper utilisation when available, and migration in and out of endemic areas (Lwihula, 1985). In Tanzania, Iorotski and Davis (1981), estimated that 3 million (19%) of the 16 million people in Tanzania were exposed to schistosomiasis with high endemicity of *Schistosoma haematobium.* Studies in Tanzania have shown radiographic abnormalities of the urinary tract in individuals infected with *Schistosoma haematobium* (Forsyth, 1969; Rugemalila, 1979). Studies done in endemic areas of Tanzania about *Schistosoma haematobium* have shown that up to 80% of infected children have haematuria (Tanner *et al.* 1983; Rutasitira *et al.* 1984; Sarda, 1986). Haematuria and proteinuria are related to morbidity especially in children (Abdul-Salam *et al.* 1978) and (Doehring *et al.* 1985). The intensity and prevalence of the disease is highest among children with a peak at 10-14 years. The highest prevalence and intensity among young children have been attributed to more water contact and exposure to infection than the older subjects (Dalton *et al.* 1978). Swimming and playing in water have been observed by Kloos *et al.* (1983) to result into frequent and intensive contact with potentially infective water and in more

pollution of snail habitats with *Schistosoma haematobium* eggs than any other type of water contact activity. A study by Ndyomugyenyi (1992) studied infection among school children at Kigogo in Kinondoni district and revealed a prevalence of 47.6%. Males were more infected (56.6%) than females (40.8%). The 10-14 years age group had the highest prevalence rate of infection. Another study by Otito (1994), in Kisarawe of Coastal region, revealed a prevalence of schistosomiasis of 32.2% in primary school children.

The morbidity due to hookworm infection is mainly manifested in the form of anaemia which if unchecked, may ultimately lead to death. Blood loss due to hookworm infection is not only caused by the worms sucking blood but also because of minute mucosal lacerations at the site of the worm attachment and reattachment. A number of surveys were conducted on primary school children in the Districts of Mwanza, Singida, and Ukara Island. The studies disclosed a very high prevalence of about 70% for hookworm (Ministry of Health,1957). Sturrock (1962) commented on the high prevalence of hookworm infection in many parts of East Africa. For instance of 216 students he examined at Mwanza secondary school, 52.3% were infected with hookworm. Out of those 113 infected, 27.4% were passing more than 100 eggs per gram (epg) of faeces while 5.3% were passing more than 500 eggs per gram of faeces. The rest were passing less than 100 eggs per gram of faeces. Killewo *et al.* (1991) in Temeke district found the prevalence of hookworm to be 12% in out-of-school and 2% in school-going children. Other intestinal helminths have been reported to contribute to low enrolment and absenteeism. Nokes *et al.*

(1993) reported that absenteeism is correlated with intensity of *Trichuris trichiura* infection. *Trichuris trichiura* infection is wide spread in Tanzania. Bloody diarrhoea caused by heavy infection with trichuriasis can cause protein energy malnutrition as a result of enteropathy.

2.3 Factors for non-enrolment

2.3.1 Child nutritional status

A study done by Moock and Leslie (1986) on childhood malnutrition and schooling in the Terai region of Nepal examined the relationship between nutritional status and schooling. Among the findings was that older children and boys were significantly more likely to be enrolled in school than girls. A child's haemoglobin level was not found to be related to school enrolment, but height for age contributed positively and significantly to the probability of a child being enrolled in school. Moock and Leslie (1986) found poor nutritional status being directly linked to non-enrolment. In eastern Ghana five factors were identified as helping to explain school drop-out among 195 children: (1) home condition; (2) peer group influence; (3) school conditions; (4) emotional predisposition of students; and (5) sexual relations (Fabih, 1987)

2.3.2 Household socio-economic status

Economy of parents has been cited as one of the factors which contribute to children dropping out-of school. Failure of parents to afford expenses of sending a child to school or the labour of child is needed to assist with the aspect of the household economy contribute to school drop-out. Sometimes school drop-out is attributed to the desire to earn money by engaging in petty business ventures. Adolescent pregnancy, which sometimes results due to economic hardship is another cause of school drop-out amongst girls. A study conducted in rural Botswana by Chenichovsky (1985), showed a positive correlation between demographic and social economic status with school enrolment. Among the findings were that girls were more likely than boys to be enrolled in school. Households with educated parents, taken as a measure of household wealth, send more children to school than uneducated parents. When household wealth is expressed in terms of assets, owners of large numbers of cattle continue to send their children to school but owners of small stocks and which is considered to be a measure of moderate to low wealth in Botswana, are more likely to keep their children at home. However, if substitutes for child labour are available in the household, children appear to be freed for schooling.

CHAPTER 3

3.0 METHODOLOGY

3.1 Study design

This was a cross-sectional study in which the health status of school-age children (those enrolled in school and non-enrolled) was compared. Furthermore the study identified socio-economic factors associated with non-enrolment in school in rural areas of Kinondoni district.

3.2 Description of the study site

Kinondoni District is one of the three districts constituting Dar es Salaam region. The other two districts are Ilala and Temeke. Dar es Salaam region is the largest commercial centre in the country with an estimated population of 3 million people (National Population Census, 1988). Kinondoni district occupies the northwest parts of Dar es Salaam region, and it boarders Kisarawe and Ilala district in the south, Bagamoyo district in the north and Kibaha district in the west. The district also boarders with the Indian Ocean in the northern and eastern parts of the region. The district is administratively divided into 18 wards out of which 13 are urban and the remaining five are peri-urban. The urban wards are Magomeni, Makurumla, Ndugumbi, Tandale, Mwananyamala, Msasani, Kinondoni, Mzimuni, Kigogo, Mabibo, Manzese, Ubungo and Kawe. The peri-urban wards are Kibamba, Goba, Kunduchi, Mbweni and Bunju.

Kinondoni district has an estimated population of 621,389 people out of whom 152,175 are estimated to be school-age children aged between 5-14 years (National

