ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE ON MALARIA AMONG PRIMARY SCHOOL CHILDREN IN KAMPALA DISTRICT, UGANDA.

BY

TURYABAGENYI CHARLES WILLIAM ARIHO

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DR. G. LWIHULA

(SUPERVISOR)

Date: 30th 9. 1996

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ABSTRACT

A cross-sectional survey was conducted with in the strategies of UNMCP. The survey involved 953 pupils, and 10 FGDs involving 80 pupils. Pupils were from primary seven class and were aged 12 years and above. It was carried out in March and April in Kampala district in Uganda in 1995. Self-administered anonymous closed questionnaire and FGDs techniques were used. The objectives were to determine knowledge on malaria, sources of information on malaria and attitudes towards them, association with socio-demographic characteristics and malaria self-protection practices among primary seven pupils in Kampala.

Malaria was among the common health problems in schools. Poor performance in class work, and absenteeism from school were some of the effects of malaria mentioned by pupils. Most of the pupils had misconceptions about the cause of malaria. Pupils showed high awareness of transmission, signs, treatments and preventive practices about malaria. Main sources of information on malaria in school were a teacher and books. Preferred sources were a teacher and a health worker. The most preferred channel was a television. Investigation of the magnitude of malaria among pupils and its effects is recommended. Workshops on malaria for teachers and health workers consolidating on the use of books and radio as media to motivate pupils to practice on malaria should be organized.

DECLARATION

I, Turyabagenyi Charles William Ariho, hereby declare that the contents of this dissertation are my original work, and it has never been submitted or is being concurrently submitted for a similar or higher degree in any other University.

Turyabagenyi

TURYABAGENYI CHARLES WILLIAM ARIHO.

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ABBREVIATIONS/ACRONYMS

UNDP	:	United Nations Development Program.
TDRP	:	Tropical Disease Research Progress.
WHO	:	World Health Organization.
UNMCP	:	Uganda National Malaria Control Program.
MOH	:	Ministry of Health.
HPU	:	Health Planning Unit.
DEO	:	District Education Officer.
KCC	:	Kampala City Council.
FGDs	:	Focus Group Discussions.
sl	:	sense lato.
A. gambiae	:	Anopheles gambiae.
A. funestus	:	Anopheles funestus.
P. ovale	:	Plasmodium ovale.
P. vivax	:	Plasmodium vivax.
P. malariae	:	Plasmodium malariae.
P. falciparum	:	Plasmodium falciparum
per. com.	:	personal communication.
mm	:	millimeters.
m^2	:	*Square meters.*
C^0	:	degrees celceus

OPERATIONAL CONCEPTS:

Attitudes - These were pupils' opinions in the form of likes about sources and channels of information on malaria.

In the FGDs attitudes were the consensus in opinions in form of likes across and differences within FGDs.

Knowledge - As used in this study was recall of facts on 6 topics of malaria; cause, diagnosis, transmission, signs, treatment, and prevention.

In the FGDs the "thought information" on cause, transmission, signs, measures against malaria attack, and malaria prevention was the consensus on recalled facts and differences across and within FGDs.

Malaria - As used in this study was malaria acute illness.

Practices - These were activities by pupils that implied, personal protection against mosquito bites.

In the FGDs practices on malaria were the consensus across and within group differences on activities taken about malaria attack, and self- protection against malaria.

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Chapter 1:

1.0 INTRODUCTION:

The Republic of Uganda (Appendix 6) is a land locked, sub-Saharan state situated in the East African sub-region. It is bordered by Kenya in the East, Tanzania and Rwanda in the South, Zaire in the West and the Sudan in the North (Langi, 1993).

Uganda has a land surface of 241.038 km^2. Open water and swamps cover 18 percent. Forest and game parks cover 12 percent. Land area covers 84 percent. The latter lies between 914 and 1524 meters above sea level (Langi, 1993).

Temperatures range between 17°C-26°C throughout the year.

The Central and South-west regions receive rains averaging to 12,000 mm annually. Heavy rains come during March to May and small rains during September to December. The Northern region has diminished rainfall as the border with the Sudan is approached. This region receives short rains with peaks in March and October averaging to 1300 mm annually.

Climatic conditions range from tropical rain forest in the South, Savanna woodlands and semi-desert vegetation in the North (Langi, 1993). The census conducted in 1991 recorded a total population of 18.1 million with growth rate of 2.9 percent. Ninety percent live in rural areas while 11 percent live in urban areas (KCC, statistics department, 1992).

The Worlds'Women (1995) pointed out that 10.7 million of the population are females. There were 4.7 million females in the age range 15-49 years. Children under 5 years were 3.9 million in 1990.

There were 6.4 million people in age category 10-24 years (The Worlds' Youth, 1994). Uganda has a population crude death rate of 21 per 1000 and crude birth rate of 51 per 1000 population. Total fertility rate is 7.4 (Grant, 1993).

School enrolment ratio ages 6-11 was 60 in 1990. Enrolment ratios of females as a percentage of males from 1986-1990 in primary school. was 83 and 50 in secondary school. Contraceptive use was 5 percent from 1980-1992. Maternal mortality rate was 300 from 1980-1990. Adult literacy rate of male to female ratio was 62:35 in 1991 (Grant, 1993).

There were 99 sets of radio and 8 television sets per 1000 population in 1989 in Uganda (Grant, 1993). Population with access to safe water was 43 percent in urban areas and 18 percent in rural areas in 1990. Population with access to adequate sanitation was 32 percent in urban areas and 30 percent in the rural areas in 1990. Population with access to health services was 90 percent in the urban areas and 57 percent in the rural areas in 1988 (Grant, 1993).

Infant mortality rate was 104/1000 live births and child

mortality rate was 16 per/1000 live births in 1991. Life expectancy at birth was estimated at 43 years in 1991 (Grant, 1993).

Langi (1993) maintains that agriculture is the backbone of the country's economy. The main cash crops are coffee, tea, cotton, and tobacco. Non-traditional cash crops mainly maize, rice, millet, simsim, beans, and cow peas are extensively grown. These make the country self-sufficient in food supplies.

Grant (1993) pointed out that Uganda had an average index of 97 food production per capita in 1991 and daily per capita calorie supply of 93 percent in 1990.

Administratively the country is divided into 41 districts. These are under the direct rule from the central government. Each district is divided into counties, sub-counties, parishes and villages which are administered by the Ministry of Local Government (KCC, 1992).

For the last two decades the country has gone through political turmoil resulting into destruction of socio-economic infrastructure. Kampala district is the capital city of Uganda with a population of 773,463 and an area of 203 square kilometers. It boards with Lake Victoria in the South, and with Mpigi district in the North, East, and West. It receives maximum rains in April and October averaging to more than 12,000 mm annually. The dry spells are in January

and August. Temperatures range between 17oC-26oC throughout the year (Langi, 1993).

Kampala district is divided into 5 divisions which are administered by City Council authority. Politically, the 5 divisions are overseen by the Central Government Representative.

The district has 2 referral and 4 consultant hospitals. There are 4 private hospitals, private pharmacies, private drug shops, and private clinics in most parts of the district. KCC runs clinics throughout the district. It is in these clinics and in the 2 referral hospitals that cost sharing of health services exist. Elsewhere health services are paid for in all the health facilities in Kampala district.

All the 21 tribes of Uganda are represented in Kampala district. The official language is English although Luganda and Lunyakitala are the most common languages spoken on the streets in Kampala city.

Peoples occupations range from self-employed, trade and hawking. Some are government workers, private wage employed, private employed, employed in domestic services and unpaid family work. There is small holder subsistence cultivation of yams, sweet potatoes, beans, cassava and banana. These are small gardens in low laying areas which are not yet built. Banana crops are a common feature around homes out of the

city center.

There are 141 primary schools in Kampala district with standard seven class. Seventy four of these belong to the KCC. The latter had an enrolment of 62,330 pupils in 1994 (KCC, statistics department, 1995).

Health Infrastructure:

The Government is the main provider of health services to the communities through MOH and Ministry of Local Government. Non-governmental organizations provide 30 percent of health services in the country. Some government ministries and parastatals do provide some health services for their employees. Private and traditional practitioners contribute significantly to the health care delivery system in the country. The MOH is responsible for policy formulation, planning, monitoring, and evaluation of health programs (Langi, 1993).

It is the MOH which administers and operates hospitals and training institutions for health workers except for medical doctors and other University graduate health workers. The MOH further provides drugs and equipment to all government and district administration health units. The MOH also gives capital inputs for national health programs to district administrations. The Ministry of Local Government under the guidance of the Directorate of Rural and Urban Health Services is responsible for the development,

operation, maintenance of all primary health care facilities, implementation, and coordination of national health programs.

Levels of health care delivery system in Uganda (appendix 8):

Primary:

This consists of health centers, dispensaries, maternity units and aid posts. These provide simple curative, promotive, and preventive services with limited outreach activities. The staff of these units have limited training usually to the level of medical assistant, nursing aide, midwife or community health workers.

Secondary:

This is composed of rural and district hospitals with 100-200 beds. These units are headed by medical doctors. They offer general curative services with limited laboratory facilities.

Tertiary:

This consists of six general referral hospitals with bed capacity of 200-400 headed by senior doctors. These offer specialized services, laboratory, radiological and other diagnostic services.

Quaternary:

This consists of Mulago, Butabika, and Mbarara hospitals. Mulago offers specialized services in all

disciplines and is the national teaching hospital. Butabika provides services in mental health and psychiatry while Mbarara offers both specialized and teaching services.

Between these levels of health care systems, there exists a network of referral systems. Currently Uganda has 81 hospitals, 90 Health Centers, 60 Dispensaries with maternal and child health services, and 360 dispensaries.

Epidemiology of malaria:

Endemicity (appendix 9):

Based on spleen rates, holoendemic malaria is restricted to Northern Lira (Lango) district. Hyperendemic malaria is restricted to the North and North-east of the Nile, and North-western (West Nile) region. The areas to the South and West of the Nile are mesoendemic while urban areas are hypoendemic. The high lands are predominantly malaria free (de Zulueta et al., 1963).

The complex landscape of mountain ranges, hills, plateaux, lakes, sluggish rivers with swamps, climatology (monthly mean temperature 15-32°C, relative humidity 60-80% and mean annual rainfall ranging from 12,000mm in most parts of Uganda except North-east which has 1,300mm) are suitable for perennial and sub-perennial transmission of malaria. The epidemiology is also influenced by the socio-economic aspects of human habitation, animal husbandry and normadism.

Swamp cultivation, irrigation schemes and strength of intervention measures also influence the epidemiology of malaria in Uganda (Langi, 1993). Malaria is endemic and stable below 1500 meters through out Uganda. However there is limited distribution up to 2300 meters where it is unstable and prone to epidemics (de Zulueta et al., 1963). Higher altitudes are regarded malaria free zones for example around Mt Rwenzori and Mt Elgon (WHO, AFRO/EPID 54, 1991).

Malaria parasites:

All the four human malaria parasites have been identified in Uganda. The most prevalent being **P. falciparum** accounting for 82.5- 97.5% of all out-patient attendances diagnosed as malaria. **P. malariae** for 8.4%, **P. ovale** for 0-3.4% and **P. vivax** 0-0.8%, of all out-patient attendances diagnosed as malaria (Hall et al., 1975).

Vectors of malaria (appendix 11):

The major mosquito vector species in Uganda are **A. gambiae** s.l., **A. arabiensis,** and **A. funestus,** (Davidson, 1955). **A. gambiae** is more prevalent during rainy seasons while A. funestus occur in high densities during dry seasons (White, 1973).

A. bwambae is a secondary vector of localized importance in Bwamba forests in Semuliki Valley (Haddow et al., 1985).

Around the shores of Lake Victoria, **A. moucheti, A. marshali, A. counstoni,** and **A. chrysti** play a secondary role in transmission of malaria (Davidson, 1955).

Malaria stability:

Malaria is endemic and stable throughout the country except for areas of high altitude in Kabale and Rukungiri districts. The latter are foci for unstable malaria (de Zulueta et al., 1963). The stability of malaria endemicity depends on longevity of vector populations, anthropogenic index and man biting rates.

The stability index of malaria has been computed in Uganda as 9.6 for **A. gambiae** and 7.5 for **A. funestus** for Lira. **Anopheles gambiae** with 5.8 for Kotido and Moroto. **Anopheles gambiae** with 7.3 and **A. funestus** with 4.2 for Masaka and Rakai respectively (Langi, 1993).

Malaria Public Health Significance (appendix 13):

Amongst the communicable diseases, malaria was the single most important cause of mortality and morbidity in children (HPU-MOH, 1990).

Malaria situation in Kampala district:

Factors that favor malaria in Kampala district.

- Rolling hills with low laying areas: The latter contain water most of the time where mosquitoes can breed. There is small holder cultivation of beans, cassava, sweet potatoes, banana, and yams. The pattern of cultivation

especially for sweet potatoes and yams favors water holding where mosquitoes can breed. Again rolling hills with low laying areas make drainage difficult. The latter coupled with poor garbage disposal favor mosquito breeding. There is a boom of housing construction especially outside the city center with poor access roads/paths thus creating abundant breeding sites for mosquitoes.

