

**THE KNOWLEDGE OF AND CONTROL PRACTICES FOR MALARIA  
IN RURAL AREAS OF MUNDRI EAST COUNTY,  
SOUTHERN SUDAN.**

by

**JAMES GASSIM SIMON**

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**UNIVERSITY OF SOUTH AFRICA**

**Supervisor: Mrs MM van der Merwe**

**Joint-Supervisor: Mrs JE Smith**

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## Declaration

**Student number 34398848**

I hereby declare that the content of this dissertation titled **THE KNOWLEDGE OF AND CONTROL PRACTICES FOR MALARIA IN RURAL AREAS OF MUNDRI EAST COUNTY, SOUTHERN SUDAN** is my own work and that all the sources that I have utilised or quoted have been all indicated and acknowledged in this dissertation by means of complete references and that this work has not been submitted before for any other degree at any other institution.

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**SIGNATURE**

(James Gassim Simon)

**DATE**

**THE KNOWLEDGE OF AND CONTROL PRACTICES FOR MALARIA IN RURAL AREAS OF MUNDRI EAST COUNTY, SOUTHERN SUDAN**

**STUDENT NUMBER:** 34398848  
**STUDENT:** James Gassim Simon  
**DEGREE:** Master of Public Health  
**DEPARTMENT:** Department of Health Studies, University of South Africa  
**SUPERVISOR:** Mrs. MM van der Merwe  
**JOINT SUPERVISOR:** Mrs JE Smith

**ABSTRACT**

Malaria is a major public health problem in under developed countries especially countries undergoing war or conflict due to breakdown of health system and exposure of the vulnerable population through displacement.

The knowledge, practice and attitude (KAP) of community members have direct influences on malaria preventive measures. A quantitative, explorative and descriptive study was conducted among rural communities of Mundri East County using interview schedules to ascertain malaria related knowledge, practices and attitude and the common factors hindering the malaria control measures at house hold level.

Data were collected from 68 respondents from the randomly selected household through personal interviews using a pre-tested interview schedule which was analysed using the SPSS version 15 computer soft ware program.

Most of the respondents demonstrated some understanding of malaria as a disease, its transmission, prevention and treatment, although there is a need to improve this through the preferable and acceptable community channels as well as the methods of accessing the modern and scientifically proved and acceptable methods.

Given the relatively moderate acceptability of malaria control measures used by the participants in Mundri East County, there is need to conduct further research on the practical implemented measure including the local herbs used for preventive and treatment of malaria

Understanding the factors that inhibits or promotes the malaria control measures at community level is necessary for better planning and implementation of malaria intervention programme, which keeps complex and sensitive matters such as educational background, religious and cultural beliefs, and political affiliations in mind.

**Key concepts:** Knowledge, Attitudes, Practice, Malaria, Malaria prevention and treatment, Mundri East County, Rural area, Hindering factors in control of malaria.

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*This dissertation is dedicated to the Department of Research Ministry of Health-Government of Southern Sudan, University of South Africa, MM van der Merwe (my Supervisor), my beloved children, Mrs Jennifer Justin (my beloved wife) and my nephews Mr Scopus Tokorawa and Kamari Ezikial.*

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**ANNEXURE**

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**ANNEXURE**

**G: Informed consent**

**ANNEXURE**

**H: Maps**

**LIST OF ABBREVIATIONS**

|        |                                           |
|--------|-------------------------------------------|
| AIDS   | Acquired immunodeficiency syndrome        |
| ACT    | Artemisinin-based combination therapy     |
| BC     | Before Christ                             |
| DALYs  | Disability-adjusted life years            |
| DDT    | Dichlorodiphenyltrichloroethane           |
| GOSS   | Government of Southern Sudan              |
| GB     | Greater Britain                           |
| HIV    | Human immunodeficiency virus              |
| IPT    | Intermittent preventive treatment         |
| IRS    | Indoor residual spraying                  |
| ITNs   | Insecticide treated nets                  |
| IEC    | Information, education and communication  |
| KAP    | Knowledge, attitude and practice          |
| LLTNs  | Long lasting treated nets                 |
| MOH    | Ministry of health                        |
| PHC    | Primary health care                       |
| RTI    | Research Tropical Institute               |
| SPSS   | Statistical package for social scientists |
| TASO   | The AIDS support organization             |
| UNISA  | University of South Africa                |
| USA    | United State of America                   |
| USSR   | Union of Soviet Socialist Republic        |
| UNICEF | United Nation Children Fund               |
| WHO    | World Health Organization                 |

## CHAPTER 1

### OVERVIEW AND ORIENTATION TO THE RESEARCH

#### 1.1 INTRODUCTION

Malaria is a disease that is preventable and curable. It is transmitted to people of all ages and is caused by parasites of the species *Plasmodium*, which is spread from person to person through the bite of an infected female Anopheles mosquito. Occasionally it can be passed directly from one person to another by unscreened blood transfusion and accidental inoculation or across the placenta from an infected mother to foetus (Gill & Beeching 2004:55). It is one of the top 10 killer diseases in the world and about 40.0% of the World's population are living in high-risk malaria areas. Global annual estimates on the incidence of clinical malaria vary between 300 to 500 million. Globally 1.5-2.7 million people die of malaria (an estimated two deaths per minute). Ninety percent of these deaths occur in sub-Saharan Africa where the parasite (*Plasmodium*) is continuously present in the community. The *Plasmodium Falciparum* is the most deadly and most predominantly causative agent of the four human malaria parasites in these areas. Other parasites include *Plasmodium Malariae*, *Plasmodium Ovale* and *Plasmodium Vivax* (World Health Organization<sup>1</sup> (WHO) 2007; WHO/UNICEF 2003; Gill & Beeching 2004:55). In addition, Africa harbours environments that are conducive to the prevalence of *Plasmodium Falciparum* transmissions. Most of these countries contain an abundance of surface water - which provides good breeding sites for mosquitoes; presence of humid conditions in the continent which facilitate longevity of the adult mosquitoes; and have climates that are relatively warm which is conducive for the successful development of both above-mentioned mosquitoes. Furthermore, poor quality houses that offer little protection from mosquito bites also facilitate interaction between mosquitoes and humans (Grove-Kopec, Blumenthal, Ceccato, Dinku, Omumbo & Connor 2006: 2-3).