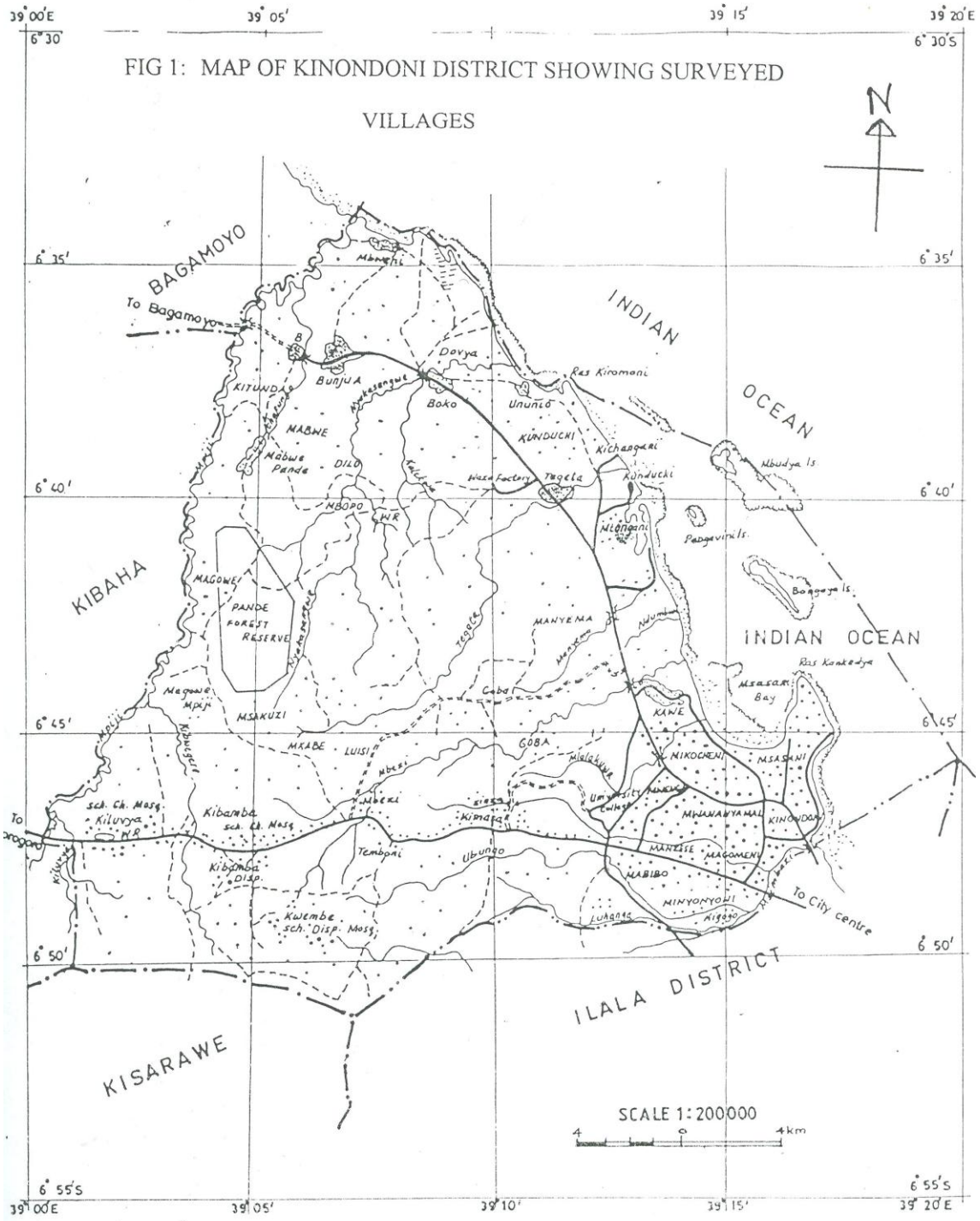
population census, 1988). The tribes are mainly constituted of the Wazaramo, Wamatumbi and Wandengereko. However the majority of the city population is drawn from the tribes of upcountry regions who migrate into the city to seek employment or commercial activities.

The main activities in this area are subsistence farming and fishing. But the majority of the population in the district are employed either in public or private sectors. Dar es Salaam region is hot and humid throughout the year with an average annual rainfall of about 1000 mm and an average temperature of 26°C.

3.3 Selection of the study area

The study was conducted in selected areas of the peri-urban portion of Kinondoni district which comprise five administrative wards namely Bunju, Goba, Kibamba, Kunduchi and Mbweni. Out of the five wards, two of them namely Bunju and Kunduchi were randomly selected for the study using lottery method. The two selected wards had a total of eight villages out of which four were randomly selected for the study using lottery method. The selected villages were Bunju A, Bunju B, Mtongani and Tegeta.

FIG 1: MAP OF KINONDONI DISTRICT SHOWING SURVEYED VILLAGES



KEY:

- Main Roads (bound surface)
- Roads (loose surface)
- Reginal Boundaries
- Other tracks or Footpaths
- District Boundaries
- Rivers or Streams.
- Villages/Populated areas/Houses
- Coast Line
- Surveyed villages

3.4 Sample Size Determination

The minimum sample size of the school-age children required for the study was determined using the statistical formula (Varkevisser, *et al.* 1991).

$$n = (U + V)^2 \{ \frac{P_1 (100 - P_1) + P_2 (100 - P_2)}{(P_1 - P_2)^2} \} \quad (1)$$

where:

n = Sample size,

P_1 = Proportion of out -of-school children infected with hookworm, = 12% (Killewo *et al.*1991).

P_2 = Proportion of school-going children infected with hookworm, = 2% (Killewo *et al.* 1991).

U = One sided percentage point of the normal distribution, corresponding to the power of 90%.

V = Percentage point of the normal distribution, corresponding to the (two sided) significance level of 0.05 (5%).

Thus using the above mentioned parameters in equation (1) the sample size (n) is calculated as follows:

$$n = (1.28 + 1.96)^2 \frac{\{12\ (100 - 12) + 2\ (100 - 2)\}}{(12 - 2)^2}$$

$$n = 10.5\ \frac{(12 \times 88 + 2 \times 98)}{10^2}$$

$$n = \frac{13146}{100} = 131.46 + 20\%\ \text{non response}$$

$$n = 131.46 + 26.292 = 157.75$$

Total sample size required was 157.75 x 2 = 315 children and similar number of their parents. The prevalence of *Ascaris lumbricoides* and *Schistosoma haematobium* in out-of-school children was not known, and no study has ever shown the prevalence of these parasites in out-of-school children. Thus the same sample size estimated for hookworm was used for *Ascaris lumbricoides* and *Schistosoma haematobium*. In this case, therefore, the minimum sample size of the children and their parents required was 315. Six locality leaders (*Viongozi wa Vitongoji*) were randomly selected from each of the four selected villages for the study. This gave a total of 24 locality leaders. Locality leaders helped in identifying households with eligible children and were registered in a book. Only one eligible child from each household participated in the study. Where the husband had two or more wives, only

the child of the first wife participated in the study. This was done so as to give chance for other households to participate.

3.5 The Target Population

This included all school-age children living in Kinondoni District and their parents.

3.6 The Study Population

This included all school-age children aged 7-14 years present in the selected households for the study and their parents.

3.7 Logistics

For the study to be carried out successfully, certain formalities had to be accomplished. These included getting a research permit from the Ethical Clearance Committee of MUCHS and Government Authorities, both, at District and Ward levels.

3.7.1 Materials required for the study

These included drugs (Albendazole, Praziquantel) and laboratory reagents. Technical details regarding their preparation is given under Appendix II and III.

3.7.2 Manpower

3.7.2.1 *Field Personnel*

This comprised the researcher and two field assistants. The assistants were trained on how to administer the questionnaire and on how to take weights and heights of the children.

3.7.2.2 *Laboratory Personnel*

One qualified laboratory technician was recruited for the laboratory procedures in addition to the researcher.

3.8 Data collection

A formal letter to introduce the research team to the village government was obtained from the Ward Secretary's office. Arrangements to get the required locality leaders were done by the investigator under the help of village government. Each village government in the study area made available a list of the locality leaders out of which six locality leaders were randomly selected from each village. This gave a total of 24 locality leaders. The selected locality leaders were requested to inform parents of the children who had registered for the study about the researchers' visit and their respective dates of visits so that the mother of the child or the guardian and the child could remain at home for the expected visit. House to house visits were made under the respective locality leader's company. Each household was visited by the whole research team.

3.8.1 Interview

Interviews were conducted among mothers or guardians of the child. The questionnaire was developed in English language but was translated into Swahili version by a different person who could understand the translation and was then retranslated into English by yet another individual. The two versions were then compared with author's own translation for agreement. The end result was finally assessed for clarity of meaning before it was sent to the researcher's supervisor for endorsement. Interviews were conducted by the researcher using the Swahili version of the questionnaire. The questionnaire was used to collect information about each subject's mother and household socio-economic status. The mother was interviewed closely about the date of birth of her child and whenever possible maternal and child health (MCH) cards, birth certificates or any other documents of relevance were referred to in order to know the exact age of the children. The mother of each child was asked to provide the following information about herself, age, religion, marital status and occupation, level of education and the number of children she had given birth to. The mother was also asked to provide the following information about her husband: occupation, education level, the number of wives, and the number of dependants. Information was then collected by interview on a number of indicators of the socio-economic status of each subject's household including the ownership and acreage of land. Most mothers reported that the land they own was far from their homes so it was not possible to verify the information given. They were also asked

about the material used to construct the floor, walls and roof of the house and the number of rooms, the type of animals owned and the possession of capital items including a bicycle, radio, television, motorcycle, sewing machine and, car. In addition to asking specific questions about socio-economic characteristics, the mother of each subject was asked questions which addressed factors affecting enrolment, non-enrolment, late-enrolment and drop-outs (Refer Appendix I).