- Kampala district gets rains throughout the year averaging to 12000 mm annually. Both factors lead to build up of mosquito population throughout the year.
- Movements of people to and from Kampala; some of them immune, some non-immune and others with different strains of malaria parasites. New strains of malaria parasites are likely to be brought in by both symptomatic and asymptomatic cases. This may lead to a new gene pool of malaria parasites. The latter are perhaps likely to lead to new attacks of malaria episodes which require different anti-malarial use. These assumptions have not been investigated.
- Housing which ranges from modern brick houses, sand and cement houses to basic mud houses. The latter are found scattered in slum areas of Mulago, Makerere-Katanga, Makerere-Kivulu, Katwe-Kibuye, Kibuli-Kikubamutwe, Kamwokya-Kifumbira, and Nagulu-Godown (appendix 5). Some of these houses are one room houses. Activities like cooking and general conversation by family members take place outside. This goes on up to 10.00 p.m. during the

night due to lack of space in the room. It is with in this period that mosquitoes (**culex species**) bite.

Anopheles gambiae and **A. funestus** pick activity after 10.00 p.m. Some people are still seated outside during this time and are likely to be bitten by the mosquitoes.

- Some of the houses have spaces between the roof and the wall where mosquitoes can pass during the night. In some families bedding facilities are not enough. Some members of the families sleep on the floors where blankets may not be enough for every one to get covered. Thus mosquitoes have chances of entering the houses when the doors are locked and have access to the people during sleeping.
- In most parts of the city there is piped water and a few stand pipes close to peoples residences. Close to these stand pipes there is always un drained water where mosquitoes can breed.

A previous study done in Kampala district (Gibbins, 1933) showed that **A. funestus** and **A. moucheti** were predominant in human dwellings. **Anopheles costalis** was found in the upper portion of the walls and lower parts of roof in dark places of the houses. Tins and bottles on the ground were found to be the favored resting places.

The ecology of Kampala district has been modified in such way that there is a diverse of breeding sites for mosquitoes than probably there used to be before. For example there is an increase in the number and types of cans, bottles, tires, jars, vases, metal containers, refuse, items

in abandoned lots and water in places where it used not to be through pipes. These can hold water in which mosquitoes can breed.

Steyn (1946) pointed out that **A. costalis** and **A. funestus** can feed on goats, chicken, and other domestic animals in Kampala district. He stressed that smoke due to cooking fires within native huts didn't prevent **A. funestus** and **A. costalis** from entering the huts. There has been no follow up studies on these observations and therefore the behavior of these vectors with regard to the above hosts and repellents is not known. It could be ambivalent. The author pointed out that cultivation of sweet potatoes and dwellings surrounded by dense vegetation were attractive to Anopheles mosquito.

The cultivation of sweet potatoes has decreased in scale in Kampala district however dwellings surrounded by vegetation still exist. Steyn collected larvae of **A. christyi**, **A. marshalli gibbinsi**, **A. coustalis**, **A. funestus**, and **A. gambiae** from cultivated and un cultivated areas that held water.

Malaria Control Program (appendix 14):

A. **Objectives:**

1. To prevent and reduce mortality due to malaria in the under fives to the lowest level possible.
2. To prevent and reduce morbidity due to malaria in the general population so that it ceases to be a public health problem.
3. To prevent and reduce malaria mortality and

morbidity amongst sicklers and non-immune visitors and residents.

4. To prevent and reduce malaria mortality and morbidity amongst pregnant women.

B. **Strategies:**

These are:

1. Provide prompt diagnosis and adequate treatment.
2. Information, Education and Communication (IEC).
3. Promotion of measures for prevention of malaria.
4. Operational Research.
5. Epidemic Preparedness.

Each of these strategies has its own ways of achieving it.

2. STATEMENT OF PROBLEM AND RATIONALE:

There was an increase of malaria cases in primary school children (per. com.). All primary school children of both sexes aged six and above years were affected (per. com.). The problem had not been properly quantified (per. com.).

Exploratory survey from both Kampala district primary school and KCC clinics showed an increase in daily attendances and admissions to the school sickbay of pupils diagnosed as having malaria. These were about sixty percent of the total health problems seen per month among pupils (per. com. MOH).

Malaria problem was further seen by the increase in number of pupils about seven and above out of a class of 40 per month. The former developed acute symptoms of malaria while at school. They were rushed to the nearest clinic/dispensary/hospital for management (per. com. Headmaster, Nakivubo, Primary School).

The problem was further seen in the tremendous increase in school absenteeism. This was revealed in pupils' class daily attendance registers. These numbered up to five and above every month in a class of 40 pupils (per. com. Headmaster, Nakivubo, primary school). There was also an increase in the number of pupils who asked for permission everyday to go to the nearest dispensary/health center for treatment with symptoms related to malaria.

Despite this malaria situation, a number of methods both at individual and national level have been going on in Kampala district and other places in Uganda. These vary in

their nature from individual personal protection against mosquito bites to malaria control on a larger area.

These include Health Education conducted by Health Education Unit of MOH as part of general Health Education for all diseases of public health importance. This encompasses the school health education program. The latter has some aspects on malaria which are supposed to be conveyed to the pupils. These are provided in series from standard two to standard seven (Basic Science & Health Education Syllabus for Primary Schools Uganda, National Curriculum Development Centre, Ministry of Education). They are taught as part of science. For education on malaria, occasionally radio, and news papers are used. The effectiveness of Health Education in reducing malaria has not been evaluated. However it is unlikely that it has had much impact.

Mosquito bed-nets could be effective in reducing the night biting nuisance of Anopheles mosquitoes. There are arguments that bed-nets provide privacy. If impregnated with some chemicals they can lead to the decrease in bed bugs and other nuisance insects (TDR News, 1994). However there has been no studies to evaluate their effectiveness as a malaria prevention strategy against intensity of transmission and seasonality in Uganda. They are in short supply in Uganda and are too expensive for the ordinary person to endure at a fertility rate of 7.4 and gross domestic product of USA $220 (Grant, 1993). Some studies have shown that nets are inefficient in holoendemic malarious areas (TDR News, 1994). So this method is ineffective and unaffordable as a tool for

nation-wide malaria control at present.

Screening of human dwellings using mosquito-gauze can only be applied to well constructed modern houses. In Uganda these are mainly found in Urban areas. Malaria is a rural disease. Ninety percent of Ugandans live in the rural. Majority of these rural people live in grass-thatched mud-and-pole houses with a few housed in corrugated iron sheeted houses. Therefore it is difficulty to apply mosquito-gauze screening to such houses. Besides mosquito-gauze is not readily available, and is expensive for the common man. These facts render house screening ineffective for nation-wide malaria control.

Pyrethrum mosquito-coils and other commercial aerosol are used in Uganda especially in Urban areas. Mosquito-coils emit smoke when burned. The latter irritates mosquitos and drives them out of the bedrooms. Pyrethrum-coils are reasonably cheap however they are not easily available. Some people are allergic to the pyrethrum and/or the smoke. There has been no studies on commercial aerosols and coils in Uganda to evaluate their effect on transmission of malaria. So this approach can not be used on a nation-wide malaria control.

Chemotherapy, and chemoprophylaxis in Uganda has depended mainly on chloroquine alone. However there has been a gradual decline in the efficacy of chloroquine in clearing parasitaemias of *P. falciparum* in indigenous semi-immune. For example (Sezi et al., 1988) found R.1, R.11, and R.111 resistances of 18 percent, 0.7 percent, and 1 percent

respectively among pupils. Failure rates to chloroquine among pupils ranged from 40 percent in Kampala to 3 percent in Arua.

Further this declining efficacy of chloroquine has progressed to actual resistance. This was confirmed in in-vivo and in vitro in non-immune in Western Uganda (per.com. Katwesigye, 1992).

A study (Green, 1984) pointed out that wherever control of malaria has been undertaken it resulted in a fall in malaria antibodies in the protected population. The biological function of this has not been serological determined. Thus one can not be proud of malaria control using chemotherapy as the evolutionary significance of this is not yet known.

Vector control through residential house spraying with DDT was tried in South-western Uganda. This was on experimental basis. The results were excellent in terms of disease control in Rukungiri district and areas around Lake Bunyonyi in Kabale district (de Zulueta et al., 1961).

Larviciding and Environmental management has been quite extensive in urban areas. There are major problems which have hampered large-scale application and success of vector control in Uganda (Onori, 1984). These include raising costs of insecticides in the face of decreasing foreign exchange reserves. Lack of equipment heightened the failure of insecticides. Lack of adequately trained man-power and general neglect of Environmental methods of vector control; the former had no concern for efficiency and no knowledge of

Environmental pollution (Zahar, 1984). It has always been difficult to establish and maintain rapport with house owners by the spray teams.

In general whatever vector control that is available has been confined to a few urban centers. There is practically no vector control in the rural areas where 90 percent of Ugandans live. In the absence of substantial anti-vector control, mosquitoes occur in great abundance with consequent malaria transmission.

The two principal vectors of malaria in Uganda; *A. gambiae*, and *A. funestus* breed credulously and profusely. This can result in amazing population build-up of mosquitoes. They are extremely efficient vectors of malaria. Therefore considerable reduction in their numbers must be achieved before malaria transmission can be affected.

Mosquito control operations, whatever their nature will not succeed without a reduction in labor costs in terms of paid personnel. In addition there must be cooperative effort on the part of the community to be served. Reduction in labor costs can best be achieved through community participation. The rural areas in Uganda are characterized by the presence of extensive breeding sites around scattered human dwellings. Source reduction and source treatment are almost impracticable through paid labor. However all Ugandans live in Resistance Councils in which there is a village government. In the latter, people are grouped under ten-cell system. The latter has not been exploited for vector control

yet.

Some source reduction, symptomatic diagnosis, and presumptive treatment can be practiced with community participation. For example volunteer village malaria workers as health educators could be trained to disseminate information about malaria control and prevention. These could be in all malarious areas in the ten-cell governments. The volunteers would be trained to take a blood smear, administer anti-malarial medication, and provide some basic instruction in health education techniques.

As most alternatives have failed to control malaria, it appears that the only way left is to go back to primary health care (Jeffery, 1984). Community participation which seems to be the alternative not exploited can be effective if the communities are made aware of malaria. This involves making them know the cause, transmission, diagnosis, symptoms, treatment (presumptive) and prevention of malaria. This, in the short run, would result into early reporting to health facilities leading to early treatment. This would also lead to decline in breeding sites for mosquitoes. The afore mentioned two accomplishments would result into decreased mortality. In the long run sustained source reduction and socio-economic change would result in reduced morbidity of malaria. However one should not forget that this could encourage improper self-medication leading to drug resistance, therapeutic failure, and delay in treatment.

The most feasible way to achieve community participation is to use existing groups like pupils and clusters like ten-

which malaria vectors and disease spread to nearly all the parts of the country.

There has been no studies among pupils in Uganda to find out the understanding of pupils on the present malaria situation. Knowledge, Attitude, and Practice studies have been recommended by UNMCP under strategy number four.

The findings of the study would enable planners to organize malaria control strategies especially primary school health education. The latter would be the type that is required in order to encourage pupils to be actively involved in any program like practicing the knowledge on malaria at their homes.

The study is expected to elucidate positive aspects on malaria knowledge; cause, transmission, diagnosis, symptoms, treatment and prevention. It is expected to reveal sources and channels of information on malaria and attitudes about these sources and channels. Further the study is expected to disclose practices of pupils on malaria.

The data collected would help in the design of interventions on malaria in Kampala district.

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Chapter 2:

3.0 LITERATURE REVIEW

Emilio (1963) reported, "Malaria is a disease caused by presence in the red blood *corpuscles*, or in the liver cells, of a unicellular parasite-a protozoan-belonging to the genus *Plasmodium, (P)*".

In nature malaria is contracted by the inoculation of saliva of a female mosquito (Anopheles species) containing infective forms (sporozoite) of the malaria parasite. These parasites must have lived in the mosquito for at least 7 days or longer depending on temperature (Emilio, 1963). The average incubation period between the infective mosquito bite and the appearance of fever varies among parasite species. It is approximately 11 days for '*falciparum infection*,' 14 days for '*vivax*', 15 days for '*ovale infections*', and 4 weeks for '*P. malariae*' (Emilio, 1963).

Malaria in humans is caused by four species of protozoal parasites of the genus; *P. falciparum, P. vivax, P. malariae, and P. ovale*. The first two account for more than 95 percent of the cases in the world. *P. malariae* has an uneven distribution while *P. ovale* is found only in Africa particularly West Africa (Emilio, 1963).

Indigenous malaria has been recorded as far North as 64°N and as far South as 32°S. Has occurred in the Dead Sea area at 400m below sea level. Has occurred in Londiani (Kenya) at 2600m above sea level, and at 2800m in Cochabamba (Bolivia) (Bruce-Chwatts, 1991).

TDRP (1993) believes that malaria is the most important

tropical parasitic disease causing great suffering and loss of life.

Although statistics on malaria morbidity and mortality in Africa are rare, TDRP (1993) maintains that extrapolations from epidemiological studies show that the disease is responsible for no less than 500,000 to 1.2 million deaths annually. These are mainly African children below the age of five years.

Bradley (1992) disclosed that the chief determinant of the pattern of malaria seen in Africa was the pattern of acquired immunity to malaria by humans. This is due to a high basic case reproductive rate (bcrr). Bcrr in excess of 1000 is found. Therefore in Africa, a vast excess of capacity for malaria transmission above what is required to maintain endemicity is available.

TDRP (1993) maintains that about 300 million people are infected with malarial parasites. Ninety percent are living in tropical Africa. *Plasmodium falciparum* accounts for most of the infections and for over one third of the infections in the world. More than two billion people, about 40 percent of the world's population are at risk of contracting malaria.