Although *Plasmodium Vivax* is the most widespread form of malaria infection, *Plasmodium Falciparum* is the most severe, potentially fatal type of malaria (Gill &

Beeching 2004:55) causing most of an estimated of 700,000 to 2.7 million deaths due to malaria annually, 90.0% of this is among young children in Africa. *Plasmodium Vivax* and *Plasmodium Ovale* have dormant liver stage parasites ("hypnozoites"), which can reactivate ("relapse") and cause malaria several months or even years after the infected mosquito bite. *Plasmodium Malariae* produces long-lasting infections and if left untreated can persist asymptotically in the human host for years, even for a lifetime (Control of disease centre<sup>2</sup> 2010: 2).

All the four different above-mentioned malaria species, share many clinical symptoms such as fever, headache, nausea and vomiting but all these are more pronounced in *Plasmodium Falciparum* especially if not promptly treated with effective medicines, the infection with *Plasmodium Falciparum* may rapidly lead to severe form such as prostration, severe anaemia (this is because *Plasmodium Falciparum* parasites affect the red blood cells at all stage or age), cerebral malaria, acidosis, hypoglycaemia, altered consciousness and coma, black water fever (severe intravascular haemolysis associated with haemoglobinuria and renal failure), bleeding disorder and death (Gill & Beeching 2004:55-59; WHO/UNICEF 2003:18-19 & WHO 2006:6).

Malaria is therefore a major public health problem for more than 600 million people in Africa. It has a devastating effect on the lives of children due to their low immunity level. One in every five (20.0%) of deaths in children in Africa is attributed to malaria. It has been estimated that an African child has on average between 1.6 and 5.4 malaria episodes each year. Those who survive death may suffer consequent complications such as recurrent fever, malnutrition, cognitive (mental) delay, and severe anaemia (if not promptly attended to) that may lead to neurological damage. Malaria is also one of the causes of premature delivery and low birth weight in Africa (Gill & Beeching 2004:60; Cornelio & Seriano 2011:8). In pregnant women, malaria also contributes significantly to anaemia, adverse birth outcomes such as spontaneous abortion, stillbirth, premature delivery and low birth weight, and overall maternal death (WHO/UNICEF 2005:11; Gill & Beeching 2004:61).

In Sudan malaria is the leading cause of morbidity and mortality. The annual estimated morbidity rate is 7.5 million and 35,000 deaths occur each year. It is

responsible for 20 - 40% of out-patient attendances in health facilities and 30-40% of hospital admissions every year. The cost of treatment for a case of uncomplicated malaria ranges from \$5.2 to \$17.2 per patient. In some endemic areas such as Gezira state, a child may have four attacks of malaria in one year and the cost may exceed four times the above-mentioned amount. About 90% of the malaria cases in Sudan are due to *Plasmodium Falciparum* though other species are also present (Republic of the Sudan Federal Ministry of Health 2004:7; World Malaria Report 2005:1).

A study conducted in Khartoum (capital city of Sudan) found that 15.0% of cases are caused by other *Plasmodium* species including *Plasmodium Ovale* (6.2%) and *Plasmodium Vivax* (8.2%). Eighty percent (though with some variation to the degree per geographic location) of the country's population reside in malaria endemic zones (unstable malaria transmission). Transmission is caused by the wide distribution of Anopheles mosquitoes: such as Anopheles Arabiensis (primary vector all over the country); Funestus and Gambiae (widely distributed in the Southern Sudan); and other determinant factors such as massive flooding, limited accessibility to health services and inadequate coverage of curative and preventive programmes contribute to existence of malaria especially in Southern Sudan (Republic of the Sudan Federal Ministry of Health 2004:4; Ministry of Health, Government of Southern Sudan 2006:7-8).

Although various authorities have implemented many strategies, the fight against malaria cannot be won without the cooperation of all role players. Members of a community should take responsibility for their own health and implement malaria control measures in their area. They need to be educated on what they can do at grass roots level. Before any education campaign can be implemented it is important to establish what members of a community already know and what rural communities already do to protect themselves against malaria outbreaks.

## **1.2 BACKGROUND TO THE PROBLEM**

A world-wide campaign to eradicate malaria started shortly after World War II. This was done by the wide spread spraying of Dichlorodiphenyltrichloroethane (DDT)

coupled with some environmental actions such as coating and drainage of breeding places. This attempt resulted in eradication of malaria in Europe, Russia and some parts of Asia from 1940 to the late 1960s. This period also showed some significant reduction in mosquito population and malaria morbidity in the tropics. However, controlling malaria in tropics was not as successful due to a number of factors such as difficult access to health facilities, deterioration of health infrastructure and gradual development of mosquitoes and malaria resistance to insecticides and drugs respectively. This forced the entire world to abandon the plans for malaria eradication hence shifting the strategy towards local protection methods with more focus on intermittent preventive treatment (IPT) targeting pregnant women. It also led to the distribution of insecticide treated nets (targeting pregnant women and children below five years of age); a combination of vector control and personal protective measures; prompt and correct diagnosis and treatment of any person suspected of having malaria. Treatment is provided using an effective drug within 24 hours of the onset of the symptoms and also included provision of home treatment for the patients who cannot have access to health care providers (WHO 2005:7, WHO/UNICEF 2005:1,14-19). In some communities or countries early epidemic detection and in-door residual spraying with DDT and other insecticides had been and are still being used to control morbidity and mortality due to malaria. However, the strategy of using DDT as in-door residual spraying has been abandoned by most countries (Tren & Bate 2001:21).