Interviews were conducted privately while specimens were collected after 10:00 a.m. in the morning. Properly labelled stool pots and urine bottles were given to the mother or guardian of the child soon after the interview and a full explanation on how and when to collect stool and urine specimens was given.

3.9 Anthropometric measurements

In this part of the study weight and height of the children were measured as a basic determinant of anthropometric parameters of the study group. Weights were measured using Seca bathroom Scale calibrated in kilograms. Readings were taken and recorded by a trained research assistant who was a Rural Medical Aid (RMA) and was assisted and supervised by the researcher. Adjustment of the weighing scale was done after every measurement to maintain precision and accuracy and standard weights were used for the same purpose. Weights were read to the nearest 0.5 kilograms. The children were asked to remove their shoes or sandals, handbags and

other objects in the pockets of their clothes before the weighing exercise commenced. Height was measured using a calibrated measuring board. Prior to measurement procedures, shoes and hats of the subjects were removed. Working in pairs one research assistant positioned the feet of the child who was standing in an upright position along the measuring board. The other research assistant positioned the head correctly and noted the reading to the nearest 0.1 cm.

3.10 Laboratory Methods

Stool specimens were preserved using two drops of 4% formalin and were stored in Parasitology laboratory. Examination of stool specimens was done at the end of the week after completing the house to house visits of some of the households under the responsibility of the selected locality leaders in each village. Urine specimens were examined on the same day after collection using filtration method. Details of the technique for urine examination is described under Appendix II on page 109. The stool and urine examination was done by the researcher in collaboration with a qualified laboratory technician. Stool specimens were preserved and stored in the Parasitology laboratory and were examined at the end of the week. Modified Kato Katz thick smear technique was used as described under Appendix III on page 110. The specimens were considered negative after being examined by both the laboratory technician and the researcher. For specimens detected positive for parasites egg counting was done to determine the intensity of infection.

3.11 Ethical Consideration

The necessary formalities were completed before data collection started. Permission from relevant authorities was obtained. Regional and District authorities were consulted and permission to carry out the study was obtained. Informed consent from individual respondents was obtained after discussion and explanation as to what the study was all about. Consent for children was given by their mothers or guardians. Laboratory results were confidential and children who were found infected were treated.

3.12 Pilot study

The village within the study area but which was not included in the study was selected for pre-testing of research instruments. The questionnaire and other research instruments were tested. The whole questionnaire was once again reviewed and necessary changes made using experiences from the pre-test.

3.13 Limitation of the study

Non-compliance

Some members of the selected household did not remain at their home in order to be met by the research team. This caused inconvenience to the research team which had to rearrange its schedule of work, thus, prolonged the period of stay in the study area.

3.14 Statistical methods

Questionnaire forms from different villages were compiled together and given serial numbers. All questions were coded and data were entered into IBM SPSS/PC software programme version 6.1. Data cleaning was done by checking for internal inconsistencies and incorrect entries. Data were analysed using the SPSS statistical programme version 6.1.

The Chi-square test (χ^2), Odds ratio (OR), 95% confidence interval (CI) were used. Chi-square and Odds ratio were used to compare proportions while the t-test was used to compare means. Results were considered significant when p value was $\leq$ 0.05. Analysis was done in two stages. First by examining whether there was a significant difference in infection and nutritional status between enrolled and non-enrolled children using Chi-square tests and t-test.

The second part of analysis was done to determine socio-economic factors which were associated with enrolment status of the children in school. Bivariate analysis was performed to examine the association between independent variable and dependent variable using Odds ratio and Chi- square test. Independent variables were marital status, sex of the child, religion, education of the father, education of the mother, occupation of the father, occupation of the mother, number of children, and number of dependants. Dependent variable was enrolment status. Multivariate

analysis using logistic regression procedures was done to determine the association between socio-demographic factors and enrolment status while controlling for confounding factors.

CHAPTER 4

4.0 RESULTS

This study involved 314 school-age children aged between 7 and 14 years who were examined for geohelminths and urinary schistosomiasis infection. These children had their anthropometric measurements taken for assessment of their nutritional status. Included also were 314 mothers of the studied children who had their socio-economic status determined through interviewing. Table 1 shows the number of children studied in each village. A total number of 328 children and their mothers were enrolled. Only 314 (95.7%) participated and about 14(4.3) did not participate and were regarded as non- responders.

4.1 Socio-Demographic Characteristics

Table 1: Population coverage in areas surveyed.

Village	Total population sampled	Those who brought stool and urine	
	No.	No.	%
Bunju B	79	72	91.1
Bunju A	82	81	98.8
Tegeta	84	81	96.4
Mtongani	83	80	96.4
Total	328	314	95.7

Table 2: Study population by enrolment status

Age (Years)	Enrolled Number	%	Non-enrolled Number	%	Total Number	%
7 - 9	49	31.0	52	33.3	101	32.2
10 –12	64	40.5	52	33.3	116	36.9
13+	45	28.5	52	33.3	97	30.9
Total	158	100	156	100	314	100

Table 3 shows the distribution of the examined children. There was no significant difference between females and males $x^2 = 0.74$, 2df, $p = 0.68$.

Table 3: Distribution of study sample by age and sex

			Sex			
Age group	Total		Male		Female	
	No.	%	No.	%	No.	%
7-9	101	32.2	52	51.5	49	48.5
10-12	116	36.9	56	48.3	60	51.7
13-14	97	30.9	44	45.4	53	54.6
Total	314	100	152	48.4	162	51.6

Table 4: Distribution of other socio-demographic characteristic

Socio-demographic factors	Number	Percentage
Marrital status		
Married	255	81.2
Divorced separated widowed	52	16.6
Cohabiting	7	2.2
Education level father		
No formal education	102	32.5
Primary education	114	36.3
Secondary education and above	98	62.3
Occupation of the father		
Peasant	223	67.2
Salaried employed	56	17.8
Self employed	35	11.1
Education level of the mother		
No formal education	170	54.1
Primary education	96	30.6
Secondary education	48	15.3
Occupation of the mother		
Peasant	95	30.3
Salaried employed	60	19.1
Self employed	72	22.9
Number of children		
1-3	59	18.8
4-6	172	59.6
>6	55	21.6
Number of dependants		
1-3	59	27.7
4-6	187	54.7
>6	54	17.5

Table 5 shows the distribution of the examined children by age, sex and village of residence. Females where more than males in each village except in Bunju A and Tegeta.

4.2 Prevalence of geohelminths

Tables (6-12) show the overall prevalence rate for geohelminths and urinary schistosomiasis in the surveyed villages. The overall prevalence rate for *Ascaris lumbricoides* was found to be 4.8%, with the highest prevalence rate (10.9%) being observed in the 7-9 years age group (Table 6). The prevalence rate for *Ascaris lumbricoides* among males was 4.6% and in females was 4.9%. There was no significant difference in prevalence of *Ascaris lumbricoides* between males and females (χ^2 = 0.02, 1df, p = 0.89). Table 7 shows the prevalence rate for *Ascaris lumbricoides* by age and enrolment status. The prevalence rate for *Ascaris lumbricoides* among enrolled children was 3.8% and for non-enrolled children was 5.8%. There was no significant difference in prevalence rate of *Ascaris lumbricoides* between enrolled and non-enrolled children (χ^2 = 0.67, 1df, p = 0.41). Younger age group (7-9) were more infected with *Ascaris lumbricoides* compared to other age groups.