Again McElroy et al (1994) maintains that in sub-Saharan Africa, *P. falciparum* causes more than 100 million clinical episodes of malaria. It kills more than 1 million children per year.

The Ministerial conference on malaria in Amsterdam (1992) pointed out that half the world's population was at

risk from malaria. The disease caused 100 million clinical cases and over one million deaths each year. The ministers maintained that 80 percent of malaria cases and deaths occurred in Africa. Malaria took the life of 1 out of 20 children before the age of 5 years. The disease caused anaemia in children and pregnant women thereby increasing their vulnerability to other diseases. Malaria afflicted the poor and underprivileged most severely. It sapped productivity and caused chronic ill health which resulted into social and economic staggering.

Ruiz et al. (1994) while working in Colombia and Ecuador on socio-economic impact of malaria among subjects of age 15-59 years found out that around 4.1 days were lost (that is from identification of the disease to the actions of care and the overcoming of symptoms).

During these four days of malaria episodes the sick incurred direct expenses for curative measures of $ 4.50.

In addition $ 5.9 were lost in labor force which added up to $ 10.40. This was equated to the amount of money a landless laborer would receive for 5.7 days of work or 21 percent of the minimum monthly wage.

This age category includes some subjects who may be pupils although the curative costs are incurred by their guardians. TDRP (1993) stressed that seasonal transmission of malaria represented variation in economic impact of the disease in different periods of the year. Each malaria attack lasted for 5-15 days often incapacitating the patient. Enormous lives, and labor days are lost. Costs of treatment for the patients,

and negative impact of the disease on development. This made malaria a major social-economic burden with an estimated annual direct and indirect cost in Africa of US $ 800 million in 1987. This figure was expected to raise to more than US $ 1800 million by 1995.

There are countries where malaria was rampant for example in Italy and Holland. These were able to eradicate malaria because their malaria was epidemiologically different from that in Africa. They had temperate malaria characterized by the presence of begnin tertian infections. Tropical and sub-Tropical zones had both malignant tertian as well as begnin infections (Gill, 1938). Williams *et al.* (1900) disclosed that temperate climate, malaria vector species, demographic characteristics of the people, and health transition stage in these countries played a big role in the eradication of malaria.

Eradication programs were tried on a small scale in African countries for example use of chloroquinized medicated salt in Tanzania and Uganda from 1961-1967. Pyrimethamine medicated salt was tried in Ghana. All these programs failed to eradicate malaria. From these observations it might be logical to infer that it was too early for African malarious countries to embark on malaria eradication programs. They had not acquired in built capacities to administer such programs and maintain them (Bruce-Chwatt, Leonard, 1983).

HPU-MOH (1991) disclosed that malaria accounted for 20 percent of the out-patients attendances, and 10 percent of the in-patient deaths in 1988. Malaria was responsible for 22

percent of out-patients attendances and 8 percent for in-patient deaths in 14 reporting hospitals in 1989.

These findings made malaria the second important cause of death to diarrhoeal diseases. In 1990, 23 percent of the out-patients attendances and 14 percent of the hospital deaths were due to malaria. Malaria mortality rates in under five was 65 percent in 1988, 75 percent in 1989, and 1990 respectively.

Again (Byarugaba, 1991) found out that malaria was associated with anaemia in pregnancy and low birth weight in Uganda.

de Zuluta et al. (1961) found out that malaria prevalence ranged from mesoendemic to hyperendemic conditions in Uganda. Spleen rates in children 2-9 years was as high as 92 percent. These children included pupils. This study showed the magnitude of malaria as a public health problem among children in Uganda.

Davies (1950) while working at Mulago hospital among children of ages up to 11 years pointed out that malaria was responsible for 41 percent of all admissions of both Baganda and non-Baganda children. This study showed the magnitude of malaria in children some of whom might have been pupils in Kampala district.

Again Sezi et al (1988) on their study among pupils aged 6-12 in Kampala district found out that failure rates to chloroquine against *P. falciparum* was the highest (40 percent). This study showed the extent to which pupils were exposed to anti-malarial. Few of the causes of chloroquine

failure are self-medication, late reporting to health facilities, and different strains of malaria parasites. This current study calls for quicker investigations of the causes of this chloroquine failure.

Studies done else where among pupils for example Uhari Matti *et al* (1992) pointed out that 40 percent of parental absenteeism from work was due to children's illness. These illnesses caused financial losses of the magnitude of about $ 33 monthly for children at a child care center. This loss was higher when compared with $ 20 for those in other care modalities. Malaria was one of the illnesses. This study clearly demonstrated parents' absence from work and costs incurred for medical care due to illnesses in pupils.

Taha *et al*. (1986) working among pupils in Juba Southern Sudan found out that 63 percent of the pupils were asymptomatic for malaria. Regardless of malaria endemicity of the area and sample selection, the study showed malaria as a public health problem in sub-Saharan Africa which needs to be combated. There is need to investigate whether the pupils can perceive this as a problem. One of the objectives of this current study was to find out whether pupils in Kampala district perceived malaria as a problem.

Some (1994) in his study of the effects of highland malaria epidemic in Kenya showed that school absenteeism among pupils ranged from 18 percent to 54 percent. This study demonstrated that malaria directly or indirectly can cause absence of a whole class of say 40 pupils and above from school. Pupils living in highland areas are likely to be

semi-immune to malaria. It would be very interesting to know their knowledge and practices on malaria. It would also be interesting to know the socio-demographic characteristics of these pupils. Their knowledge, practices on malaria and their socio-demographic characteristics would help in working out strategies for malaria epidemics.

Again Colbourne (1955) working on the effect of malaria suppression of age category 7 years, showed that absentee rate in the treated pupils was reduced. Every 7-year pupil suffered on average five to six days sickness from malaria of severity to cause absence from school. If a pupil is going to be absent from class for 5-6 days a term, then this pupil is likely to perform poorly in end of term examinations. This pupil is likely to be generally weak. The guardians will have spent money in terms of drugs for treatment. This calls for measures to stop this situation. Before it can be done we need to know the socio-demographic characteristics of these pupils to help us in designing a malaria control program strategy.

Kere *et al.* (1993) working among pupils in Solomon Islands on economic impact of *P. falciparum* malaria showed that a total of an equivalent of 55.14 school pupils years were lost to a child who was expected to attend school for 200 days in a year. Total consequences for investment in primary education was US $ 108,996.00. This was equivalent to 27.31 teachers being paid for not teaching. Teachers are supposed to teacher a full class of pupils (40). At the end of the month they get salaries. When pupils are absent from

class due malaria sickness or its consequences, teachers are still paid the same amount of money as if they had taught a full class of pupils for an equivalent days of a month. Thus teachers are paid money part of which they did not work for as salary. This is an economic loss to the nation. There is need to interrupt this situation. In Uganda primary education is totally commercial. It is very beneficial to the guardians if authorities control malaria among pupils so that both the guardians and government don't loss.

Aikins et al. (1993) working in The Gambia found out that twenty eight percent of the respondents knew the cause of malaria as a mosquito. Rains, allah, eating mangoes, drinking too much cows'fresh milk were among other causes that were mentioned. One of the objectives of this current study was to find out whether the pupils knew what transmits malaria. This would help to expel some beliefs held by pupils that hinder control and prevention of malaria.

Yeneneh et al. (1993) working among adult female illiterates in rural Ethiopia on symptoms of malaria, found out that 87 percent of the respondents knew shivering. Sixty two percent knew headache, and 50 percent knew fever. One of the objectives of this current study was to determine the pupils' knowledge on malaria signs through a prompted closed questionnaire and FGDs. This would help us to consolidate on the available knowledge to motivate pupils to regard these signs as medical emergence and to expel some beliefs about symptoms that can hinder control and prevention of malaria. It is likely that if pupils know symptoms of malaria then

they are likely to report early to their guardians or encourage those who don't know to report to health facilities. These actions might stop the would be complications and disability due to malaria.

Again Aikins et al (1993) while working in The Gambia among adults on knowledge on treatment for malaria found out that respondents mentioned herbs. Baobab fruits, leaves, mango leaves, and locust beans were other treatments that were mentioned. In one of the studies in Kenya respondents knew chloroquine, malariaquin, aspirin, panadol and herbal medicine as treatment for malaria (Ruebush et al., 1995). These two studies show different beliefs on the treatments for malaria. One of the objectives of the study was to determine the pupils' knowledge on treatment for malaria. If pupils know both symptoms and treatments for malaria then this is likely to lead to early reporting and treatment at the health facilities. This would theoretically reduce the magnitude of malaria reservoirs and therefore alter transmission of malaria. Further it would help the planers to design strategies to expel some beliefs on treatment of malaria held by pupils and to consolidate on the relevant knowledge.

Stephens et al. (1995) working in Dar-es-Salaam and Tanga found out that respondents were using coils. Nets, sprays, fans, and window gauze were also used as personal protection against mosquitoes. One of the objectives of this current study was to find out measures pupils were using to protect themselves against mosquito bites and associated

fevers. Knowing these measures would assist the planners to encourage those which were feasible, applicable, and cost-effective in the control of malaria.

Yeneneh et al. (1993) on his study on knowledge on prevention of malaria found out that respondents knew chemoprophylaxis, insecticides and cleanliness. In this current study one of the objectives was to find out pupils' knowledge on malaria prevention. This would serve as a basis on which UNMCP would consolidate the most feasible cost-effective preventive method.

Velonakis *et al.* (1984) working in Greece on socio-economic factors and school education found out that the indicator of correct knowledge depended on educational level of the father and the fathers' profession. One of the objectives of this current study was to find out how socio-demographic characteristics of the pupils ware related to their knowledge on malaria cause, transmission, and diagnosis,... This would enable us to plan how to reach the target groups without compromising those who had little knowledge on malaria due to certain socio-demographic characteristics.

Again Brieger (1990) found variations in sources of information on mass media and health communication among adult men and women. For example literature was ranked first and friends ranked second among youngsters of age 16-17.

Friends was ranked first and literature second among the 15-16 year oldies. Mothers were important sources of information for girls. One of the objectives of this current

study was to find out the sources and channels of information on malaria. This was done through both prompted closed questionnaire and FGDs. The latter would complement the former. This would help the planners to design their strategies incorporating the most feasible and liked media of malaria information.

Brieger (1990) working in rural Nigeria found out that 75 percent of the respondents liked radio. Forty eight percent liked television, 29 percent liked newspapers, and 19 percent liked magazines. The study was conducted in a rural area and subjects were adult men and women. The study showed subjects'attitudes about mass media. Likewise pupils form attitudes about mass media. One of the objectives of this current study was to find out pupils'attitudes about the channels of information on malaria. This would help us in designing a strategy based on the feasible and liked channels in delivering malaria information to the targeted audience.

In Ethiopia respondents were found using insecticides, chemoprophylaxis, cleanliness and good nutrition as personal practices against mosquito bites (Yeneneh et al., 1993). One of the objectives of this current study was to find out pupils' personal practices against mosquito bites. This would help us in designing a cost-effective protective means against mosquito bite for example impregnated bed nets.

Literature search failed to get previous studies on knowledge and practices on malaria, sources and channels of information on malaria and attitudes towards these among pupils in Kampala district.

Chapter 3:

4.0 Hypothesis of the study

Primary School Children were likely to have both knowledge and practices on malaria, and favorable attitudes on sources and channels of information on malaria.

4.1 Broad Objectives

1 To assess the level of knowledge on malaria in the Primary school children in Kampala district in Uganda.

2 To determine the sources and channels of information on malaria and attitudes towards these among primary school children in Kampala district.

3 To assess the level of practices on malaria among primary school children in Kampala district in Uganda

4.2 Specific objectives

1 To determine the proportion of pupils who knew about the causes of malaria, its transmission, its diagnosis, symptoms, treatment, measures, and prevention.

2 To find out if scores on malaria in specific objective 1 was associated with socio-demographic characteristics of the pupils: age, sex, education and occupation (parent & guardian)
grade of school and family size.

3 To determine the sources and channels of information on malaria among the pupils.

4 To determine pupils' attitudes towards sources and channels of information on malaria.

5 To determine the proportion of pupils who practiced on protection against mosquitoes bites.

Chapter 4:

6.0 METHODOLOGY:

6.1 Study design

This was a cross-sectional survey involving 953 pupils and 10 FGDs of 8 pupils each.

6.2 Study area (Appendix 7)

6.2.1 Distribution of Population in Kampala:(Appendix 5)

Kampala city (district) is the capital of Uganda. This is made up of rolling hills with some low laying areas. Some of the latter are claimed and others remain un reclaimed. Some of these areas are covered with swamps. The latter harbor water throughout the year.

Occupations of the people include trading in a wide variety of commodities from farm produce, to imported fabrics and other commodities. There is fishing in Lake Victoria on a small scale by few individuals. Small holder-cultivation of yams, sweet potato, sugar cane goes on in areas which are not built, and small plots near residences.

A lot of building construction goes on with access roads and sewers not well constructed. This building construction, lack of proper drainage, small scale cultivation and poor refuse disposal provide ideal breeding conditions for main malaria vectors.

Housing ranges from modern brick houses, sand and cement houses to basic mud houses. The latter make up the slum areas. Piped water is available in most parts of the district and a few stand pipes close to homes.