Though, during the 20<sup>th</sup> century, the efforts to control malaria combined with improved access to treatment and general socio-economic development have made a major impact on the reduction or elimination of the spread of malaria in many regions in the World. The disease is however now returning to areas from which it was eliminated, as well as spreading to new areas, which had no malaria. In sub-Saharan Africa, malaria transmission continues to be a major health problem due to factors such as resistance of parasites to the common drugs, breakdown of control programmes; various complex emergencies situations (conflicts, wars, natural calamities etc); collapse of local primary health care services; and resistance of mosquitoes to insecticides resulting to 90% of global malaria cases (WHO/UNICEF 2005:12-13).

In Sudan, several attempts have been made to control malaria by using the following strategies: Use of insecticide treated nets targeting the pregnant mothers; and children under five years of age; prompt and effective malaria case management; *prevention* of malaria in pregnancy (intermittent presumptive treatment); and indoor residual house and space spraying; larviciding; and other environmental and biological control measures. Response to epidemic and complex emergencies is also part of malaria control programmes implemented by the government, international non-governmental organisations, indigenous and faith-based organisations, and international agencies such as WHO, UNICEF to name but a few (Republic of the Sudan Federal Ministry of Health 2004:9-16).

There could be multiple factors that perpetuate malaria morbidity and mortality in Sudan and Mundri East County in particular. Factors such as age, gender and occupation influence practices that support malaria transmission, cultural beliefs and practices may unknowingly promote transmission, and education factors such as inability to read or understand health education messages could also lead to poor recognition of malaria prevention methods (Worrall, Basu & Henson 2003:25-26, 27, 31, 36-37).

Poor participation in malaria control activities could result from lack of community knowledge and practices. In addition, other factors such as inappropriate, ineffective, inefficient or costly public health infrastructures (for example use of fishing, improper or costly diagnosis and treatment of infected persons leading to persistence of lifecycle or development of resistance) (Ministry of Health, Government of Southern Sudan 2006:8-10). If all the above issues are dealt with, there could be reduction in the prevalence and hence reduction in morbidity and mortality from malaria.

### **1.3 RATIONALE OF THE RESEARCH PROBLEM**

It was on the basis of the development of the problem already discussed and briefly outlined below that the research problem was selected:

- Malaria is a major public health problem in Africa and the entire World, which require close attention.

- In Sudan malaria is the leading cause of morbidity and mortality.
- A world-wide campaign was launched to eradicate malaria as early as after World War II and malaria was subsequently eradicated in Europe.
- Controlling malaria in the tropics was not so successful due to factors such as poor access to health services, poor health infrastructure and the development of the mosquito's resistance to insecticides.
- In Sudan many control measures have been implemented such as: insecticide treated nets for special target groups; prompt diagnosis and treatment; environmental and biological control measures but malaria still poses a major health problem.
- Poor community participation in malaria control measures impairs the success of these measures, probably due to lack of knowledge, illiteracy, and socio-economic factors.
- Malaria control programme intervention could only be successful if the community members have understood malaria transmission routes and ways of controlling it, which might change their attitudes towards malaria prevention, hence improving their control practices (either traditionally or modern scientifically).
- To successfully control malaria in the rural areas of the Mundri East County, it would be necessary to assess the knowledge of the members of the community, determine what they already do to control malaria and what factors hinder their efforts. The findings of this research could therefore contribute to the designing of a malaria intervention programme in the areas by the Ministry of Health or any other organisation involved in the control of malaria.

#### **1.4. STATEMENT OF THE PROBLEM**

Although some governmental and non-governmental organisations promote control measures in Mundri East County of Sudan, the morbidity and mortality rate for malaria remain high and is currently the number one single cause of death in this area. To tackle such a devastating and wide spread health problem, the community must understand and implement control measures. However it is not known what specific knowledge the members of the rural community in Mundri East County,

South Sudan, have; what control measures they already have been implementing to control malaria; and what problems they are experiencing at household level that hamper the control of malaria. This necessitates a study so that appropriate and acceptable strategies could be designed to control malaria at household level.

#### **1.4.1 The research questions**

The following research questions have been derived from the above problem statement and directed the research process:

- What knowledge do the members of the rural community of the Mundri East County, Sudan, have on malaria, its transmission, treatment and control?
- What do the members of the rural community of the Mundri East County, Sudan, do by themselves to control malaria?
- What inhibiting factors hinder the malaria control activities on household level in the rural community of the Mundri East County, Sudan?

#### **1.5 AIM OF THE RESEARCH**

The aim of the research is to study the knowledge of community members of the rural Mundri East County of Sudan on malaria as disease and the control thereof; what did they do themselves to control malaria; and to identify the major problems encountered by the community that hinder the control of malaria.