The overall prevalence rate for hookworm was found to be 25.8% (Table 8). The prevalence rate among males was 23.0% and in females was 28.4%. There was no significant difference in hookworm infection between males and females

(χ^2 = 1.18,1df, p = 0.27). Table 9 shows the prevalence rate for hookworm by age and enrolment status. The prevalence rate for hookworm among enrolled children was 20.3% and for non-enrolled children was 31.4%. The difference in prevalence rate between enrolled and non-enrolled children was statistically significant (χ^2 = 5.10, 1df, p = 0.02). The highest prevalence was found in the 13-14 years age group. It is apparent from the table that hookworm infection increases with increasing age. Older age group (13-14) were more likely to experience infection than younger age group (χ^2_{trend} = 24.98, p = 0.0005).

The prevalence rate for urinary schistosomiasis by age and sex is shown in Table 10. A total of 54 (17.2%) children were infected with *Schistosoma haematobium.* Prevalence of S*chistosoma haematobium* among males was (15.8%) and in females it was (18.5%). There was no significant difference in prevalence rate of *Schistosoma haematobium* between males and females (χ^2= 0.41, 1df, p = 0.52). Table 11 shows the prevalence rate for *Schistosoma haematobium* by age and enrolment status. The prevalence of *Schistosoma haematobium* was 16.5% for enrolled children and 17.9% for the non-enrolled children. There was no significant difference in prevalence rate between enrolled and non-enrolled children (χ^2 = 0.12,1df, p = 0.73). Infection with *Schistosoma haematobium* appear to exhibit similar infection rates in all age groups.

Table 12 shows the prevalence of *Ascaris lumbricoides*, hookworm, *Schistosoma haematobium*, *Strongyloides stercoralis* in each of the surveyed villages. Hookworm was the most prevalent helminth in the study area. *Strongyloides stercoralis* was the least recorded helminth, with a prevalence rate of 1.3%. Out of the 314 children examined for helminths, 165 (52.5%) of them were found to be infected with helminths. The prevalence rate for *Ascaris lumbricoides* and *Trichuris trichiura* were highest in Tegeta village. When considered at village level, Bunju A had the highest prevalence of hookworm infection (34.6%) followed by Tegeta (25.9%). *Schistosoma haematobium* was most prevalent in Bunju B (30.5%).

Table 5: Distribution of the study population by age, sex and village of residence

Age group (Years)	Village Surveyed									
	Mtongani		Tegeta		Bunju A		Bunju B		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
7 – 9	11 7.2	16 9.9	12 7.9	14 8.6	16 10.5	12 7.4	13 8.6	7 4.3	52 34.2	49 30.3
10 – 12	15 9.9	19 11.7	17 11.2	12 7.4	11 7.2	11 6.8	13 8.6	18 11.1	56 36.8	60 37.0
13+	10 6.6	9 5.6	14 9.2	12 7.4	14 9.2	17 10.5	6 3.9	15 9.3	44 29.0	53 32.7
Total	36 23.7	44 27.2	43 28.3	38 23.5	41 26.9	40 24.7	32 21.1	40 24.7	152 100	162 100

Table 6: Prevalence of *Ascaris lumbricoides* by age and sex

Age group	Males			Females			Total		
(Years)	Number examined	Number Positive	Percentage Positive	Number examined	Number Positive	Percentage Positive	Number examined	Number Positives	Percentage Positive
7-9	52	4	7.7	49	7	14.3	101	11	10.9
10-12	56	2	3.6	60	0	-	116	2	1.7
13-14	44	1	2.3	53	1	1.9	97	2	2.1
Total	152	7	4.6	162	8	4.9	314	15	4.8

There was no significant difference in prevalence of *Ascaris lumbricoides* between males and females ($p > 0.05$).

Table 7: Prevalence of *Ascaris lumbricoides* by age and enrolment status.

Age groups (Years)	Enrolled			Non - enrolled			Total		
	Number examined	Number Positive	Percentage Positive	Number examined	Number Positive	Percentage Positive	Number examined	Number Positive	Percentage Positive
7 - 9	49	4	8.2	52	7	13.5	101	11	10.9
10 - 12	64	1	1.6	52	1	1.9	116	2	1.7
13-14	45	1	2.2	52	1	1.9	97	2	2.1
Total	158	6	3.8	156	9	5.8	314	15	4.8

There was no significant difference between enrolled and non-enrolled children ($p > 0.05$).

Table 8: Prevalence rate for hookworm by age and sex

	Males			Females			Total		
Age groups (Years)	Number examined	Number Positive	Percentage Positive	Number Examined	Number Positive	Percentage Positive	Number examined	Number Positive	Percentage Positive
7 - 9	52	7	15.2	49	6	12.2	101	13	12.8
10 -12	56	14	22.9	60	12	20.0	116	26	22.4
13-14	44	14	31.1	53	28	52.8	97	42	43.3
Total	152	35	23.0	162	46	28.4	314	81	25.8

There was no significant difference in hookworm infection between males and females

($p>0.05$)

Table 9: Prevalence rate for hookworm by age groups and enrolment status

Age group (Years)	Enrolled			Non - enrolled			Total		
	Number examined	Number positive	Percentage positive	Number Examined	Number positive	Percentage positive	Number examined	Number positive	Percentage positive
7 - 9	49	6	12.2	52	7	13.5	101	13	12.8
10 - 12	64	13	20.3	52	13	25.0	116	26	22.4
13+	45	13	28.9	52	29	55.7	97	42	43.3
Total	158	32	20.3	156	49	31.4	314	81	25.8

The difference in prevalence rate between enrolled and non-enrolled children was statistically significant ($p<0.05$).

Table 10: Prevalence of *Schistosoma haematobium* by age and sex

Age group (Years)	Males			Females			Total		
	Number examined	Number positive	Percentage positive	Number Examined	Number positive	Percentage positive	Number examined	Number positive	Percentage positive
7 - 9	52	9	17.3	49	8	16.3	101	17	16.8
10 - 12	56	10	17.8	60	11	18.3	116	21	18.1
13+	44	5	11.4	53	11	20.7	97	16	16.5
Total	152	24	15.8	162	30	18.5	314	54	17.2

There was no significant difference in infection between boys and girls ($p>0.05$).

Table 11: Prevalence of *Schistosoma haematobium* by age and enrolment status

Age group (Years)	Enrolled			Non - enrolled			Total		
	Number examined	Number positive	Percentage positive	Number examined	Number positive	Percentage positive	Number examined	Number positive	Percentage positive
7 - 9	49	8	16.3	52	9	17.3	101	17	16.8
10 - 12	64	12	18.7	52	9	17.3	116	21	18.1
13+	45	6	13.3	52	10	19.2	97	16	16.5
Total	158	26	16.5	156	28	17.9	314	54	17.2

There was no significant difference in prevalence rate between enrolled and non-enrolled children ($p>0.05$).