There are a few traditional medicine men in Kampala district. These are consulted for both medical and spiritual problems. Anti-malarial are readily available in most health facilities and open market.

There are 773,463 people in Kampala district, predominantly christian with a few moslems. The district covers an area of approximately 203 km^2 (KCC census office, statistics department, 1991). There are 116,019 people below 15 years. The gross density of the city is 39 persons per hectare (Uganda first urban project-revision of Kampala structure plan population density by parish, 1991). Population is not evenly distributed over the entire space. Forty six percent of the population live on 80 percent of the land at low densities of 0-50 persons per hectare. A population of 3.4 percent live on 0.6 percent of the area at high densities of over 200 persons per hectare (Uganda first urban project-revision of Kampala structure plan population density by parish, 1991).

A block in Mulago II Parish revealed a net density of 1,963 persons per hectare as compared to a gross density of 296 persons/hectare (Uganda first urban project-revision of Kampala structure plan population density by parish, 1991). Mulago II and Kamwokya II are the most densely populated Parishes in Kampala district (appendix 15). Overall much of the district is not intensively utilized. There is need for further consolidation of development to curb urban sprawl. This is likely to decrease expenditure incurred on laying

infrastructure over a widely dispersed urban system.

Kampala district like any other part of Uganda is under the umbrella of population growth rate of 2.9% and a capita income of US$ 170 (World population data sheet, population reference bureau, 1994). There are 141 registered primary schools in Kampala district. Seventy four of these belong to the KCC. These KCC primary schools are graded. The grade of the schools is based on the total number of pupils enrolled in the school. A grade I has more than 750 pupils, grade II has equal to or more than 500-750, and grade III has less than 500. There are 39 grade I, 24 grade II, and 11 grade III (KCC DEO, 1994).

The KCC schools had an enrollment of 62,330 pupils in 1994. Girls were 32,194 and boys were 30,136 (KCC DEO, 1994). Primary education is commercial in Uganda. There is a lot of (coaching) extra tuition of pupils within Kampala district. People in the rural areas send their children to relatives who live in Kampala district. The belief is that there is better education facilities in Kampala district.

Children are recruited into standard one when they are six years. However guardians at times take their children to standard one when they are five years. Repeating of same class is allowed by Ministry of Education.

6.3 Study population:

These were pupils in government primary schools in Kampala district who were in standard seven. They were resident in Kampala district and were 12 years and above.

6.3 Target population:

These were all the pupils who were both residents and in government primary schools of Kampala district.

6.4 Sample size:

6.4.1 Focus group discussions

These were participated in by 10 primary schools. These 10 primary schools were chosen on convenience basis so as to ease transport of the pupils to the "neutral territory" (meeting place).

Two primary schools were chosen from each division. Groups of 8 people were adopted based on Bender and Ewbank (1994). The unit of measure was a group.

The group composition was homogeneous in education level and district of residence (standard seven and Kampala district). Pupils in each group held a discussion on malaria lasting for about 2 hours. Eighty pupils participated in the FGDs.

6.4.1.1 Schools that participated in FGDs.

A	B	C	D	E
01	NAKAWA	NTINDA P	2	NtiP
		NAGULU P	1	
02	CENTRAL	BAT VALLEY	1	BatP
		CITY P	1	
03	RUBAGA	NAMUNGONA (A).P	2	NngP
		KASUBI P	1	
04	KAWEMPE	ST. MARTIN MULAGO	1	MUP
		MAKERERE U PS	2	
05	MAKINDYE	RAILWAY CHILDREN	1	K'eP
		KIBUYE P	1	
TOTAL	5	10		5

Key:

A = code number

B = name of the division

C = name of the school

D = grade of the school

E = "neutral territory" (meeting place)

P = primary

MU = Makerere university

K'e = Kibuye

Nng = Namungonna

Bat = Bat valley

Nti = Ntinda

6.4.1.2 FGDs process:

These were held to indicate the range of knowledge and practices relating to malaria among the pupils. Attitudes towards sources of information regarding malaria were also discussed.

6.4.1.3 Selection criteria:

Two schools were chosen from each five divisions of Kampala on convenience basis so as to ease transport of participants to the meeting point. A group of 8 people was adopted based on Bender and Ewbank (1994).

The group was homogeneous in education level and district of residence. It was composed of both sexes 4 girls and 4 boys. Two girls and two boys from one school met with 2 boys and 2 girls from another school to form one group of 8 pupils.

Identification of pupils was done with the help of the class teacher who knew pupils who could speak without fear. This took less time to assemble the pupils than the principle investigator would have taken to identify these pupils.

6.4.1.4 Conduct of FGDs:

After the headmasters had agreed to participate in the study, 120 notes were written by the principal investigator to the parents. These were endorsed by the headmasters of the schools that were going to participate in the FGDs. A photocopy of the letter from KCC DEO authorizing the principal investigator to carry out the study was attached to each note. These notes were given to pupils to take to their guardians at home. These notes had the information requesting consent from parents for their children to participate in the study. These were given to 12 pupils from each school of whom 8 pupils finally participated in the FGDs. The number of pupils was made higher than the 8 because of un fore seen problems for example sickness and absenteeism from schools. All the guardians gave consent for their children to participate in the FGDs.

The date and time of the FGD for each group was selected in agreement with the headmasters' opinions. A "neutral territory" was selected on agreement among the principal investigator and the two headmasters of the two primary School that were going to participate in the FGD.

Pupils (8) from one school were transported to another primary school. However at other occasions pupils had to walk when the distance to the meeting place was near. These were

accompanied by one teacher to the meeting point.

At the meeting point, the pupils were divided into two groups of two girls and two boys. The latter were joined by another group of two girls and two boys from the "host" school. Thus there were two groups of 8 pupils at the "neutral territory".

It was agreed that while one group was having a FGD, the other four pupils who were brought to the "neutral territory" from another school would join the primary seven class of the "host" school. For this reason the "neutral territories" were in schools. This arrangement had the advantage of keeping the pupils occupied and was relatively cheaper in cost to the principal investigator.

Endeavor was taken not for pupils to know the subject matter in advance so as not to formulate ideas. The principal investigator was the moderator. The latter directed the FGDs and ensured that each pupil had an opportunity to express his/her opinion. He further probed for additional information as needed and encouraged quieter pupils to speaker.

The moderator avoided statements that implied value judgements such as good, excellent, right as well as head nodding. He endeavored to link the pupils' ideas into cohesive patterns by using phrases that were generated from the FGDs such as "It seems like most of you, many people feel....I wonder what others who disagree might say ?".

The moderator was assisted by one research assistant (the recorder). The recorder was responsible for recording the FGDs with a hand-held tape recorder. He observed the

process of the FGDs in detail and made notes where appropriate on those observations in their proper contexts.

Two FGDs were held each day. Notes and tapes were reviewed on the day of the FGD. Pupils were seated in a semi-circle; this made it difficult for a few pupils to dominate the FGD. The moderator was seated in the semi-circle with the group while the recorder was seated beside the semi-circle.

The moderator introduced himself and asked each pupil to give his/her name. The moderator opened with a brief introduction to put the group at ease, establish "ground rules" , and allow a rapport to develop between him and the group.

The use of a tape recorder was explained to the pupils so that the latter felt at ease to speak. The moderator assured pupils of confidentiality of the FGDs, "Reports will not contain your names. I shall keep the tapes safely and I shall not share them with anybody".

The moderator clarified to the pupils why they had been brought together. He emphasized to the pupil that there were no right or wrong answers.

The objectives of the study were made clear to the pupils.

6.4.1.5 "Ground rules":

Pupils spoke one at a time. They avoided interrupting one other. Further the pupils were encouraged to speak clearly and slowly so that the tape recorder could pick up what was said.

6.5 Quantitative phase.

6.5.1 Number of pupils that participated in the questionnaire:

A	B	C	D	E	F	G
01	NAKAWA	MURCHISON	1	1250	86	72
		KALINABIR	2	980	123	62
		KISWA	1	1398	136	97
02	CENTRAL	BUGANDARD	1	3628	425	144
		GREENVALE	3	225	25	25
		SUMMITVU	3	264	34	32
03	RUBAGA	NAMUNGONA(B	2	301	85	42
		KITEBI	1	1359	180	74
		MENGO	1	1312	121	63
04	KAWEMPE	MAKERERE U	2	721	66	66
		KISAASI	2	504	90	84
		KAWEMPEMU	1	632	76	52
05	MAKINDYE	STPETERNS	1	1191	170	87
		POLICECHI	1	2877	186	81
TOTAL	5	14		14722	1803	951

Key:

A = code number and population in the division

B = division

C = name of school

D = grade of school

E = total number of pupils in the school

F = total number of pupils in primary seven

G = actual number of pupils in the study sample.

6.5.2 Determination of number of pupils:

Number of school pupils were determined using the following formula:

$n = (z^2 * p * q)/d^2$. (Armitage & Berry, 1988).

Assumptions regarding this formula:

The proportion of pupils in primary schools in Kampala district having the characteristic of interest (p) in this case "knowledge on malaria " were assumed to be 50 percent. This implied that (p) = 0.5; because there had been no studies done on the same parameter in the same study area.

A 95 percent confidence interval was assumed. This implied that z = 1.96 where z was the normal standard deviate.

The standard error (d) was assumed to be 0.05.

This gave n = 384 as the minimum number of pupils to participate in the study. This number (384) was multiplied by a factor of 2.5 because the technique involved multistage cluster sampling. This gave 960 pupils.

6.5.3 Sampling Techniques:

A multistage sampling technique was adopted. This was quicker and less costly. In this case a sampling frame of individual units was not required for the whole target population. The sample was easier to select than a single

random sample of similar size because the individual in the sample were physically together in groups instead of scattered all over the target population. This method could have had the disadvantage; clusters selected in the first stage might have determined the representative of the final sample.

6.5.4 Determination of the number of primary schools that participated in the study:

There are 5 divisions in Kampala district. It was decided that equal weight be given to each division. The number of study population (primary seven class) in the divisions did not differ significantly.

The numbers of pupils in primary seven in the divisions were Central, 1532; Lubaga, 1064; Kawempe, 1128; Nakawa, 1097; and Makindye, 1013. Proportionate probability was applied at a latter stage in the selection of the pupils. The number of pupils from the 5 divisions of Kampala district to participate were 960. Each division contributed 960/5 = 192 pupils to the sample.

6.5.5 Getting the names of primary schools that participated in the study:

A sampling frame of all the government primary schools in each division was got. These were stratified into groups

according to grade of the school.

Simple random sampling was used to get 2 or more schools according to the grades of schools that existed in the division. These schools contributed 192 pupils in proportion to the pupils that were in primary seven class in each school.

6.5.6 Getting pupils that participated in the study:

The total number of pupils in primary seven in the selected primary schools were got for the division. Using this as a denominator, the number of pupils in class seven in the respective primary school (numerator) was divided by the denominator and this was multiplied by 192.

Since a sampling frame (class register) was in existence, a sampling fraction was worked out. Systematic sampling was used to select the number of pupils using the class register. Those primary seven class with more than one stream (parallel classes), each stream contributed equally towards the pool of pupils that came from that school.

6.6 Data collection:

Permission was sought from DEO to carry out the study in Kampala district primary schools. Consent was sought from all Headmasters of those schools that participated in both qualitative and quantitative approaches.

Consent was also sought from parents in the case of pupils who participated in the FGDs. This was because some of the pupils were moved out of their school compound.

The headmasters read both the closed questionnaire and the FGD guide before they could be administered to the pupils. A pupil had the right to refuse to participate. However no pupil refused to participate in the study.

6.6.1 Materials:

Pencils and erasing rubbers were used by the pupils during the answering of the closed questionnaire. A hand-held radio cassette recorder to record the discussants' voices during the FGDs was used. Pre-labelled 60 minutes cassette tapes with number of each FGD and division were used. A microphone and batteries for radio cassette were bought and utilized. Pads of paper and pens were also used.

6.6.2 Instruments:

6.6.3 Development of Questionnaire and FGD guide:

A pilot testing was done in January 1995 at Kamwokya in Central division among primary seven pupils who were in school holiday at that time. These pupils were from different primary schools in different areas of Uganda.

The principal investigator knew the occupations and education levels of most of the parents and guardians of the

pupils. Free-answer questions were used; mainly factual questions on knowledge on malaria. The answers from the questions enabled the principal investigator to develop a closed questionnaire and FGD guide.

Questionnaire design (Oppenheim, 1966) was adopted because it was easier and quicker to construct. It required little writing from the pupils and quantification was rather straight forward. However it had the disadvantage of losing expressiveness and spontaneity by the pupils. Further forcing pupils to chose between given alternatives and thinking of alternatives that might not have occurred to pupils was another bias.

The total length of the questionnaire, amount of time, and effort that could be requested from the average pupil was considered.

The questionnaire had six sections (appendix 2). These sections were logically developed so that the questionnaire became attractive and interesting. Section one contained easy impersonal questions for identification purposes. Section two contained questions on socio-demographic characteristics of the pupils. These were relevant variables that were likely to influence knowledge and practices on malaria. They were selected in such a manner so as not to intimidate the pupils.

Section three contained factual questions on malaria

knowledge. Section four and five contained questions on sources and channels of information on malaria and attitudes towards these sources and channels. Section six contained questions on practices on malaria. The questionnaire was written in English language.

A FGD guide design (Bender & Ewbank, 1994) was adopted (appendix 3). Groups of 8 pupils was adopted. The same sections except one, two and five were incorporated in the FGD guide. This was written in English language.