#### **1.6 SPECIFIC OBJECTIVES OF THE RESEARCH**

- To explore and describe the level of knowledge that community members in the Mundri East County, Sudan, have on malaria as disease, its transmission, treatment and the control of malaria at household level.
- To assess the practices they have implemented in the Mundri County, Sudan, to control malaria at household level.

- To identify the major problems encountered by the community of Mundri East County, Sudan, in the control of malaria at household level.

## 1.7 SIGNIFICANCE OF THE RESEARCH

It was important to conduct this research as no recorded research could be found on knowledge that community members in the Mundri East County, Sudan, possess on the control of malaria at household level. The findings of the research could be used to design policies and procedures based on what the members of the community needs.

## 1.8 OPERATIONAL DEFINITIONS OF THE KEY WORDS

Concepts relevant to this research included the following:

### ➤ **Knowledge**

*Knowledge* is defined in the Oxford Advanced Learner's Dictionary (2000:658), as the information, understanding and skills that you gain through education or experience. Knowledge is further defined as awareness gained by experience of a fact or situation (Oxford Dictionary of current English 2006:504).

*Knowledge* in this research refers to the expertise acquired by a member of the rural community of Mundri East County, Sudan, through *experience* or *education* on malaria as disease, its transmission and control and the skills to implement preventive measures.

### ➤ **Practice**

The term practice is defined in Collins English Dictionary (2003:448) as something done regularly or habitually.

In this research the term practice refers to any action or activity (traditional or scientific) undertaken by members of the rural community in the Mundri East County, Sudan, at household level to control malaria.

### ➤ **Control measures**

According to Gill & Beeching (2004:71), malaria control measures are the measures taken to control disease and mortality that result from malaria. These measures include the provision of diagnostic and treatment services as close as possible to residential areas. It also include provision of simple, affordable treatment for uncomplicated disease, prompt recognition and treatment of severe disease and provision of intermittent presumptive treatment for selected groups. Ensuring well functioning referral system to hospitals, educating community about the features and dangers of malaria, and taking anti-vector measures such as water drainage where possible, and use of pyrethrum-treated bed nets or curtains.

Malaria control measures in this research refer to both traditional and scientific actions implemented by members of the rural community in Mundri County for controlling malaria to prevent malaria epidemics, prevent death and disability (mortality and morbidity), and to reduce socio-economic loss caused by malaria.

These actions or measures include the early diagnosis and treatment of malaria (by using modern and traditional methods and medicines); reducing the number of people being infected through prophylaxis and insecticide-treated or untreated bed nets and traditional herbs; and controlling the insect vector by insecticide spraying or smoking, environmental management and biological control (covering wells and filling in ditches, and keeping irrigation channels fast flowing).

### ➤ **Malaria**

Malaria is defined as a potentially fatal blood disease caused by a parasite called Plasmodium. It is transmitted through the bite of infected Anopheles mosquitoes, and presents with symptoms of intermittent fever with chills, headache and vomiting, occurring daily, alternate day or every fourth day and associated with enlargement of the spleen later. Its estimated annual death is 2.7 million (Oxford Advanced

Learner's Dictionary 2000:715, Micro world contents 2001; Babu, Nair & David (2004:1).

Malaria was also described as a stubborn disease, slow to kill, quickly to incapacitate and hard to cure (Kager 2002:1042).

In this research (since malaria in Sudan is diagnosed both clinically and by laboratory tests) the term *malaria* refers to a disease caused by one of the genus Plasmodium, which is found in the blood of an infected individual through laboratory tests after the individual has been bitten by an infected Anopheles mosquito or diagnosed clinical by trained health personnel (including community health workers, Medical assistants/clinical officers, nurses and doctors) after having ruled out other causes that may mimic malaria. The patient may mainly present with fever, headache, and shivering, vomiting and general body pain.

## **1.9 RESEARCH METHODOLOGY**

A quantitative, explorative and descriptive study has been conducted among the community at household level in Mundri East County, Sudan, through personal (face-to-face) interviews using pre-tested interview schedules.

### **1.9.1 Quantitative research**

Polit and Beck (2004:15 & 729) describe quantitative study as a structured (or systematic collection of numerical information) investigation of event(s) or interest that produces numerical information amenable for statistical analysis. This study is set to assess the knowledge of and control practice, and identify the major problems encountered by the community in controlling malaria at household level in the rural areas in Mundri East County, Sudan. Therefore in this research, the quantitative study is considered an appropriate measure to describe such variables as knowledge, and practices related to malaria. As the knowledge individuals should possess and the measures individuals should implement were known, this research, therefore measured the level of knowledge and measures implemented by respondents, and the findings will be analysed through quantitative methods.

### **1.9.2 Explorative research design**

Explorative design aims to explore or examine a new interest or when the subject of study itself is relatively (somewhat) new (Babbie & Mouton 2001:81; Burns & Grove 2003:717). According to Polit and Beck (2004:718), explorative research begins with some phenomenon of interest and investigates the full nature of the phenomenon, the manner in which the phenomenon is manifested and other factors related to it. It is also believed that explorative study could be used for an in-depth exploration and description of a single variable, process or phenomenon to reach a complete description and explanation. Thus the explorative researcher usually explores or investigates the phenomenon or variables or population of interest (Polit & Beck 2004:20). This design is usually used in qualitative research. However since there are no documented research findings on the knowledge, practice and major problems facing the community in controlling malaria at the household level in the area of study, and the structured research method will be used to collect data, this research design could also be considered to be explorative in nature.