Table 12: Prevalence of geohelminths and urinary schistosomiasis in each of the surveyed villages

Village surveyed	*Ascaris*	%	Hookworm	%	*Trichuris*	%	*Strongloides*	%	*S. haematobium*	%
Tegeta (n = 81)	6	7.4	21	25.9	5	6.2	3	3.7	7	12.9
Bunju A (n = 81)	2	2.5	28	34.6	2	2.5	0	-	15	27.8
Bunju B (n = 72)	2	2.8	17	23.6	1	1.4	1	1.4	22	40.7
Mtongani (n = 80)	5	6.3	15	18.8	3	3.7	0	-	10	18.5
Total (n = 314)	15	4.8	81	25.8	11	3.5	4	1.3	54	17.2

4.3 **Intensity of Infection**

The intensity of infection was categorized according to Purnell (1967). The intensity of infection with geohelminths was moderate with 36.5% of the infected cases falling under light category, 41.7% under the moderate category, and 21.8% under heavy category (Table 13). The highest egg count was 9960 eggs per gram of faeces (epg) for *Ascaris lumbricoides* while the lowest count was 24 epg with the mean egg count of 794 epg.

Table 13: Distribution of the infected cases per parasite and intensity according to Purnell (1967)

	Intensity			
	Light	Moderate	Heavy	Total
Ascaris lumbricoides	1-100epg	101-1000epg	1001+epg	-
	5(33.3)	6(40)	4(26.7)	15(100)
Hookworm	1-100 epg	101-500epg	501+epg	-
	30(37.0)	34(42.0)	17(21.0)	81(100)
Total	35(36.5)	40(41.7)	21(21.8)	96(100)

Note: The number in brackets are percentages

Table 14 shows the relationship between *Schistosoma haematobium* intensity with sex of the children.

Table 14: Relationship between *Schistosoma haematobium* intensity and sex of the children

Schistosoma haematobium intensity	Sex of the child				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Heavy	5	20.8	1	3.3	6	11.1
Light	19	79.2	29	96.7	48	88.9
Total	24	100.0	30	100.0	54	100.0

Males were heavily infected compared to females (Fisher exact test, p = 0.05). The overall intensity (geometric mean) of *Schistosoma haematobium* infection was found to be 22.4. It was observed that 11.1% (6/54) of the infected children had heavy infection (more than 50 eggs/10ml urine). The mean intensity (geometric mean) was 23.7 in enrolled children and 21.3 in non-enrolled children and in boys and girls it was 28.5 and 18.5 respectively.

Table 15 shows the relationship between *Schistosoma haematobium* intensity and enrolment status of the children. There was no significant difference in intensity of *Schistosoma haematobium* between enrolled and non-enrolled children (Fisher exact test p = 0.63).

Table 15: The relationship between *Schistosoma haematobium* intensity and enrolment status of the children

Schistosoma haematobium intensity	Enrolment status					
	Enrolled		Non-enrolled		Total	
	No.	%	No.	%	No.	%
Heavy	3	11.5	3	10.7	6	11.1
Light	23	88.5	25	89.3	48	88.9
Total	26	100.0	28	100.0	54	100.0

4.4 Nutritional status

4.4.1 Height for age

The distribution of nutritional status by height for age z score (HAZ), which is an indicator for stunting is shown in Table 16. The prevalence of stunting in the studied population was found to be 15%. When compared to the children aged 7-9 years, the level of stunting increases 2 fold in the age group 10-12 and 3 fold in the age 13 and above years. Stunting is a nutritional indicator for chronic malnutrition expressed as height for age (H/A) below 2 SD or 2Z score (WHO, 1983). There was no significant difference in mean Z score of height for age in enrolled and non-enrolled children (t-test = 1.6434; p = 0.1013).

Table 16: The distribution of the nutritional status by height for age z score (HAZ) among school-age children in Kinondoni rural, 1998 (N = 314)

Age groups in years	Number of Children examined	Normal height for age		Stunted	
	No.	No.	%	No.	%
7-9	101	93	92.1	8	7.9
10-12	116	97	83.6	19	16.4
13-14	97	77	79.4	20	20.6
Total	314	267	85	47	15

4.4.2 Weight for height

The prevalence of wasting in the study population was found to be 1.2% (2/167). Wasting is a nutritional indicator for acute malnutrition expressed by weight for height (W/H) below 2SD or 2Z score (WHO, 1983). This index cannot be calculated for weight for height for girls aged more than 10 years and for boys aged more than 11.5 years because of the growth spurt.

4.4.3 Weight for Age

Table 17: The prevalence of underweight among the school-age children in Kinondoni rural 1998, (N=314)

Subject	Number	Percent
Underweight WAZ (<-2 Z score)	29	9.2
Normal WAZ (-2 z score)	285	90.8
Total	314	100.0

Underweight is a nutritional indicator for chronic malnutrition and is expressed as weight for age (W/A) below -2SD or -2 Z score from the mean (M) of the reference population (WHO 1983). There was no significance difference in the mean z score of weight for age in enrolled and non-enrolled children (t-test = 1.5898; p = 0.1129).

4.5 Factors associated with enrolment and non-enrolment

In order to examine the relationship between socio-economic factors and enrolment, the Bivariate Analysis using Odds ratio, Chi-square test and Multivariate analysis using multiple logistic regression procedures was performed. The relationship between enrolment status and sex of the child, marital status of the mother, religion, education of the parents, and occupation of the parents was assessed.

The data for socio-economic and demographic factors were collected from 314 mothers who were interviewed. The age of the mothers ranged from 22 to 58 years, with a mean age of 36 years.

4.5.1 Marital status of the mother

Out of the 314 mothers 81.2% were married, 6.7% were widowed, 5.7% were separated, 4.2% were divorced and 2.2% were cohabiting. Table 18 shows the relationship between marital status and enrolment. Analysis was done to find out whether marital status of the mother was related to enrolment of the children to school. Divorced, separated, and widowed mothers were aggregated and compared with married and cohabiting mothers. It was found that widowed, separated and divorced mothers were less likely to enrol their children in school as compared to married mothers. Cohabiting mothers were more likely to enrol their children in school compared to married mothers. Odds ratio were 0.99 and 1.32 and 95%CI were (0.38,0.41) and (3.25,5.6). About 39% of the interviewed mothers reported that their marriage was polygamous.

Table 18: The relationship between marital status of the mother and enrolment of the children

Marital status	Enrolled		Non-enrolled		Odds ratio	95%CI
	No.	%	No	%		
Married	128	81.0	127	81.4	1	
Divorced, separated, widowed	26	16.5	26	16.7	0.99	(0.138, 0.141)
Cohabiting	4	2.5	3	1.9	1.32	(3.25, 5.6)
Total	158	100	156	100	-	

4.5.2. Education level of the father

About 32.5% of the spouses of the interviewed mothers had no formal education, 36.3% had primary education while 24.2% had secondary education. Those with vocational and university education were 4.1% and 2.9% respectively. Fathers with secondary, vocational and university education were aggregated for the purposes of analysis and compared with those non-educated. Table 19 shows the number of non-enrolled or enrolled children according to whether the father had no education, primary education or any higher education. The level of education of the father was found to be associated with enrolment of the children in school. Fathers with primary education were 2 times more likely to enrol their children in school compared to fathers with no education (OR = 2.15, 95%CI=1.24,3.37). Fathers with secondary education were 4 times more likely to enrol their children in school than fathers with no education (OR = 3.93, 95% CI =2.19,7.09).

Table 19: The number of enrolled and non-enrolled children by the education of the father

Education level of the father	Enrolled No. %	Non-enrolled No. %	Odds ratio	95%CI
No education	34 21.5	68 43.6	1	
Primary	59 37.4	55 35.3	2.15	(1.24,3.37)
Secondary+	65 41.1	33 21.2	3.93	(2.19,7.09)
Total	158 100	156 100	-	-

4.5.3 Education level of the mother

Out of the 314 mothers interviewed 15.3% had secondary education, 30.6% had primary education 54.1% had no formal education and none of them had either vocational or university education. Table 20 shows the number of non-enrolled and enrolled children according to whether the mother had received no education, primary education or secondary education. Mothers with primary education were more likely to enrol their children in school compared to uneducated mothers. However the difference was not statistically significant (OR=1.24, 95%CI=0.75,2.11). Mothers with secondary school education were 3 times more likely to enrol their children in school compared to uneducated mothers (OR=3, 95%CI=1.43,6.37).