Both the closed questionnaire and the FGD guide were finally piloted at Kitante primary school in the Central division in April 1995. They were found suitable.

6.7 Data collection process:

6.7.1 Man power

Two research assistants and the principal investigator were involved in the data collection process. Pupils were administered with a closed questionnaire at one setting in one of their classrooms at their respective schools. The exercise was conducted by the principal investigator and the two research assistants. The exercise was done in one day at each respective primary school at an agreed time among the headmaster, principal investigator and science teacher. The exercise took about one hour.

At the end of the exercise the questionnaires were

collected. These were compiled with respect to the school and division that participated in the study.

This method was less expensive in terms of cost and time. It permitted anonymity. To ensure anonymity numbers were used instead of names of pupils. Assurance was given to pupils that results will not be traced back to particular individuals. This resulted in more honest responses. This method eliminated bias due to phrasing questions differently with different pupils. However some pupils might have misunderstood some of the items in the closed questionnaire.

6.7.2 Quality control:

The two research assistants underwent training before the exercise started. The instruments were pretested with the research procedures predetermined. The questionnaires were checked for completion, sensibility and consistence.

The tapes from the FGDs were labelled with date, division, and sequence of tapes adopted. The questionnaires and tapes were stored by the principal investigator at his place.

6.8 Data processing:

The data was sorted according to the study subjects. Quality control was done to check for completeness and reliability. Vague answers were excluded so as not to affect

the validity of the study. There was need to clarify the meaning of the group interactions and compare impressions while the discussion was still fresh in the research teams' mind. Therefore debriefing of the tapes took place immediately following the session.

The tapes were transcribed word-for word in English. This consisted of tapes and hand written notes. The voices were traced to the statements as the tapes rewound and each speak was followed by his or her statement. Copies of the transcripts were made for record keeping.

6.9 Problems encountered during data collection:

Some of the headmasters were not willing to have their pupils participate in the study. The reasons for this were not explored.

The schools that failed to participate because of this were Shimoni demonstration school and Wandegeya muslim primary school. These failed to participate in the FGDs. They were replaced.

Some of the appointed time to carry out both the qualitative and quantitative part of the study coincided with other functions like athletics, debate, and music festivals. Schools that failed to participate because of this were: Green valley and Kibuli demonstration. These failed to participate in the questionnaire. They were replaced.

6.10 Data analysis:

6.10.1 Quantitative data:

The data from the questionnaire was entered using Epi Info version 5 program. Report writing was done using Word Perfect Version 51.

Analysis was done using SPSS computer program (SPSS/PC+4.0). Chi-square test was used to assess the associations between explanatory variables and the total knowledge quartiles. Kruskal-Wallis one-way anova procedure was used to test for statistical significance between mean scores on knowledge on malaria and explanatory variables.

Since the scores on knowledge on malaria were arbitrarily given, a non-parametrical statistical test (Herzberg, 1983) Kruskal-Wallis one-way Anova was adopted. The test did not require specific parameters of the population distributions. It was unaffected by the particular shapes of the population distributions and was therefore distribution-free.

The test procedure ranked the mean scores according to the desired explanatory variable and then gave the significance differences between explanatory variables being compared. The test is more sensitive in detecting mean differences of numerical (quantitative) data.

A 95% confidence level was adopted at the prevailing degrees of freedom during analysis. Pupils' knowledge about

malaria; cause, diagnosis, transmission were expressed in proportions. Right answer on cause, diagnosis and transmission of malaria was each given one point (one score) while wrong answer which meant any other than the right and those who did not know received no point (no score).

Pupils' knowledge about malaria; signs, treatments, and prevention was analyzed as numbers of each malaria characteristic identified by the pupil and expressed as proportions of pupils having that number of malaria characteristic. Each sign, treatment, and prevention on malaria option identified about malaria by the pupil was each given one point (one score) and summed to give a total score for each pupil.

Kruskal-Wallis one-way anova was used to find out whether there were statistically significant differences between the mean scores on knowledge on malaria and independent variables (age, sex, with whom the pupils were staying, grade of school, education of father or mother, occupation & education of guardian, occupation of the father or mother, and family size).

Independent variables which showed statistically significant p-values were not pooled together at once because of lack of program (Canonical variate analysis) that could analyze all the significant explanatory variables at once.

Again all the scores for each individual on knowledge on

malaria; cause, diagnosis, transmission, signs, treatment and prevention were summed for each pupil and divided into quartiles (25%). These were called total quartiles on malaria knowledge. Total quartiles were then cross-tabulated with independent variables (socio-demographic characteristics of the pupils) to find out the degree of relationship between both measures. Chi-square test was used.

Attitudes were analyzed as opinions of likes and dislikes. These were expressed as proportions of pupils in the closed questionnaire. In the FGDs, this was the consensus in opinions in form of likes across and within groups of pupils.

Practices against mosquito bites were analyzed as numbers of activities performed by each pupil and the corresponding number of pupils under each number expressed as proportions.

6.10.2 Qualitative data:

6.10.2.1 Analysis of transcripts:

The FGD topic guide, tapes, transcripts, notes, written summaries of each group were assembled at once. The summaries were read at one setting to refresh the memory about the setting, participants' tone of discussion, potential trends or patterns, and frequently-held opinions.

Each transcript was read completely and sections that

related to each question in the FGD topic guide marked out. One question was examined at a time. A brief summary statement that described the question was made. Patterns of "thought information" across groups and within groups were made.

6.10.2.3 Theme identification:

Particular patterns, themes, concerns or responses that were posed repeatedly by the focus group pupils were identified. These were matched with respect to each question by the principal investigator and one research assistant. The group was the unit of analysis of the "thought information".

Chapter 5

7.0 RESULTS.

Introduction:

The results were got from a study which adopted both qualitative and quantitative techniques. FGDs (10) with 8 pupils each were chosen from the 5 divisions of Kampala. A survey involving 953 pupils from 16 primary schools of the 5 divisions of Kampala was carried out. Pupils were from primary seven class. They were aged 12 years and above. The study was carried out in March and April 1995 in Kampala district in Uganda.

7.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS:

Table 1 a: Distribution of pupils by age, grade of school, with whom pupils lives and sex.

Characteristic	Sex Female	Male	Total
Age*			
12	151	145	296
13	167	138	273
14	118	97	215
15	43	64	107
16+	1	14	15
Grade of school			
1	335	363	698
2	74	81	155
3	29	71	100
With whom pupils lives			
Mother	87	90	177
Father & Mother	265	264	529
Father	50	42	92
Guardian	78	77	150

KEY:

* p = 0.014

The proportion of girls was approximately equal to that of boys. Ages ranged from 12 years to 18 years. Mean age was 13.18 years. The modal age was 12 years. The mean age for girls (13.09) was smaller than that of boys (13.27). The difference was statistically significant with a p-value of 0.014 (table 1 a).

The percentage of girls in grade one, two and three were 48, 51 and 70 respectively. Males were 52, 50 and 30 percent in grade one, two and grade three respectively. Approximately 85 percent of the pupils were staying with a parent and 15 percent were staying with a guardian (table 1 a).

Table 1 b: Distribution of Occupation and Education of guardians and parents.

Characteristic.	Guardians (N=151)	Father (N=801)	Mother (N=802)
Occupation	%	%	%
Civil servant	23.8	36.5	18.5
Own business	24.5	30.5	47.0
Pri business	14.6	28.8	19.2
Peasant	11.9	2.1	5.7
Jobless	7.8	0.5	7.6
Others	17.4	1.6	2.0
Education			
None	4.3	2.0	2.9
Primary	8.3	6.6	16.1
Secondary	37.4	37.0	43.4
Post-secondary	26.2	52.4	36.4
Others	23.8	2.0	1.2

Most of the pupils' guardians were self-employed (25%). Civil servants comprised the biggest proportion (37%) of the pupils' fathers. Majority of the pupils' mothers were running their own business (47%). Most of the pupils' guardians (37%) and mothers (43%) had secondary education. Approximately fifty two percent of the pupils' fathers had post-secondary education (table 1 b).

7.2 KNOWLEDGE ON MALARIA:

Malaria was perceived as a health problem across the FGDs among other diseases by pupils in Kampala district. The other health problems mentioned were red eyes, cough, typhoid, trachoma, diarrhoea, headache, stomachache, common cold, flu, skin rash, poor hygiene, burns, bilharzia, ring worms, worms, wounds, and pregnancy. Pupils indicated that malaria led to poor performance in examinations at schools.

Pupils maintained that malaria led to general body weakness, malnutrition, anaemia and death to pupils. Absence from school and repetition of same class were also mentioned. Other effects included both absence from work and costs of drugs incurred by parents. Pupils also said that malaria was an economic burden to the society.

Table 2: Frequency distribution on knowledge on malaria cause, transmission and diagnosis through an anonymous closed questionnaire.

Characteristic	Number of pupils	%
Malaria cause (N = 951)		
Plasmodium sp	244	25.6
Mosquitoes	687	72.1
Bad air	5	0.5
Eating sugarcane/pineapple	2	0.2
Dust	6	0.6
Don't know	9	1.0
Malaria transmission (N = 949)		
From sick people	36	3.6
Always in contact with water	25	2.6
Through mosquito bite	851	89.3
Working in swamps	36	3.8
Walking during the night	4	0.4
Don't know	1	0.1
Malaria diagnosis (N = 951)		
Examination of faeces	75	7.9
Examination of urine	161	16.9
Examination of blood	548	57.5
Examination of body	151	15.8
Don't know	16	1.9

Approximately 26 percent of the pupils correctly identified the cause of malaria (Plasmodium) (table 2). Information from the 10 FGDs showed consensus across groups on Plasmodium species as the organism causing malaria. Within

groups, pupils mentioned,

"Malaria is caused by a protozoa.

Malaria is caused by a virus.

Malaria is caused by a bacteria".

Approximately 89 percent of the pupils correctly identified how malaria is transmitted (through mosquito bite) (table 2). Information from FGDs showed consensus across groups that malaria was transmitted through the bite of Anopheles mosquito. Within groups, pupils mentioned,

"Female Anopheles mosquito transmits malaria.

Infected female Anopheles mosquito transmits malaria.

A housefly transmits malaria".

Approximately 58 percent of the pupils could correctly identify how malaria is diagnosed and 42% of the pupils had misconceptions (table 2).

Table 3: Frequency distribution of numbers of signs, treatments and preventive measures against malaria known by pupils.

Characteristic	Number of pupils	%
Number of signs of malaria (N = 953)		
1	289	30.3
2	121	12.7
3	157	16.5
4	159	16.7
5	104	10.9
6+	123	12.9
Number of treatments for malaria (N = 952)		
1	243	25.5
2	191	20.0
3	237	24.9
4	162	17.0
5	75	7.9
6+	44	4.7
Number of preventive practices (N = 950)		
1	236	24.8
2	161	16.9
3	196	20.6
4	210	22.0
5	108	11.3
6+	39	4.4

NOTE:

Signs of malaria inquired into included : head hurting too bad, body hot all over, body can be weak, all bones can be hurting, can sweat plenty, stomach pain, feel like vomiting,

can lose appetite, dizziness, diarrhoea, and convulsions. Treatments for malaria inquired into included: chloroquine, camoquine, quinine, aspirin, panadol, fansidar, metakelfin, herbal medicine and oral rehydration salt.

Preventive practices inquired into included: avoid persons with malaria, get rid of breeding sites for mosquitoes, sleep under a net, burn mosquito coils, smear with repellents, take drugs, smoke the house with leaves and cow dung, and spray insecticides.

Approximately 30 percent of the pupils identified one sign of malaria. Two to three signs of malaria were identified by approximately 29 percent of the pupils. Four and more signs of malaria were identified by approximately 41 percent of the pupils (table 3).

Information from the FGDs showed consensus across the groups on six general symptoms of malaria. These were; general body weakness, high body temperature, body shivering, vomiting, loss of appetite, and loss of weight. Within groups, pupils mentioned;

"You feel joint pains. You feel headache and dizziness. You are restless. You sweat a lot. You feel stomachache. You cough. You get dehydrated. You get anaemia. You get yellow eyes".

Approximately 26 percent of the pupils could identify one type of treatment for malaria. Two to three treatments

for malaria were identified by approximately 45 percent of the pupils. Four and more treatments for malaria were identified by 29 percent of the pupils (table 3). From FGDs pupils agreed on the following as measures against malaria attack;

> "You put a cloth in cold water, remove it and put on the head of the person with malaria. You give the person with malaria drug for malaria. You give the person with malaria alot of drinks. You take the sick person to hospital".

Approximately 25 percent of the pupils knew one preventive practice about malaria and associated fevers. Two to three preventive practices were known by approximately 37 percent of the pupils. Four and more preventive practices were known by 37 percent of the pupils (table 3).

There were misconceptions amongst pupils on malaria treatment and prevention. Some pupils agreed that malaria can be treated with herbal medicines (8%) and oral rehydration salt (2%). Also some agreed that mosquitoes can be controlled in the home environment by smoking the house with fumes from herbs and cow dung (0.4%).

7.2.1 All variables dealing with knowledge were given a score of 1 and a total score computed for each student. The total knowledge score was then divided in knowledge quartiles in order to perform bivariate analysis to assess the relationships between knowledge on malaria and socio-demographic variables.