### **1.9.3 Descriptive research design**

The descriptive research design explores and describes the phenomena in the real life situation and provides an accurate account of characteristics of particular individuals, situations or groups (Burns & Grove 2005:233). It's believed that through descriptive studies the researchers would discover new meaning, describe what exists, determine the frequency with which something occurs and categorise the information. A descriptive study is conducted in a natural setting (without manipulation or change of the environment (Burns & Grove 2005:232). Thus the research is set to study the knowledge of the community in relation to malaria control in a rural area under a natural setting using a structured interview schedule (for participant's interview).

#### **1.9.4 Research setting**

Research setting refers to the specific locations where the data collection is conducted and this includes natural, partially controlled or highly controlled settings (Polit & Beck 2004:158-159; Burns & Grove 2009:588). In this study, the research setting where the data collection was conducted is the household (natural setting) with malaria or which had malaria in the past one month. This setting is considered to be a natural setting because there was no direct control over settings by the researcher or data collectors.

#### **1.9.5 Research population**

Research population is defined as the entire aggregation of cases that meet a designated set characteristics (such as age limit occupation and so on) for the inclusion in the study (Polit & Beck 2004:28) while Burns & Grove (2009:41) refer to research population as the target population that means the whole or total set of individuals or elements that meet the sampling criteria. Sampling criteria refers to the essential characteristics for the membership in the target population. This is also referred to as eligibility criteria (Burns & Grove 2005:342).

In this study, the research population were all people in the Mundri East County of Southern Sudan, between the ages 18 to 60 years who have had malaria or is currently suffering from malaria.

#### **1.9.6 Sampling method**

Sampling as described by Burns and Grove (2009:346) is the process of selecting subjects who are representative of the population or events being studied. Sample also refers to the selected group of people or elements of the research population to be studied and is expected to represent the research population where they are selected from (Burns & Grove 2009:346). Sampling is further defined as a process of selecting a portion or sub-set (sample) of the designated population to represent the entire population as it is often impossible to study the whole population (Gari &

Judith 2002:242; Polit & Beck 2004:731). The sample and sampling method has been discussed in more detail in chapter 3.

In this research, sampling refers to the ways of how the Payams<sup>1</sup> Bomas<sup>2</sup>, villages and the participants were selected for the study.

Since it was not possible for the researcher to study the entire population, in this research the multi-stage cluster sampling have been used as the sampling method. However the sampling of the participants was done at village level through systematic sampling.

#### **1.9.6.1      *Multi-stage cluster sampling***

Multi-stage sampling refers to the sampling procedures where the subjects are selected at more than one stage. It may involve combination of methods such as simple random and cluster sampling, or cluster and sampling random sampling and so on (Katebire 2007:47).

In this sampling technique the entire population is divided into groups, or clusters and a random sample of these clusters are selected. It is typically used when the researcher cannot get a complete list of the members of a population they wish to study but can get a complete list of groups or 'clusters' of the population (Burns & Grove 2009: 239). It is also used when a random sample would produce a list of subjects so widely scattered that surveying them would prove to be far too expensive. It also has the advantage of concentrating the field of study in a specific section of the greater geographical area and thus helps to save time and cost of the study (De Vos, Strydom, Fouché & Delpont 2002:206).

Population in Southern Sudan, of which Mundri East is one of the counties, are sparsely scattered over a wide area and the sampling frame such as list of names or household numbers are particularly lacking; therefore this study utilised multi-stage cluster sampling. It is believed that when more clusters are included in the study, the

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<sup>1</sup> (Sub-district),

<sup>2</sup>(Are the same as parishes)

more representativeness of the population the sample would have and the less error could occur (De Vos et al 2002:206). The study used three Payams out of the five, six Bomas out of the nineteen and 70 household which is 0.1% of the total research population. However since the study was only done in one county, which is composed of one tribe, it will not be possible to generalise the findings in other areas.

### **1.9.6.2 Selection criteria**

To avoid unnecessary inclusion of subjects in the study, the respondents have been selected upon fulfilment of following features so as to be eligible for inclusion in the sample.

#### **1.9.6.2.1 Inclusion criteria**

The respondents had to have the following characteristics:

- An adult between the ages 18 and 60 years;
- Have been living in the rural area of Mundri East County of Southern Sudan for at least one month- before the data were collected;
- Male or female;
- Have had malaria in last month – before data were collected (diagnosed clinically or by laboratory confirmation) ;
- Only one person per household was interviewed.

### **1.9.6.3 Sampling procedure**

Since the communities in Mundri East County are clustered in certain features like villages, Bomas and Payams, a cluster sampling was used as follow:

In the process of the sampling, the County was clustered into Payams (this is an equivalent of sub-district or sub-County) of which half of the Payams was selected using simple random sampling and the selected Payams was further clustered into Bomas. The names of the individual Boma were written on a small ball, (a golf ball) and then put in a container with lid and shaken vigorously. Then a ball was picked,

the name written down and put back. When the Boma's name was re-picked, it was not re-written on the other subsequent times but only recorded once and this continued until the required numbers of Bomas were selected. Fifty percent (50 %) of the total Bomas was selected as the study area. The selection of the villages from each Boma was done by using the same procedure used in the selection of Bomas from Payams except only 10% of the total villages in each selected Boma were included.

Households were selected systematically after standing in the middle of the village (as identified by the Boma Administrator or Chief of the area), and a pencil was spun to show the direction. Before the selection of households, the sample ratio was calculated. The sample ratio is the number of elements in the population divided by the number of elements in the sample. In this case it is the total number of households in the selected villages (1608) divided by the sample of households (70) - equals 23. Then every 23<sup>rd</sup> household was selected, starting with the 1st, in the direction pointed out by the pencil. Sixty-eight respondents were selected.