Table 20: The number of enrolled and non-enrolled children by the education of the mother

Mothers education	Enrolled		Non -enrolled		Odds ratio	95%CI
	No.	%	No.	%		
No education	76	48.1	94	60.3	1	-
Primary	48	30.4	48	30.8	1.24	(0.75,2.11)
Secondary	34	21.5	14	8.9	3.00	(1.43,6.37)
Total	158	100	156	100	-	-

4.5.4 Occupation of the father

The majority of the spouses were peasants (67.2%), 11.1% were salaried employees, 17.8% were self-employed, and 3.8% were herdsmen. Table 21 shows the number of enrolled and non-enrolled children according to whether the father was peasant, self-employed or salaried employee. Herdsmen and peasants were aggregated and compared with self-employed and salaried employees. Self-employed fathers were 2 times more likely to enrol their children in school than peasants. However the difference was not statistically significant (OR=2.0, 95%CI=0.96,4.18). Salaried employed fathers were 2 times more likely to enrol their children in school than fathers who were peasants (OR=1.8, 95%CI=1.73,1.95).

Table 21: The number of enrolled and non-enrolled children by the occupation of the father

Occupation of the father	Enrolled		Non-enrolled		Odds ratio	95%CI
	No.	%	No	%		
Peasant	102	45.7	121	54.3	1	-
Self-employed	34	60.9	22	39.3	2.0	(0.96,4.18)
Salaried employee	22	62.9	13	37.1	1.8	(1.73,1.95)
Total	158	50.3	156	49.7	-	-

4.5.5 Occupation of the mother

Mothers who describe themselves as peasants were 30.3%. The study also showed that 27.7% of the mothers were housewives, 22.9% were self-employed, and 19.1% were salaried employees. Housewives and peasants were grouped as peasants and were compared with self-employed and salaried employed mothers. The occupation of the mother was found to be significantly associated with enrolment of children in school. Salaried and self employed mothers were 3 times more likely to enrol their children in school than mothers who were peasants Odds ratio were 2.9 and 3.1 9 and 95%CI were (1.77,5.91) and (1.69,5.78) respectively (Table 22).

Table 22: The number of enrolled and non-enrolled children by the occupation of the mother

Occupation of the mother	Enrolled		Non -enrolled			
	No.	%	No.	%	Odds ratio	95%CI
Peasant	71	39	111	61	1	-
Self-employed	47	62.3	25	34.7	2.9	(1.77,5.19)
Salaried employed	40	66.7	20	33.3	3.1	(1.69,5.78)
Total	158	50.3	156	49.7	-	-

4.5.6 Religion of the mother

In the same sample, it was observed that 51.0% mothers were Muslims and 49.0% were Christians. Religion was not associated with enrolment of the child in school (OR = 1.08, 95%CI = 0.308,3.79).

Table 23: The number of enrolled and non-enrolled children by the religion of the mother

Religion	Enrolled		Non-enrolled		Odds ratio	95%CI
	No.	%	No.	%		
Christian	79	51.3	75	48.7	1.08	(0.308 3.79)
Muslim	79	49.4	81	50.6	-	
Total	158	50.3	156	49.7	-	

4.5.7 Number of children

Mothers with 1-3 children were 27.7% and about 54.8% had 4-6 children, while 17.5% had more than 6 children. Table 24 shows the number of enrolled and non-enrolled children according to the number of children the mother had given birth to. It was found that mothers with more than 3 children were less likely to enrol their children in school as compared with mothers with 1-3 children However, the difference was not statistically significant odds ratio were 0.81and0.82 and 95%CI were (0.43,1.51 and 0.46,1.48) respectively.

Table 24: The number of enrolled children and non-enrolled according to the number of the children the mother had given birth to.

Number of children	Enrolled		Non-enrolled		Odds ratio	95%CI
	No.	%	No.	%		
1-3	47	54.0	40	46.0	1	
4-6	84	48.8	88	51.1	0.81	(0.43,1.51)
>6	27	49.1	28	50.9	0.82	(0.46,1.48)
Total	158	50.3	156	49.7	-	-

4.5.8 Sex of the child

Sex of the child was found to be associated with enrolment status of the children in school (OR=2.23, 95% CI = 1.42,3.50). Male children were 2 times more likely to be enrolled in school than their female counterparts (Table 25).

Table 25: The relationship between sex and enrolment status of the children

Sex of the child	Enrolled		Non-enrolled			
	No.	%	No.	%	Odds ratio	95%CI
Male	92	60.5	60	39.5	1	-
Female	66	40.7	96	59.3	2.23	(1.42,3.50)
Total	158	50.3	156	49.7	-	-

4.5.9 Number of dependants

Mothers who reported to have between 1-3 dependants were 18.8 %. Exactly 59.8% had 4-6 dependants while those with more than 6 dependants were 21.6%. Table 26 shows the number of enrolled and non-enrolled children according to the number of dependants the mother was supporting. Mothers with 1-3 dependants were compared to those with 4-6 dependants and more than 6 dependants. It was found that mothers with more than 3 dependants were less likely to enrol their children in school compared to mothers with 3 and less children. However the difference was not statistically significant (OR=0.6, 95%CI=0.33,3.03). Mothers with more than 6 dependants were less likely to enrol their children in school compared to mothers with less than 3 dependants. The difference was statistically significant (OR=0.39, 95%CI=0.19,0.80).

Table 26: The number of enrolled and non-enrolled children by the number of dependants

Number of dependants	Enrolled		Non-enrolled			
	No.	%	No.	%	Odds ratio	95%CI
1-3	37	62.7	22	37.3	1	-
4-6	94	50.2	93	49.7	0.6	(0.33,3.0)
>6	27	39.7	27	60.3	0.39	(0.19,0.80)
Total	158	50.3	156	49.7	-	-

4.6 Logistic regression analysis

A logistic regression model was constructed to examine the association of the following variables with enrolment of the children in school. The variables used were those which were found to influence enrolment status of the children in school in bivariate analysis. These variables were education level of the father, education level of the mother, the occupation of the father, education level of the mother, the number of dependants the household was supporting, and sex of the children. When data for all 314 subjects were analysed four variables were significant: (Table 27) Sex of the children was found to be associated with school enrolment. Males were 2 times more likely to be enrolled in school compared to females (OR=2.34, 95%CI=1.43,3.84). Another factor which was found to be associated with school enrolment was the number of dependants the household was supporting. Household with more than 6 dependants were less likely to enrol children in school compared to household with less than 3 dependants (OR=0.43, 95%CI=0.2,0.94). There was no significant difference in enrolling children in school was found between household with more

than 3 dependants and those with less than 3 dependants. (OR=0.62, 95%CI=0.84,1.19). Education level of the father was another factor found to be associated with enrolment status of children in school. Fathers with primary, secondary and high education were more likely to enrol their children in school compared to those with no education. The difference was statistically significant. Odds ratio were 2.04 and 2.69 while 95%CI were (1.02,4.07) and (1.35,4.09) respectively. Another factor which was found to be associated with enrolment was the occupation of the mother. Self-employed mothers were more likely to enrol their children in school compared to mothers who were peasants (OR=2.19, 95%CI=1.29,5.63). There was no significant difference in enrolling children in school between salaried employed mothers and peasants (OR=1.9, 95%CI=0.80,4.67). Education of the mother and occupation of the father were not found to be associated with school enrolment in multivariate logistic analysis model although they were statistically significant in bivariate analysis.