The upper quartiles signified higher knowledge scores than the lower quartiles. Pupils' demographic characteristics included age, sex, grade of school, family size, occupation and education of whom the pupil lived with.

Table 4: Relationship between grade of the school and pupils' total knowledge quartiles on malaria. N = 953.

	Total knowledge quartiles.				
Grade.	1st	2nd	3rd	4th	N
1	183(26.2%)	162(23.2%)	182(26.1%)	171(24.5%)	698
2	11(7.1%)	38(24.5%)	50(32.3%)	56(36.1%)	155
3	6(6.0%)	19(19.0%)	31(31.0%)	44(44.0%)	100
Total	200	219	263	271	953

chi-square = 52.69

degrees of freedom = 6

p-value < 0.001

Pupils in grade three had better total scores in the 4th

quartile than pupils in other grades. This was found to be statistically significant with a p-value of 0.001.

Table 5: Relationship between with whom pupil lives and total knowledge quartiles on malaria (N = 948).

With whom pupil lives	Total knowledge quartiles.				
	1st	2nd	3rd	4th	N
parents	173(21.7%)	172(22.2%)	234(29.3%)	214(26.8%)	798
guardian	26(17.3%)	39(26.0%)	29(19.3%)	56(37.3%)	150
Total	199	211	263	270	948

Missing observations: 5.

chi-square = 11.40

degrees of freedom = 3

p-value = 0.009

This was done because primary education in Uganda is commercial in toto and is viewed by the guardians as an investment. It is believed by guardians that the more money you invest in a pupils' education the better the academic performance of the pupil.

Pupils staying with a guardian were better in scores (proportion) in the 4th quartile. This difference was found

to be statistically significant with a p-value of 0.009. After partitioning for parents into single (mother/father) and both parents (father and mother), knowledge scores were no longer statistically significant with a p-value of 0.124.

Further partitioning into single (father/mother)parent versus guardian, showed that pupils staying with a guardian had better scores in the 4th quartile. This was statistically significant with a p-value of 0.001.

Further partitioning into both parent (father and mother) versus guardian showed that pupils staying with the guardian had better scores in the 4th quartile. This was statistically significant with a p-value of 0.048.

Table 6: Relationship between education of the mother and pupils' total knowledge quartiles (N = 792).

Mother Education.	Total knowledge quartiles.				
	1st	2nd	3rd	4th	N
None	4(17.4%)	4(17.4%)	8(24.8%)	7(27.4%)	23
Primary	39(30.2%)	20(15.5%)	37(28.7%)	33(25.6%)	129
Secondary	72(20.7%)	61(19.3%)	108(31.0%)	101(29.0%)	348
Post-secondary	56(19.2%)	88(30.1%)	76(26.0%)	72(24.7%)	292
Total	171	179	229	213	792

chi-square = 20.76

degrees of freedom = 9

p-value = 0.014

Missing observations: 161.

Pupils whose mothers had secondary education had better scores in the 3rd and 4th quartiles. This was statistically significant with a p-value of 0.014.

Table 7: Relationship between occupation of the mother and pupils' total knowledge quartiles on malaria (N = 802).

Occupation	Total knowledge quartiles 1st	2nd	3rd	4th	N
Civil servant	29(19.1%)	36(23.7%)	48(31.6%)	39(25.7%)	152
Non-prof.c.s	7(29.2%)	7(29.2%)	7(29.2%)	3(12.5%)	24
Own business	73(19.1%)	80(20.4%)	114(28.9%)	126(31.6%)	393
Pri business	40(24.0%)	38(24.7%)	50(32.5%)	26(16.9%)	154
Peasant	8(17.4%)	13(28.3%)	12(26.1%)	13(28.3%)	46
Jobless	17(6.3%)	4(12.1%)	3(9.1%)	9(27.3%)	33
Total	174	178	234	216	802

Missing observations: 151

chi-square = 41.30

degrees of freedom = 15

p-value = 0.001.

KEY:

Pri = private

prof c.s = professional civil servant.

Pupils whose mothers were running their own business were in better quartile scores; in the third and fourth quartile. This difference was statistically significant with a p-value of 0.001.

Table 8: Relationship between education of the father and total knowledge quartiles on malaria (N = 606).

	Total knowledge quartiles.				
Education.	1st	2nd	3rd	4th	N
None	2(22.2%)	2(22.2%)	4(44.4%)	1(11.1%)	9
Primary	11(31.4%)	5(14.3%)	13(37.1%)	6(17.1%)	35
Secondary	49(22.0%)	37(16.6%)	70(31.4%)	67(30.0%)	223
Psecondry	61(18.0%)	93(27.4%)	88(26.0%)	97(28.6%)	339
Total	123	137	175	171	606

Missing observations: 347

chi-square = 17.291

degrees of freedom = 9

p-value = 0.044

Pupils whose fathers had secondary education were in better quartile scores of malaria knowledge. This difference was statistically significant with a p-value of 0.044.

7.2.2 Table 9. Mean scores on malaria knowledge by socio-demographic characteristics.

Characteristic.	number	Mean knowledge score.
Gender		
Female	480	14.86
Male	473	14.02
Chi-square =	5.948,	p-value = 0.015
Residing with		
Guardian	150	15.25
Parent	798	14.30
Chi-square =	5.702,	p-value = 0.035
Grade of school		
1	698	13.82
2	155	15.72
3	100	16.81
Chi-square =	41.256,	p-value = 0.000
Mothers occupation		
Selfemployed	393	15.62
Executive C.S	152	14.65
Peasant	46	14.33
Pri.sect	154	13.42
Non Prof C.S	24	12.79
Jobless	33	12.67
Entire Population	802	14.31
Chi-square	=14.772,	p-value = 0.011

KEY

C.S = civil servant.

pri.sect. = Employed in private sector.

Mean scores on malaria knowledge were smaller among

those pupils who were staying with a parent (14.30) than those who were staying with a guardian (15.25). The difference was statistically significant with a p-value of 0.0354. Mean scores on malaria knowledge was also found to be significantly higher in females (14.86) than in males (14.02). P-value = 0.015 (table 9).

Grade 3 schools had the biggest mean scores (16.81) on malaria knowledge. Grade 2 and 1 had 15.72 and 13.82 mean scores respectively. Mean scores increased as the grade of the school increased. The differences were found to be statistically significant with a p-value of 0.000 (table 9).

Mothers' occupation was also found to influence mean scores of malaria knowledge. Pupils whose mothers were running their own business had the highest mean scores (16.68). These findings were statistically significant at a p-value of 0.011 (table 9).

Knowledge on malaria was noted not to be influenced by pupils' age groups; education of the father or mother; guardian or mother; occupation of the father or guardian and family size. Occupation of the mother was found to modify the effects of mothers' education on the knowledge of the pupil. Pupils staying with mothers who had better income but lower education level achieved (primary seven and lower) almost the same mean knowledge score (14.27) as those pupils whose mothers had higher education (secondary and higher) (14.41).

7.3 SOURCES AND CHANNELS OF INFORMATION ON MALARIA:

7.3.1 Sources of information on malaria.

Table 10. Pupils' sources of information on malaria through a closed questionnaire (N = 953).

Number of Sources	Number of pupils	%
1	336	35.3%
2	288	30.2%
3	207	21.7%
4	100	10.5%
5+	22	2.3%
Total	953	100.0%

The questionnaire inquired into sources of information on malaria and this was complemented by information generated from 10 FGDs. A total of 953 pupils responded to the question on sources. The sources inquired into were primary school teacher, family member, health worker, friends and religious leader.

More than 60% of the pupils gave two or more sources (table 10). This was complemented by the information from FGDs. The latter showed consensus across groups on a teacher, books, fellow and health work. Within groups pupils reported;

"For me I get malaria information from school nurse. me I get malaria information from a doctor. at times we get

information from a first aider and visitors'talks like you. for me i get information from seminars. we get information from parents and child to child program".

7.3.2 Attitudes towards sources of information on malaria.

Opinions of the pupils about their preferred sources of information on malaria as expressed in their choices through a prompted closed questionnaire. The latter was complemented by opinions about preferred sources of information on malaria expressed by pupils through 10 FGDs.

Table 11: Pupils' responses to the attitude statements on sources of information on malaria through a questionnaire (N = 949).

Responses	Number of pupils	%
1. Health worker	540	56.7%
2. Teacher	319	33.7%
3. Family member	73	7.7%
4. Friend	12	1.3%
5. Religious leader	2	0.2%
6. None	3	0.3%
Total	949	100.0%

Missing observations: 4.

Fifty seven percent of the pupils liked a health worker,

34 percent liked a teacher. Other sources liked were a family member, friend and religious leader by 8 percent, 1 percent and 1 percent of the pupils respectively. Three pupils made no choice (table 11).

Information from the FGDs showed concordance across groups on a teacher, books, fellow pupils, and health worker as liked sources of information on malaria. Within group responses included parents, friends, mother, elders, and people who have convalesced from malaria.

7.3.3 Channels of information on malaria:

Table 12: Channels of information on malaria and proportion of pupils identifying them (N = 951).

Number of channels	Number of pupils	%
1	336	35.3%
2	169	17.8%
3	153	16.1%
4	131	13.8%
5	80	8.4%
6+	82	8.6%
Total	951	100.0%

Missing observations: 2.

The questionnaire inquired into channels of information on malaria. A total of 951 pupils responded to the question on channels. The channels inquired into were posters (5%), film shows (1%), books (29%), radio (25%), television (37%), leaflets (1%), pamphlets (1%), [stories, songs, music, dance, campaigns, talks, magazine] (1%). More than 60 percent of the pupils got information on malaria by two or more channels (table 12).

Table 13: Pupils' responses to the attitude statement on channels of information on malaria (N = 952).

Attitude statement: Which way of getting information on malaria do you like most.

Channels	Number of pupils	%
Television	328	34.4%
Books	298	31.3%.
Radio	212	22.2%
Posters	47	4.9%
Drama	47	4.9%
Film	18	1.9%
None	4	0.4%
Total	952	100.0%

Missing observations: 1.

Thirty four percent of the pupils liked a television, 31 percent liked books, 22 percent liked radio, 5 percent liked posters, 5 percent drama, 2 percent liked film, and 1 percent made no choice (table 13).

7.4 PRACTICE ON MALARIA:

Table 14. Distribution of number of activities pupils practice to avoid mosquito bites (N = 951)

Number of activities	Number of pupils	%
1	493	51.7%
2	224	23.5%
3	129	13.5%
4	67	7.0%
5+	38	4.0%
Total	951	100.0%

Missing observations: 2.

KEY:

The questionnaire inquired into pupils' activities against mosquito bites. The activities inquired into were complete body coverage during sleeping, close windows/doors, sleep in a night dress, spray insecticide in the bedroom before sleeping, kill mosquitoes using a cloth, and kill mosquitoes using hands.

Approximately 52 percent of the pupils had practiced one activity that was likely to stop mosquito bites. Two to three activities were practiced by approximately 37 percent of the

pupils. Four and more activities were practiced by approximately 11 percent of the pupils (table 14).

Information from the FGDs regarding ones'protection against malaria showed consensus across groups on depleting stagnant water around homes/houses, cutting bushes around homes/houses, and spraying insecticides in houses before sleeping.

Within groups responses included use of mosquito nets, smoking the houses with cow dung and plant leaves. Using mosquito coils, covering ones-self completely with a blanket at night when sleeping and pouring petrol on stagnant water. Other measures mentioned included swallowing medicine like chloroquine, refraining from predisposing habits to mosquitoes bites, and education on malaria in the communities.

Also information generated from FGDs on how malaria could be reduced showed consensus across groups on slashing bushes around homes/houses, and draining away stagnant water around homes/houses. Health education of the public on malaria was also mentioned.

Within group responses included use of insecticides, closing house windows early in the evening, taking medicine like chloroquine, pouring petrol on stagnant water, holding seminars on malaria, using mosquito nets, using mosquito coils, changing habits that expose people to mosquitoes,

immunization against malaria, and building homes away from places like swamps.

Chapter 6

8.0 DISCUSSION:

Malaria was one among the 18 health problems mentioned across FGDs by the pupils in Kampala district. Recalling that Kampala district is both mesoendemic for malaria and a capital city, there is perhaps very heterogenic strain composition of malaria parasites which are perhaps likely to change with time due to population movements in and out of Kampala.

In such situations endemicity may not explain why malaria might be found (Ibrahim et al., 1995) in all age categories of people. However it is probable that children in such an area have low immunity or no immunity to the heterogeneity strain parasites of malaria and are perhaps more likely to get severe attacks of malaria which probably they can easily recall. It is also probable that the pupils could have recalled what they were taught in class (appendix 4).

Further the wide scale use of many anti-malarial in Kampala district as evidenced through sale pressure by drug supply agents and advertising in the media is indicative of massive selection pressure which is a sign of failure of first line medication and this might imply multi-resistance gene within the malaria parasite population.

Although not documented, such malaria related severe

attacks have been observed among pupils in the school environments in Kampala (per. com, Buganda Road Primary school nurse). There is no available qualitative data linking perception of malaria and immunity to malaria among pupils in Kampala however quantitative data (Davies, 1950; Sezi et al., 1988; de Zulueta et al., 1961) show prevalence of malaria ranging from 41-92% among ages up to 11 years. These figures do not correspond to the known malaria endemicity of Kampala.