#### **1.9.6.4      *Sample size***

Sample size refers to the number of the subjects, events, behaviour or situations that are examined in a study (Burns & Grove 2009:358). In this research the sample size is the number of the respondents who were included in the sample and interviewed. This means one respondent per household. To get the number (sample) of the respondents to be interviewed, simple random sampling was used.

Since the study was looking at finding out the knowledge the community members have on malaria as disease, its transmission and control and the skills to implement preventive measures, the sample size was 70 respondents which is 0.1% of the research total population (64915).

#### **1.9.7    *Data collection***

According to Polit & Grove (2009:51) data collection is the process of acquiring the subjects and collecting the data for the study and generation of numerical data.

Burns & Grove (2003:45) further elaborated that the data collection process used should systematically gather information to address the research objectives which are relevant to the research purpose or specific objectives, questions or hypothesis of the study. It is noted that the data collection methods employed in a descriptive design include observation, questions (interviews and questionnaires), review of available data, projective techniques, physical assessments or physiological test of humans, and chemical or physical test on non-human or inanimate objects (Burns & Grove 2009:42).

Data collection is the precise, systematic gathering of information that is relevant to the research problem, aim, specific objectives and research questions of the planned study (Burn & Grove 2009:42).

In this research, the data collection method which has been used is the interview using prepared and a pre-tested interview schedule to ensure that reliable and valid data are collected.

#### **1.9.7.1      *Interview method.***

The interview is a systematic method of data collection in which the person (an interviewer) enters more or less imaginatively (by asking questions to another person) into the life of a comparatively stranger (the respondent). Therefore an interview is a dialogue between the interviewer and the interviewee for the purpose of collecting data about the respondent (Cauvery, Nayak, Girija & Meenakshi 2003:129-130; Mbabazi 2007:79).

There are various ways of conducting an interview including meeting the respondent face-to-face or through telephone interview. Interviews may be conducted using unstructured approach in which the researcher does not have a set of prepared questions that must be asked in a specific order or worded in a given way, or the researcher may use a structured interview approach with schedules. In the latter the researcher has a limited role to play but mainly operates by making use of a written, prepared research instrument which is known as the interview schedule. An interview often allows a more representative sample to be obtained because it

enables the researcher to collect data from subjects who are unable or unlikely to complete questionnaires due to sickness, inability to read, write and express themselves; and it can be conducted from anywhere to accommodate the respondent's needs.

The interview may either be recorded on an audio tape recorder or the answers to the questions may be written down by the interviewer (Burns & Grove 2003:284-285, Cauvery et al 2003: 138-140; Mbabazi 2007:79). By making use of the same prepared interview schedule in each interview many of the disadvantages of an interview could be excluded, such as researcher's bias and asking leading or loaded questions.

In this research, the researcher decided to use face-to-face personal interviews with the respondents using prepared and pre-tested interview schedules because it was convenient to collect the data using standardised research tools, made recording easy and errors made during the data collection can be corrected when editing the data. During the data collection process, the respondents were asked the questions in the interview schedule and their answers to these questions were written down on the interview schedule by the data collectors and later cross-checked by the researcher. The interview has been discussed in more detail in chapter 3.

#### **1.9.7.2      *Selection and training of data collectors***

Three data collectors who had medical background were selected from the selected areas (Kediba, Lozoh and Minga Payams) and trained to help in data collection.

The data collectors were first approached by the researcher on individual basis and briefed about the objectives of the planned research project and they were asked whether they would assist the researcher in data collection (that would take about seven days) using an interview schedule. This was followed by obtaining final approval from their supervisors in the work place (for those who are employees) to avoid interference with their work.

The three data collectors were then trained on quantitative data collection methods for four days and were continuously assisted by the researcher during the data collection period to ensure reliable and accurate data. The actual training covered areas such as the purpose of the data collection and what actually is required for, the method of sample selection, how to approach the respondents, in adequate and accurate completing of the interview schedules and in absorbing the research ethic when collecting the data from the respondents. Additionally, during the training, all the data collectors were trained to do the following:

- to introduce themselves to the respondents and whom they are representing
- tell the respondents how they were selected
- adopt the approach as the situation permits (if the respondents asks to be interviewed the following day, it should be respected)
- create the relationship of confidence and understanding or rapport
- conduct the interview in a relaxed way
- follow the question in the interview schedule
- ask the question exactly as they are worded in the interview schedule to avoid misinterpretation by the interviewer
- present the questions in the same order as in the interview schedule
- all the questions in the interview schedule, which are misinterpreted or misunderstood, should be made clear (Cauvery et al 2003:137). The selection and training of the data collectors are discussed in more detail in chapter 3. See also annexure F for the training of data collectors.

### **1.9.7.3 Interview schedule**

An interview schedule is a set of questions which are asked and completed in by the interviewer in face-to-face situation with the respondent (Desai 2008:145). According to LoBiondo-Wood & Haber (2002:301) and Polit & Beck 2004:361), it is a paper and pencil instrument that is designed to gather data from individuals, and is similar to a questionnaire. Though both interview schedules and questionnaires can use open-ended and closed-ended questions, questions are usually completed by the respondents themselves while the interview schedules are completed in by the

interviewers. The interview schedule is therefore more appropriate in situations where the level of literacy is low (Cauvery et al (2003:87).

The researcher had the English copy of the interview schedule translated into the local Moru language, to ensure that the respondents understood the exact meaning of the questions and to ensure consistency. A translator and editor have been used to ensure that the questions are translated correctly. See annexure C and D for a copy of the interview schedule (English version and translated version).