Table 27: Factors associated with enrolment status of children in school

Factor	No.	% in school	Odds ratio	95%CI
Sex of the child				
Female	162	(40.7)	1	-
Male	152	(60.0)	2.34	(1.43,3.84)
Education level of the father				
No formal education	102	(33.3)	1	-
Primary education	114	(51.8)	2.04	(1.02,4.07)
Secondary+	98	(41.1)	2.69	(1.35,4.09)
Number of dependants				
1-3	59	(62.7)	1	-
4-6	187	(50.2)	0.62	(0.82,1.19)
>6	54	(39.7)	0.43	(0.2,0.94)
Occupation of the father				
Peasant	223	(45.7)	1	-
Self employed	56	(60.9)	0.69	(0.36,1.36)
Salaried employed	35	(62.9)	1.2	(0.39,3.42)
Education of the mother				
No formal education	170	(44.7)	1	-
Primary education	96	(50.0)	1.3	(0.55,3.07)
Secondary education	48	(70.8)	0.79	(0.35,1.72)
Occupation of the mother				
Peasant	182	(39)	1	-
Self-employed	72	(62.3)	2.2	(1.29,5.63)
Salaried employed	60	(66.7)	1.9	(0.80,4.67)

4.7 Socio-economic indicators

In the absence of data on income, several indicators of disposable capital were used including the type of house, number of rooms, the ownership of animals and the possession of capital items including bicycle, radio, sewing machine, television, motorcycle, and car. The economic status of the parents was assessed by enquiring and where possible observing whether they owned any of the above mentioned capital items. A weight was given to each item in accordance with its cost and rarity in Kinondoni rural at the time of survey and a score derived by adding up the weights for all items owned. Three categories of socio-economic status were formed, low socio-economic status, medium socio-economic status, and high socio-economic status. Parents with low socio-economic status were 118 (37.6%), medium socio-economic status were 178 (56.7%), and high socio-economic status were 18 (5.7%). Enrolment of the children to school was found to be associated with socio- economic status of the parents. Parents with high and medium socio-economic status were more likely to enrol their children in school compared to parents with medium and low socio-economic status Odds ratio were1.82 and 2.29 and 95%CI were (1.55,2.14 and 1.83,2.86) respectively (Table 28). When socio-economic status was related with enrolment status and stratified by sex of the child no association was found between socio-economic status of parents and sex of the child ($p > 0.05$).

Table 28: Relationship between socio-economic status of the parents with enrolment status of children

Economic status	Enrolled		Non-enrolled		Total	Odds ratio 95%CI
	No.	%	No.	%	No.	
Low	48	40.7	70	59.3	118	1 -
Medium	99	55.6	79	44.4	178	1.82 (1.55,2.14)
High	11	61.1	7	38.9	18	2.29 (1.83,2.86)
Total	158	49.7	156	50.3	314	

Table 29 shows the relationship between socio-economic status of parents and hookworm infection. Hookworm infection was found to be associated with economic status of parents. Children from parents with low socio-economic status were more infected compared to children from parents with medium to high socio-economic status. The difference was statistically significant ($\chi^2 = 15.1$, 2df, p = 0 .0005).

Table 29: Relationship between socio-economic status of the parents and hookworm infection

Socio-economic status	Hookworm positive		Hookworm negative		Total	
	No.	%	No.	%	No.	%
Low	45	38.1	73	61.9	118	100
Medium	33	18.5	145	81.5	178	100
High	3	16.7	15	83.3	18	100
Total	81	25.8	233	74.2	314	100

($\chi^2 = 15.1$, 2df, p = 0 .0005).

4.8 Responses as to why the child was enrolled, never enrolled, late enrolled or dropped out from school

4.8.1 *The enrolled child*

The aim was to find out the reasons leading to the parents enrolling their children in school. The study showed that many parents viewed education as an investment for future. They believe that schooling would enable their children to acquire a job become a useful person in the future, enabling the child to be independent and provide economic security for the parents in their old ages.

4.8.2 *The non-enrolled child*

The aim of the study was to find out why children dropped out of school, never enrolled in school, or were enrolled late in school. Among 156 non-enrolled children

47.4% were drop-outs. Financial constraints was reported to be the main reason leading to the high level of school drop-outs (23.7%) while poor health of the children was reported by 7.1% of the mothers as the cause for their child to drop-out of school. Taking care of siblings and pregnancy were reported by 4.5% of the mothers as the reason for their children to drop-out from school. About 7.5% of the mothers reported that poor academic performance also contributed to drop-out from school. It was found that care of siblings accounted for 46.1% of the late enrolment, financial constraints was reported by 8.3% of the mothers as another factor for the late enrolment of the children. Other reasons for late enrolment were long distance to school, poor health, small stature, and attending "*madrasa*". About 6.4% were found to have never been enrolled. Poor health, financial constraints and children attending to family matters were the main reasons associated with non-enrolment.

4.8.3 *Decision to send a child to school*

About 72% of the mothers reported that the decision to enrol the child was made by the father while only about 27% of the mothers were responsible for sending the child to school. Only 1% of mothers reported that the decision was made by the guardian.

4.8.4 *Payment of school fees*

In a total of 314 responses, the data showed that fathers were mainly responsible for paying school fees (72.6%) whereas the mothers were responsible for 23.1%. Cases where both parents paid for the child's fees were only 2.2% of the sample. About 1% of the children paid school fees on their own.

4.8.5 *Activities performed by out-of-school children*

Activities reported to be done by out-of-school children were farming 24.7%, fishing 0.6%, and petty business 13.5%. The rest reported to be dealing with domestic chores. Activity performed by out-of-school children was not associated with infection with geohelminths and urinary schistosomiasis.

CHAPTER 5

5.0 DISCUSSION

Although all necessary measures were taken to minimise the known sources of bias the data presented here should be interpreted with caution due to likely selection bias and underreporting of some information like socio-economic indicators. About 14(4.3%) children and their mothers did not participate in the study and were regarded as non-responders. Their exclusion from this study might have affected the results. Furthermore, many socio-economic factors are difficult to assess quantitatively especially earnings because people are understandably reluctant to reveal to strangers their income or other wealth including land or livestock. In some circumstances it may be feared that these enquires could lead to increase taxation, robbery or hostile envy. Thus under reporting of some information about socio-economic indicators and non-participation among mothers and children may pose validity problems. There are no reports yet of a similar study based on school-going children and out-of-school children that has been conducted anywhere else in Dar es Salaam.

Although this study had some weaknesses, its findings have provided a useful base line information on the current health of school-age children and factors affecting non-enrolment in rural areas. The results also provide a background information upon which health planners may utilise to initiate or strengthen the existing interventions designed to improve health of school-age. The study has provided information, which may be used by education planners to plan measures that will help to improve school enrolment and attendance.

5.1 Prevalence and Intensity of Helminths

From the results, it is evident that the health of school-age children in Kinondoni district is poor since over a half of the examined school-age children had urinary schistosomiasis, geohelminths and were malnourished. There was no difference in prevalence rate for ascariasis, urinary schistosomiasis and malnutrition observed between enrolled children and non-enrolled children. The only difference was observed in hookworm infection where the prevalence rate in non-enrolled children were significantly higher compared to enrolled children. This difference can be explained by the fact that most schools require that pupils should wear shoes. Observation of children going to school confirmed that most of them complied whereas hardly any of the out-of-school children were seen to wear shoes (personal observation). This result confirms the previous findings by Killewo *et al.* (1991) in Temeke district where he found the prevalence of hookworm to be higher in non-enrolled children compared to enrolled children.