With such pupils who perhaps have partial or no immunity to malaria, it would be worthwhile if a malaria chemoprophylaxis intervention for the pupils was thought of. This would reduce morbidity due to malaria among the pupils. WHO (1983) maintains that lower doses of malaria chemoprophylaxis to a large population will not interfere with semi-immunity individuals.

Few of the many malaria effects mentioned by pupils across FGDs were; general body weakness, absenteeism from school, poor performance in class work and parents' absence from work. These effects strongly suggest inability to carry out one's daily activities. It is perhaps conceivable that pupils recalled what they had experienced with malaria as an illness and may be complemented with what they were taught about malaria in classroom work.

There is no qualitative data on the effects of malaria

among pupils in Uganda however quantitative data available in sub-Saharan Africa (Uhari Matti et al., 1992; Taha et al., 1986; Some, 1994; Colbourne, 1955) give ranges of absenteeism from 18%-54%, absentee rate of 7 days per term and 40% of parental absenteeism from work as a result of malaria. These findings call for proper quantification of the problem which seem to have been underrated and given little attention by UNMCP.

Transmission of malaria was well known quantitatively (89%) (table 2) and from FGDs. It is highly probable that pupils could recognize the role of mosquitoes in the transmission of malaria. Again pupils were specific on the sex and genus of mosquito. This knowledge could be utilized in the control of malaria transmission by the UNMCP.

There is no documented data on childrens' knowledge on malaria in sub-Saharan Africa. However Kasale (1988) got a high proportion (95%) of heads of households in Tanga who knew transmission of malaria. The latter had been exposed to malaria control activities sporadically and continually in Tanga since pre-independence. This could have influenced their knowledge on malaria.

More than half (table 2) of the pupils knew how malaria is diagnosed. Given the prevalence of malaria in the study area it was expected that a larger proportion would know that blood specimens are required for diagnosis. It is highly

probable that children in this sample either self-medicate themselves or are given tablets by parents on the basis of symptoms rather than a blood test hence the above observation.

Studies from Kenya (Ruebush et al., 1995) and Ethiopia (Yeneneh et al., 1993) indicate that a large proportion of adults 76% and 68% self-medicated without a laboratory diagnosis. Langi (1993) maintains that Ugandans stock anti-malarial and antipyretics at their homes. It is therefore highly likely that pupils are not exposed to the habit of taking blood specimens for examination of malaria parasites.

The fact that there is higher awareness of clinical features of malaria amongst pupils is evidenced in the high proportion of pupils who could identify symptoms and signs of malaria. This was reflected both in the quantitative (table 3) and qualitative data. Any attempts at intervention of malaria could influence pupils to regard these signs and symptoms as conditions requiring medical attention. This will work greatly towards creating a generation of people who are more consistent in recognizing and treating malaria in the future.

High awareness of signs and symptoms of malaria albeit in adult populations has been noted by other researchers in sub-Saharan Africa while (Kasale, 1988) in Tanzania found 98 percent of adults could identify five signs of malaria. Gomes

et al. (1994) maintains that individual practices are too variable to assign individuals to exposed and non-exposed groups for the purposes of identifying links with health outcomes.

A large proportion of the pupils could identify 2 or more (table 3) specific names of anti-malarial drugs for malaria. It is not clear from the syllabus how many anti-malarial drugs are mentioned. However anecdotal information and observations indicate that, in the settings of Kampala district children are sent to buy anti-malarial drugs from drug shops and private clinics with and without prescription. In other instances children are sent to ask for anti-malarial drugs from neighbors. This may perhaps explain their ability to recall the names of such drugs. Such knowledge of pupils could be put to use in developing guidelines for self-medication with anti-malarial.

Other studies in adult populations have found out that 73% (Kasale, 1988) of the respondents identified chloroquine, quinine, and aspirin as treatment for malaria. Adequate dosage of anti-malarial is important given the risks of drug resistance to anti-malarial with under medication. Chloroquine failure has been identified at 40% among pupils in Kampala district (Sezi et al., 1988).

High awareness of source reduction, malaria anti-vector measures and chemoprophylaxis of malaria amongst pupils is

reflected in the high proportion of pupils who could identify two or more preventive practices about malaria and its associated fevers. This was seen in both quantitative (table 3) and qualitative results. Any attempts at intervention could motivate pupils to put this knowledge to practice. Adequate knowledge practices on source reduction, malaria anti-vector measures and malaria chemoprophylaxis are imperative given the risks of contracting malaria in Kampala district.

Previous studies (Gibbins, 1933; steyn, 1946) in Kampala district confirmed these risks like presence of infective malaria vectors in human dwellings, in both cultivated and un cultivated areas, in tins and bottles that held water. Furthermore activities like cooking and conversations take place outside up to 10.00 p.m and beyond in most slum areas in the settings of Kampala district. These activities are perhaps more likely to result in contraction of malaria because it is during this time that malaria vectors are most active (Klein et al., 1995).

High awareness of source reduction, anti-vector measures and chemoprophylaxis of malaria although in adults has been found by other researchers in sub-Saharan Africa. Yeneneh et al. (1993) in Ethiopia pointed out that respondents knew chemoprophylaxis, insecticides, cleanliness and nutrition.

Pupils staying with a guardian had higher mean scores on malaria knowledge (table 9). Important observations in Uganda show that many children are staying with guardians for schooling purposes. The better performance on the knowledge quartiles of pupils who lived with guardians, probably implies a selection effect in that those with good academic potential are more likely to be assisted by a relative in order to achieve a good education. Both quantitative and qualitative approaches showed that a teacher was a common and preferred source of information on malaria. If a pupil is performing well in a class where malaria is taught as part of the syllabus then knowledge on malaria would be expected to be higher in brighter pupils.

Females were found to have a higher mean score than males (table 9). Family member preference by pupils was mentioned in the FGDs. It is possible that females are more close to the guardians within the domestic settings which would imply that females were perhaps more likely to have many sources of information on malaria than males and this may perhaps mean that the more sources a pupil had the more knowledge on malaria. A study in Nigeria (Brieger, 1990) showed that mothers were an important source of information for girls.

Grade three and pupils whose mothers were running their

own-business had the highest mean scores on malaria knowledge (table 9). FGDs also showed that mothers were preferred as a source of information on malaria by pupils. The biggest proportion of pupils in grade three had mothers who had their own-business and post-secondary education.

Educated mothers are more likely to get information on malaria and comprehend such information. Additionally they may also have the financial resources required to protect their families against malaria. Children in such settings learn both by being told about self-protection as well as practice of self-protection. Any attempt at intervention could focus at a participatory community malaria program that transfers responsibility to the parents. This would go along way to enhance both family health and knowledge on malaria.

There are studies which have stressed the importance of mothers occupation and education with regard to the welfare of the children in the sub-Saharan Africa. Cleland et al. (1988) pointed out that half of the gross effect of mothers' education on the health of a child was attributable to her economic advantadge. Educated mothers attache a higher value to the welfare and health of children, and are more knowledgeable about disease prevention and cure.

Further International Bank for Reconstruction and Development (1993) reports, "When new risks appear elite people are the first to change their life-styles as information becomes

available about disease and its prevention. Educated mothers are better at getting information on health and acting on it. Child benefits from maternal education comes from learning about health through mass media."

Total knowledge quartiles on malaria (table 8) was found to be influenced by education of father (secondary education). Fathers were found to be those who were self-business running. It is probable that the fathers by virtue of their occupation and education are perhaps able to "buy" education for their children. Although not documented most of the pupils in Kampala district go for extra tuition. Perhaps the extent depending on the resources of the guardians. This could influence childrens' knowledge on malaria hence the observation. Studies done elsewhere (Velonakis et al., 1984) showed that the indicator for correct knowledge depended on the education level and profession of the father while International Bank for Reconstruction and Development (1993) maintains that child benefits of a father's education works mostly through his income.

Both quantitative (table 10) and FGDs showed that pupils got information on malaria from many sources. A health worker (57%) and a teacher (34%) were most common sources. Given the degrees of influences and interactions of both cadres with pupils, parents and the general public in Kampala district, seminars could be organized by malaria control program for

these cadres focusing on how they could be involved in information dissemination on malaria. Some researchers (Brieger, 1990) showed that local health facilities were a major source of health information while (Lancet et al., 1978) showed that adolescents identified a doctor and a teacher as sources of information.

The most preferred sources of information on malaria among the pupils were a health worker and a teacher. This fact was reflected in both quantitative (table 11) and qualitative approaches. Given the number of primary school teachers working with KCC primary schools and the number of health workers in both government and private practices in KCC jurisdiction, seminars/workshops on malaria could be organized to refresh them on malaria knowledge and communication. Both cadres could become "health educators on malaria" to pupils and the general public in Kampala district. In turn pupils could become "malaria educators" to their families. A study (Bilqis et al., 1994) has shown that pupils were able to communicate health information to 91% of the population in a latrine program in Bangladesh.

A big proportion of the pupils got information on malaria by two or more channels (table 12). Thirty four percent liked television, 31% liked books, and 22% liked radio (table 13). The difference between the proportions of pupils who liked television and books was not significant.

Comparing the affordability of a radio and a television in Kampala, it would be worth while to promote the use of a radio and books in the dissemination of information on malaria. A health education program on malaria could be aired on radio as well as incorporating it into school teaching time table. Pupils could listen to the program in the presence of a teacher.

Small pamphlets on malaria in English could be printed and given to pupils to read in conjunction with family members. Television despite being the most preferred channel by pupils and having coverage all over Uganda, studies are required to find out whether it is not a class medium before it can be used in malaria control.

A study by Grant (1993) showed that there were 99 radio sets and 8 television sets per 1000 people by 1991 in Uganda. However (Liisberg, 1993) maintains that Television is a class medium not a mass medium in Africa. Further Brieger (1990) working among adults in rural Nigeria showed that radio was the most liked medium by 75 percent of the respondents. Television was liked by 48%, newspapers (29%) and magazines (19%).

FGDs showed that the pupils knew how malaria could be prevented and reduced. However quantitatively less than a half of the pupils were practicing two or more activities against mosquito bites (table 14). The results showed that

malaria anti-vector sprays were most used by pupils. The cost of malaria anti-vector sprays ranges from 800-4,000 Uganda Shillings (0.8-4.0 US$) at the open market in Kampala, it is probable that family income might be influencing pupils practices on malaria indirectly in that pupils from families that can afford these sprays are the ones who are probably likely to practice hence the observation seen. Sprays last for a short period and provide a temporary solution against malaria vectors and in the long run they are expensive leave alone the resistance that is very likely to develop after vector populations have become exposed to sprays for a long and varied period of time.

Buying of sprays and practicing might infer that both the pupils and guardians can perceive the importance of preventive measures however given the fertility rate (7.4), family sizes (6-9) on average and the different malaria anti-vector measures practiced by communities in Kampala district, majority of the people might not afford the most cost-effective measure (bed nets) against malaria vectors. Therefore any intervention at vector-man contact should try to motivate pupils and adults to practice malaria chemoprophylaxis while promoting use of bed nets in under fives. Both chemoprophylaxis and nets could be social-marketed through motivating pupils, use of health workers and media.

There is no available data on man-vector contact protective measures among children in Kampala. However a study (Tilahun et al., 1995) showed that weekly chloroquine with a daily dose of proguanil prophylaxis were highly effective. While WHO (1983) maintains that use of small doses of anti-malarial to a large population will not interfere with semi-immunity. Studies done elsewhere (Aikins et al., 1993; Koram et al., 1995) in adults in The Gambia showed that mosquito coils, perfumed resins, bed nets, branches and leaves, chemoprophylaxis and antipyretics were used against mosquitoes bites. Stephens et al. (1995) in Tanzania have shown that the use of malaria anti-vector repellents depends on relative efficacy of the product, durability and side effects to the users.

occupation and domestic settings with respect to the welfare of their children.

Most of the pupils (65%) got information on malaria from two and more sources. Fifty seven percent and 34% of the pupils got information on malaria from a health worker and a teacher respectively. While a teacher and books were the main sources of information on malaria in schools.

A health worker and a teacher were the preferred sources of information on malaria. While the most liked channel of information on malaria was a television. All these findings justify the use of at least two sources of information on malaria who are a teacher and a health worker through consolidating on books in the dissemination of information of malaria to pupils. Studies are needed to find out the possibility of using a television as compared to a radio.

The findings of the study showed that pupils knew primary preventive measures about malaria vectors however few were practicing more than two activities against mosquito bites. Information generated from FGDs showed consensus on spraying insecticides as a personal protection against mosquito bites. While slashing bushes around homes/houses, and draining stagnant water around homes/houses were among the ways pupils had consensus on through the FGDs that could reduce malaria. Although information from FGDs complemented the quantitative data, it should be treated with reservations

as it can not enable us to make a general conclusion on pupils in Kampala district. However it is possible that a number of factors might be influencing the practices of pupils both directly and indirectly for example family income and family size. Studies should be done to find out why pupils despite having rich knowledge on primary preventive practices they don't practice. These should address the socio-economic and domestic settings of where the pupils live.

Total quartile knowledge on malaria showed that 72% of the pupils had 50% and below of the total knowledge on malaria (appendix 16). The proportion of pupils above 50% on total malaria knowledge (the 3rd and 4th quartiles) must be increased before utilization of pupils can be sought of by UNMCP. Misconceptions they hold on malaria must be expelled.

One can therefore infer that pupils' knowledge on malaria was insufficient to justify their use in the control and prevention of malaria in Kampala district now.