The instruments used in this research (the interview schedule), covered the research objectives and consisted of closed-ended and open-ended questions. However most of the questions were closed-ended, because closed-ended questions expose all the participants to the same response categories and are easier to analyse by computer (Burke & Larry 2000:169; Cauvery et al 2003:151; Burns & Grove 2009:396).

In the closed-ended-ended questions, respondents were asked to respond to questions with fixed alternatives and the respondent's answers were then noted by the data collectors. Enough space has been provided for the interviewer to write the exact words of the participants when answering open-ended questions.

Both open-ended and closed-ended questions have strengths and weaknesses. Closed-ended questions are usually difficult to construct but easy to analyse while open-ended questions are easy to construct and administer but more difficult to analyse. The closed-ended questions in this research have been coded to facilitate the analysis by computer. The open-ended questions had been categorised by the researcher by finding commonalities and assigning a code to enable analysis and discussion. This process is time consuming and needed considerable skill.

The interview schedule has been evaluated by experts, such as experts in the field, a statistician and the supervisors of the research in the Department of Health Studies, University of South Africa. After it had been approved by the above-mentioned individuals the interview schedule was translated into Moru by the researcher, edited by the language expert and pre-tested to ensure that the items

measure what they are intended to measure (LoBiondo-Wood & Haber 2002:305). After correcting the instrument and after the pre-test on 10 participants (who did not take part of the main study), the instrument was used to collect data of the selected sample of 68 participants.

After the completion of the data collection process, the verbatim text was translated back to English. Again the service of the language expert was used to ensure that it was translated correctly into English. The completed interview schedule was then posted to the statisticians for analysis on the Statistical Package for Social Sciences (SPSS) version 15 computer program.

Although an attempt was made to keep the interview schedule as short as possible, it was necessary to cover all the objectives of the study. See annexure C for a copy of the interview schedule.

#### 1.9.7.3.1 Coding

In quantitative research “coding” refers to the process of providing a number for a particular answer to a closed-ended question for easy computer data analysis. In open-ended questions “coding” refers to the process whereby verbal data is translated into categories or numerical numbers (Polit & Beck 2004:504).

Coding of the closed-ended questions in the interview schedule was done during the compiling of the instrument, but the coding of the open-ended questions was done after data collection.

#### 1.9.7.3.2. Format of the interview schedule

The interview schedule consists of the following main aspects:

##### **Section A: Demographical information of the respondents**

This section covered the demographical information of the respondents.

##### **Section B: Respondents’ knowledge on malaria**

This section consisted of questions, which aimed at determining the community members’ knowledge on malaria.

**Section C: Treatment of malaria**

The section identified the common malaria treatment practices being practised by the community members in the rural area of Mundri East County.

**Section D: Measures taken to control malaria**

The section identified the preventive measures implemented by respondents.

**Section E: Factors preventing implementation of preventive measures**

This section dealt with the factors preventing the implementation of preventive measures of malaria in rural areas of Mundri East County.

**Section F: Health education received on malaria**

This section covered the type and the sources of health education received by the community on malaria in the last three months.

To gather information of data on the above-mentioned sections, the use of the interview schedule was necessary, as it required the use of a standardised data collection tool.

**1.9.7.3.3. Pre-testing of the interview schedule**

Pre-testing involves determining the feasibility of using a given instrument in a formal study using a small part of the proposed study population. Pre-testing provides an opportunity to try out the instructions and the instrument itself, especially if the research instrument has never been used with a specific population (Burns and Grove 2003:491; Desai 2008:157-158).

Pre-testing of the interview schedule identifies problems in the design of questions, sequencing of questions and procedures for recording responses, as well as reliability and validity of the instrument. It also helps the researcher to refine the methodology such as the instrument and or data collection process to be used in the large study (Desai 2008:157-158). Pre-testing of the instrument has been discussed in more detail in chapter 3.

In this research, pre-testing of the interview schedule was done by conducting an interview with 10 respondents who were not part of the main study. This was done to:

- identify weaknesses in the organisation and administration of the research instrument;
- enable the researcher to make improvements and corrections before embarking on the actual data collection procedure;
- ascertain the clarity and to reduce any ambiguity in the questions and
- establish the content validity of an instrument.

The following corrections have been made (if any exists):

- correction of incorrect numbering of items;
- deletion of duplicated questions;
- correction of unclear sentences;
- adjustment of the spaces provided for the open-ended questions;
- correction of typing errors;
- proper sequencing of the question on interview schedule;
- correcting the coding of the interview schedule;
- correction of spelling errors, and
- adjustment of the logical order or flow of the questions. The specific changes will be discussed in more detail in chapter 3.

#### **1.9.8. Analysis of data**

According to Polit and Beck (2004:452), the raw data collected during the research only provide meaningful answers to research questions after having been processed and analysed in some orderly, coherent fashion so that the relationship can be clearly seen. Analysis of quantitative data is generally done by the use of statistical procedures ranging from manual to computerised techniques. Prior to the actual data analysis, the following has been done:

- The services of a statistician was obtained to verify whether the research instrument could be analysed by computer, and to suggest improvement.

- After obtaining permission from the statistician, supervisors, and other relevant authorities such as ministry of health, the data were collected.
- The researcher and the research supervisor cross-checked the field data on a daily basis to correct any missing or wrongly completed interview schedules and made necessary adjustments.
- Data were then collected for the actual study.
- Data were analysed by the computer and initially only presented into frequency tables. The researcher then started to discuss the findings whilst the pie diagrams, bar diagrams and other figures were drawn.
- The results were presented in graphs, tables, and percentages. This process will be discussed in more detail in chapter 3 and the results were discussed in chapter 4.