The results from this study have shown low prevalence of *Ascaris lumbricoides* and *Trichuris trichiura.* The low prevalence rate could be attributed to the fact that most areas of the surveyed villages had access to tape water drawn from upper Ruvu water supply line to the city which passes through these villages. Safe, clean, and adequate water supply plays an important role in raising both personal and public hygienic standards. This in turn helps to reduce the prevalence of *Ascaris lumbricoides* and *Trichuris trichiura.* The dry spell which was prevailing before and during the study could also contribute to low prevalence of *Ascaris lumbricoides* and *Trichuris trichiura.* This is in line with Miller (1969) that wet season has a direct relation to

high prevalence in geohelminths infection. The same opinion has also been propounded by McCullough (1974) who acknowledged that rainfall accentuates the transmission and therefore lead to an increase in prevalence both for ascariasis and trichuriasis. This is equally true of the hilly and mountainous areas of Tanzania having high rainfall. However Kinondoni district consisted of lowland area with scarce to moderate rainfall. Like other studies done by Berger and Saleh (1986); Ng'andu *et al.* (1991) and Otito (1994) higher prevalence of hookworm and urinary schistosomiasis was established. This study confirms previous results by Sturrock (1964) and (1966); Vaughan *et al.* (1973) which shows that *Ascaris lumbricoides, Trichuris trichiura* are generally less prevalent along the coastal belt of Tanzania as compared to hookworm which is quite prevalent.

Sanitation, rainfall, soil environment, habitual contamination of the soil with faecal matter are some of the factors which determine variation in prevalence of intestinal parasites (Kihamia, 1977).

This study reveals no difference in prevalence rates and intensity between males and females in *Ascaris lumbricoides* and hookworm. This finding is not in line with that of Girges (1934), Senkoro (1978) who observed that females are more liable to geohelminth infection than males. These observations could not be experienced in this study due to the possible fact that children between 7-14 years have more or less a similar life style whether they are male or female and hence would experience the same exposure rate to geohelminthiasis. Whereas this study comprised school-age children Senkoro's study comprised children and adults. The difference in infection with sex might be due to the fact that adult females are more exposed to infection as

the drawers of water and collectors of firewood and they frequent the fields more in search of food like vegetables and bananas for the family (Muhondwa, 1976). In addition they also participate in the day to day farming activities with men.

In further analysis of infected cases, prevalence of *Ascaris lumbricoides* was found to be higher in young age group than older age groups. The prevalence of hookworm increases with increasing age of the studied subjects. This finding confirms that of Senkoro 1978. The older age group appears to experience more infections than the younger age groups. The older age group are physically more active and adventurous and thus stand more chances for risks from infection sites or in areas where open air defecation is common. Community groups involved in farming away from their homes practice open-air defecation near their farmlands such areas become potential infection sites for children.

Prevalence rates and intensity of infection that was observed for *Schistosoma haematobium* was not different in enrolled and non-enrolled children. This might be due to equal chances of exposure to infection. Recreational water contact activities like swimming and playing in water have been observed to result into more frequent and intensive contact with potentially infective water (Lwihula, 1985).

Egg output was also similar in enrolled and non-enrolled children. There was no difference in prevalence rates observed between males and females. This support previous studies by Forsyth and Bradly 1966. The intensity was higher in males than in females. The difference was statistically significant. This finding confirms that of

(Edington *et al.* 1970; Ndyomugyenyi 1992). The difference in egg output by age and sex reflects the differences in exposure frequency to contaminated water and probably different degrees of protective immunity. The prevalence and intensity of infection was observed to be higher among children in the age 10-14 years. Similar observations have been made (Wilkins *et al.* 1979; Ejezie *et al.* 1981 and Ndyomugyenyi, 1992). The high prevalence rate and intensity of infection observed in this age group has been attributed to more human water contact and exposure to infection (Dalton and Pole, 1978). In accordance with these authors the frequency of water contact was higher among 10-14 years than in the age 5-9 years and 15-19 years.

5.2 Nutritional status of children

The study revealed that chronic under nutrition was high among school-age children and was progressively increasing with increasing age of the children. A similar study of nutritional status in school children done in Kisarawe district in Coastal region by Otito (1994) revealed that chronic under nutrition was the primary nutritional problem and stunting increases with increasing age of the child. There were no significant differences observed between the mean Z score of height for age and weight for height between enrolled and non-enrolled children. This indicates that there is no significant difference in nutritional status between enrolled and non-enrolled children.

5.3 Factors for non-enrolment

Analysis of the factors associated with enrolment indicates that education of the father and occupation of the mother were associated with enrolment of their children in school. Other factors which were found to influence school enrolment were sex of the child and the number of dependants the household was supporting.

Socio-economic status of the parents was found to be associated with non-enrolment. Parents with low socio-economic status were less likely to send their children to school compared to parents with moderate to high socio-economic status. This finding confirms that of Chenichovsky (1985) in rural Botswana where demographic and socio-economic status was found to be associated with enrolment of children to school. There was no sex preference in enrolling children in all classes of socio-economic status.

The more frequently reported reason for non-enrolment was financial constraints. Inability of parents to afford the expenses of sending the child to school and the need of child labour to assist in household economy were the major factors reported to contribute to non-enrolment. Inability of parents to pay school fees and to buy school uniforms was reported as the major reasons which contribute to drop-out of children from school. Another reason was the need of the child to assist with some aspects of household economy. Children were needed to help with domestic chores such as taking care of siblings, farming and trading. These activities conflicted with enrolment in school and resulted into non-attendance, late enrolment or drop-out of school. The importance of child labour to supplement income in poor parents was the prime reason for children dropping out of school or being frequently absent.

In addition to economic reasons pregnancy was another factor reported to contribute to drop-out of girls from school. Other reasons, which were cited to contribute to drop-outs, were poor academic performance and poor health. Another reason, which was found to affect school enrolment, was long distance to school. Some children had to walk several kilometres to reach the nearest school. Distance to school was cited as the major reason for late enrolment in school. Other factors for late enrolment were taking care of siblings, attending *"madrasa"* (Muslims religion nursery school) small stature and poor health.

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

- The health of children enrolled in school was not significantly different from non-enrolled children except in infection with hookworm where non-enrolled children were more infected compared to enrolled children.

- The intensity of infection was not significantly different in enrolled children except in hookworm where the infection was higher in non-enrolled children than in enrolled children

- There was no significant difference in nutritional status between enrolled and non-enrolled children.

- Non-enrolment was found to be associated with poor socio-economic status of the parents.

From the study the following recommendations are made:

- The government and non-government organisations should be approached to provide adequate medicaments for the treatment of geohelminths and urinary schistosomiasis by using village health workers (VHW), dispensaries and the health centres in conducting deworming programmes.

- School-age health programmes should reach all school age children including non-enrolled children since they also have poor health status.

- Since poverty is the major factor underlying poor enrolment there is need for activities to empower people economically such as entrepreneur skills, provision of credit facilities and marketing techniques. There is need for vocational institutions to provide practical training to children and useful skills, especially for drop-outs, as well as the need for incentives for children to complete their education, or for drop-outs to return to school. Government and non-governmental organisations should assist in education of children from poor parents. Mobilisation of charitable organisations to support parents who are unable to meet school requirements will reduce drop-out rate.

- Future research to identify other factors beside socio-economic and demographic factors which influence enrolment of children in school like school structure, furniture, number of teachers, and quality of education is suggested.

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