9.2 Recommendations:

Malaria was perceived as a health problem among pupils in Kampala district. It is recommended that the UNMCP carry out investigations to determine the magnitude of this problem among pupils in Kampala district.

Since both the health worker and teacher were both the

common and preferred sources of information on malaria, it is recommended that workshops or seminars be organized to refresh the two cadres on malaria knowledge following which the latter can impart it to the pupils and the public while consolidating on the use of radio and books.

10. LIMITATIONS OF STUDY:

An in-depth study on practices of self-protection and vector control was not carried out to approve or disapprove the pupils responses.

Canonical Variate Analysis was not carried out because there was no such program at the Institute. Thus multivariate analysis of the total knowledge quartiles was not carried out with regard to socio-demographic characteristics of the pupils.

11.0 REFERENCES:

1. Aikins M K, Pickering H, Alonso P L, D'Alessandro V, Lindsay S W, Todd J, Greenwood B M. Perceptions of the causes of malaria and of its treatment and prevention in the study area. A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa. Transactions of the Royal Society of Tropical Medicine and Hygiene 1993; 87 Suppl 2:25-30.

2. Ajzen, Fishbein. Learning experiences appropriate for elementary school. In: Teaching Elementary Health Science. London: Addison-Wesley, 1975:192-211.

3. Armitage P, Berry G. Sampling. In: Irwin J O, editors. Statistical Methods in Medical Research 2nd edition. Oxford: Blackwell Scientific Publications, 1988:78.

4. Banks M H, Bewley B R, Bland J M. Adolescent attitudes to smoking: Their influence on behavior. International Journal of Health Education. 1981;34:39-44.

5. Bender E D, Ewbank D. The focus group as a tool for health research. In: John landers editor. Issues in design and analysis. The cultural, social and behavioral

determinants of health. Camberra: Health Transition centre, 1994; 4(1)63-79.

6. Bilqis A M, Zeitlyn S, Ali N, Yahya F S M, Shaheed N M. Promoting Sanitation In Bangladesh. World Health Forum. Geneva, WHO 1994;15(4)358-362.

7. Bradley D J. Malaria: Old infections and changing epidemiology. In: John Landers, editor. Historical Epidemiology and the health Transition. Camberra: Health Transition Centre, 1992;2:137-153.

8. Brieger William. Mass media and health communication in rural Nigeria. Health policy and planning. A Journal on health in development 1990;5(1):77-81.

9. Bruce-Chwatts'. Epidemiology of malaria. In: Gilley M Herbert, Warrel A David, editors. Essential Malariology. Oxford:
Oxford University Press, 1993.

10. Byarugaba A. Malaria in Pregnancy and the role of Chemotherapy. Uganda. Malaria Workshop 1991 Sept 30-3

oct.

11. Cleland J G, van Ginneken K J. Maternal education and child survival in developing countries: The search for pathways of influence. Social Science and Medicine, 1988; 27(12):1357-1368.

12. Colbourne M J. The effect of malaria suppression in a group of Accra school children. Transactions of Royal Society of Tropical Medicine and Hygiene 1995;49:(4) 356.

13. Cynthia P D. Perception. In: Freedman MA, Kaplan IH, editors. Human Behavior: Biological, Psychological, and Sociological. New York: Allyn and Bacon, inc., 1972:277-281.

14. Davidson G. Further studies of the basic factors concerned in the transmission of malaria. Transactions of the Royal Society of Tropical Medicine and Hygiene 1955;49:339.

15. Davies J N P. Childrens' diseases at Mulago hospital 1950-51. An analysis of the causes of admission. East African Medical Journal 1955;32:285.

16. Downie N M. Fundamentals of measurement: In: Guilbert J J, editor. Techniques and Practice. Educational Hand Book for Health Personnel. Geneva: WHO 1981;(35):4.21-4.54.

17. Gibbins E G. The domestic Anopheles mosquitoes of Uganda. Annals of Tropical Medicine and Parasitology 1933;(1)15-25.

18. Gill A C. The epidemiological types of malaria. In: The Seasonal periodicity of malaria and the mechanism of the epidemic wave. London: Churchill J A, 1938:18-81.

19. Gomes M, Espino F E, Abaquin J, Realon C, Salazar N P. Symptomatic Identification of malaria in the home and in the primary health care clinic. Bulletin of the WHO 1994;72(3)383-390.

20. Grant J P. Economic and social statistics on the nations of the world, with particular reference to children's well-being. In: Adamson L, editor. The State of the Worlds' Children. Oxford: Oxford University Press, 1993:68-82

21. Haddow A J, Ssenkubuge. The mosquitoes of Bwamba County,

Uganda. Further studies on the biting behavior of an out door population of Anopheles gambiae complex. Bulletin Entomology 1975;62:407-414.

22. Hall S A, Langlands B G. The Uganda Atlas of Disease distribution [letter] 1985.

23. Hall B L. Revolution in rural education: health education in Tanzania. participation and education in community water supply and sanitation programs.Bulletin of the WHO 1979;(13):69-70.

24. Herzberg P A. Classification of procedures. In: Principles of statistics. New York. John Wiley & Sons Inc., 1983:432-443.

25. Ibrahim M E, Lars H, Palle H J, Haider G, Gwira M H S, Arnot E D, Jensen J B, Theader T G. High proportion of sub-clinical Plasmodium falciparum infections in an area of seasonal and unstable malaria in Sudan. American Journal Tropical Medicine and Hygiene 1995;53(1)78-83.

26. IBM PC/XT/AT and PS/2. SPSS/PC+ Y.O. SPSS Inc, United States of America, 1990.

27. Jeffery G M. Chemotherapy in malaria control through primary health care; constraints and future prospects. In: Applied field Research in malaria in Africa. Geneva: WHO, 1984 49-54.

28. Kampala city council census office. Uganda first urban project-revision of Kampala structure plan population density by parish, Statistics department, Kampala district (1992).

29. Kampala city council district education office. Enrolment of pupils by class and sex plus teachers by sex and grade for primary schools in Kampala district for the month of October (1994).

30. Kere N K, Keni J, Kere J F, Bobogare A, Webber R H, South gate B A. Economic Impact of *Plasmodium falciparum* malaria on education investment. A Pacific Island case study, The South East Asian Journal of Tropical Medicine and Public Health 1993;24(4):659-663.

31. Kirkwood B R. Relationship between multiple regression and analysis of variance. In: Essentials of medical statistics. London: Blackwell scientific publications, 1988:71-72.

32. Lancet M, Modan B, Kavenaki S, Antonouski H, Shohan I. Sexual knowledge, attitudes, and practices of Israel adolescents. American Journal of Public Health 1978;68(11):1083-1089.

33. Langi P. Malaria Control Program. In: WHO information center, editor. Malaria situation in Uganda. Entebbe, 1993;(2766):7-19.

34. Lawler E E, Porter L W. Determinants of job performance. In : David Dahlbacka, editor. Psychology 2nd Edition. Boston: Allyn and Bacon, Inc.,1982:643-651.

35. Liisberg E. Tell the World. In: World Health Forum 1993 WHO Geneva. WHO 1993;14:(3)267-274.

36. Mc Elroy D Peter, Beir C John, Oster N Charles, Christine Beadle, Sherwood A James, Oloo J Aggrey, Hoffman L Stephen. Predicting outcome in malaria: Correlation between rate of exposure to infected mosquitoes and level of *Plasmodium falciparum* parasitemia. The American Journal of Tropical Medicine and Hygiene 1994;51(5)523-532.

37. Muhondwa E P Y, editor. Community Participation in

control of Urban malaria-an experience from Tanga Municipal Council. Proceedings of the 7th Annual Scientific Conference 1988; Nov 8-11; Arusha. Dar-es-Salaam: Tanzania Public Health Association Publications, 1988.

38. MOH. Message Development Workshop. Fact for Life pre-publication text, HPU-MOH: Reference information for Health Education, 1990 Jun 4-8.

39. National Curriculum Development Centre. Basic Science & Health Education Syllabus for Primary schools Uganda. Ministry of Education Uganda.

40. Oppenheim A N. Problems of Questionnaire Design. In: Donald Gunn MacRae editor. Questionnaire Design And Attitude Measurement. London: Heinemann Education Books, 1982:24-48.

41. Onori E. Distribution of P. ovale in Eastern, Western, and Northern Regions of Uganda. Bulletin of the WHO 1967; 67:617.

42. Pampana Emilio. The characteristics of the malaria

infection and the source of infection. In: A text Book of Malaria Eradication. London: Oxford University Press,1963:1-31.

43. Piaget Jean. Intellectual Development. In: David Dahlbacka editor. Psychology 2nd edition. Boston: Ally and Bacon, Inc., 1982:255-255.

44. Population Reference Bureau. The Worlds' Youth. Machiko Yanagishita and Nancy Yinger, Washington D.C. USA:1994.

45. Population Reference Bureau. World Population Data Sheet. Demographic data and Estimates for the Countries and Regions of the World. Machiko Yanagishita and Nancy Yinger, Washington D.C. USA 1994.

46. Population Reference Bureau. The Worlds' Women. What Legacy Do They Share. Machiko Yanagishita and Nancy Yinger, Washington D.C. USA:1995.

47. Pulaski M, Pulaski S. The Nature of Concepts. In: Teaching Elementary Health Science. London: Addison-

Wesley Company,1975:171-180.

48. Ruebush T K, Kern M K, Campbell C U, Oloo A J. Self-treatment of malaria in a rural area of Western Kenya. Bulletin of the WHO 1994: 73(2):229-236.

49. Ruiz W, Kroeger A. The Socio-economic Impact of Malaria in Colombia and Ecuador. Health Policy and Planning. A Journal on Health in Development 1994;2:144-154.

50. Sezi M. Report on studies on the susceptibility of P. falciparum malaria to chloroquine, Amodiaquine, and Pyrimethamine sulfadoxine in Uganda. East African Medical Journal 1988;4:71-79.

51. Some E S. Effects and Control of Highland Malaria.Epidemic in Uasin Gishu District Kenya. East African Medical Journal 1994;71:2-8.

52. Stephens C, Masamu E T, Kiama M G, Keto A J, Kinenekejo M, Ichimori K, Lines J. Knowledge of mosquitoes in relation to public and domestic control activities in

the cities of Dar-es-salaam and Tanga. WHO Bulletin 1995;73(1):79-102.

53. Styn J J. Natural malaria infection of house frequenting Anopheles mosquitoes in Uganda. Annals of Tropical Medicine and Parasitology 1946(26)239.

54. Taha T E T, Broadhead R L. Malaria in Primary School Children in Juba, Southern Sudan. East African Medical Journal 1986;63(8):546-549.

55. The International Bank for Reconstruction and Development/The World Bank. Households and Health. In: World Development Report. London: Oxford University Press Inc., 1993:37-51.

56. Tilahun A, Martin S W, Karen MacGuire-Ruth, Nancy C, Larry M. Risk factors for malaria among expatriates living in Kampala, Uganda; The need for adherence to chemoprophylactic regimes. American Journal of Tropical Medicine and Hygiene 1995; 52(3):207-212.

57. Uhari Matti. Absences for Sickness Among Children in day care. Acta Paedriatrica. An International Journal of paediatrics 1992; 81(11):929-932.

58. Velonakis E, Karaitianou A, Yfantopoulos J, Trichopoulous D. Socio-economic factors and school education in Greece. International Journal of Health

education 1984;3:20-24.

59. Williams D. The prevention of malaria in Italy. British Medical Journal 1900;1:1185-1187.

60. White G B. Comparative studies on sibling species of the Anopheles gambiae complex 111. The distribution, ecology, behavior and vectorial importance of species D in Bwamba county, Uganda. Bulletin of Entomological Research, 1973;(63):65-97.

61. WHO. Tropical Disease Research Progress 1991-1992; Geneva. WHO 1993:20-27.

62. WHO(TDR)/UNDP/WORLD BANK. Tropical Disease Research News; 1994 Jun. Report No.45:1.

63. WHO. World Declaration on the control of malaria. Proceedings of the ministerial conference on malaria meeting in Amsterdam; 1992 Oct 27; Geneva. WHO, 1992:9;12.

64. WHO/UNDP/World Bank/TDR. Lessons learned from Applied Research activities in Africa during the malaria eradication era. Bulletin of the WHO 1983;62:19-29.

65. WHO/UNDP/World Bank/TDR. The Impact of Malaria

Chemoprophylaxis in Africa with special reference to Madagascar, Cameroon and Senegal. Applied Field Research in Malaria in Africa. Bulletin of the World Health Organization 1983;62:41-48.

66. WHO. The impact of malaria chemoprophylaxis on the immune status of Africans. Applied field Research in Malaria in Africa. Geneva: WHO, 1984:69-76.

67. Yeneneh H, Gyorkos T W, Joseph L, Pickering J, Tedlas S. Antimalarial drug utilization by women in Ethiopia; Knowledge, attitudes-practices. Bulletin of the WHO 1993;71(6):763-772.

68. de Zulueta J, Kafuko G W, Cullen J R. An Investigation of the annual cycle of malaria in Masaka District (Uganda). East African Medical Journal 1963;40:469-488.

69. de Zuluta J, Kafuko G W, Cullein J R, Perdersen C K. The results of the 1st year of a malaria eradication pilot project in Northern Kigezi (Uganda). East African Medical Journal 1961;38:1-26.51.

70. Zahar A R. Vector control operations in the African context. In: Applied field Research in malaria Africa.

Geneva: WHO, 1984:89-100.