## **1.10 RELIABILITY AND VALIDITY OF RESEARCH**

In any research that aims to collect quantitative data, reliability and validity of the sources of data require attention (Mbabazi 2007:116; Burns & Gove 2005:374). The two main quantitative measures, which have been applied for assessing its quality, have been discussed below.

### **1.10.1 Reliability**

The reliability of an instrument is defined as the degree of consistency with which instrument measures the attributes (Polit & Beck 2004:35). Reliability is also referred to by Cozby (2004:85) as the consistency or the stability of measure of behaviour. Some researchers like Babbie and Mouton (2001:123) and Burns & Grove (2005:749) consider reliability as the extent to which the instruments yield the same result on repeated measures. It is considered to be a function of consistency and its failure is referred to as a random error. Therefore reliability is concerned with consistency, accuracy, precision (exactness of the measure used in an observation or description of an attribute), stability (instrument's ability to produce the same results with repeated testing), equivalence (when the tool produces the same results when equivalent or parallel instruments or procedures are used) and homogeneity

(means all the items in a tool, measure the same concept or characteristic). According to Polit and Beck (2004: 416), “reliability of an instrument that yields quantitative data is a major criterion for assessing its quality and adequacy”.

For the research findings to be reliable the research instruments should accurately reflect or measure true scores of the attributes. Thus reliability in this research was ensured through the following procedures:

- Consultation with experts in the field and supervisors.
- Translation and editing of the interview schedule.
- Cross checking of completed interview schedules.
- Pre-testing interview schedule and correcting it before the final data collection process (Polit & Beck 2004: 328).

### **1.10.2 Validity**

Validity is referred to as the extent (degree) to which an instrument measures what it is intended to measure (Polit & Beck 2004:735). Validity is also referred to as the extent to which a specific measurement provide data related to commonly accepted meanings of a particular concept under consideration and there are several ways for determining validity in a study namely face validity, content validity, criterion-validity and construct validity (Babbie & Mouton 2001:122, 125; Polit & Beck 2004:432).

*Face validity* means that the measure appears to accurately assess the intended variables (Cozby 2004:90), *criterion-validity* is also referred to as predictive validity and is used to predict or estimate the probability of a specific outcome in a given situation that can be achieved through research (Babbie & Mouton 2001:123; Burns & Grove 2009:376), *construct validity* is based on the logical relationship among variables, and *content validity* refers to how much a measure covers the range of meanings included within the concept (Babbie & Mouton 2001:123; Burns & Grove 2009:376).

In this research, the following procedures have been followed to ensure validity:

- The data collection instrument (interview schedule) was formulated and then evaluated by experts in the field as well as the supervisors for face-value and content validity.
- Correction of incorrectly phrased questions or removal from the instrument.
- The instrument was pre-tested on 10 (10% of the sample) respondents who did not take part in the major study and mistakes corrected.

### **1.11 AN OVERVIEW OF THE ETHICAL CONSIDERATIONS**

Research ethics are a guiding set of principles intended to assist researchers in conducting ethical studies (Burke et al 2004:94, 96). According to Mouton (2001:238), ethics refer to what is wrong and what is right in the conduct of research. Mouton is of the opinion that scientific research is a form of human conduct therefore it should conform to generally accepted norms and values as in any area of human life.

Certain steps were taken to ensure that the research is conducted in an ethical manner. Permission was asked or obtained to conduct the research from

- Research and Ethics committee of the University of South Africa. See annexure B.
- Ministry of Health for government of South Sudan. See annexure A.
- Every prospective participant will be given the freedom to decide whether to participate in the research. Thereafter they signed a prepared informed consent. See annexure G.

In this research anonymity and confidentiality of the respondents and data collected was guaranteed by not sharing any of the collected information with others. The respondents were also informed that they were free to decide to become research subjects or not, and that they were free to withdraw from the study at any time without any penalty. They were also informed that they would not receive any monetary or in-kind benefits from the study. The ethical considerations has been discussed in more detail in chapter 3

## **1.12 SCOPE AND LIMITATIONS**

This research is limited in terms of scope because it was only conducted in one County of the Southern Sudan. The County (Mundri East County) is inhabited by only one tribe, and the only people who recently contracted malaria (one month prior to the data collection process) have been included in the sample.

The findings of this research could therefore not be generalised to other communities in Southern Sudan.

Other limitations identified during the research process have been discussed in chapter 5.

## **1.13 CHAPTER LAYOUT**

The dissertation was divided into the following chapters:

Chapter 1: Orientation and overview of the research

Chapter 2: Literature review

Chapter 3: Research methodology

Chapter 4: Presentation and discussion of data

Chapter 5: Summary, limitations, conclusions and recommendations

## **1.14 CONCLUSION**

The burden caused by malaria in the Mundri East County of Sudan, and the variety of the control methods that had or are still being practised have been discussed in this chapter. An overview was also given on the background of the research problem, from which it developed, as well as the aim, research objectives and questions of the research. Key concepts of the study have been defined.

Important aspects of the methodology such as the study design, the research population, sample and sampling procedures that had been used were outlined. An overview was also given on the measures that have been taken to ensure validity and reliability. Ethical aspects pertaining to the research that had to be considered were briefly mentioned.

In the next chapter a literature review relevant to the research problem and other relevant topics are presented.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

Historically, malaria is one of the very few diseases that have had major impacts on human health and socio-economic development. Pre-historic man was thought to have suffered from malaria, it's believed that the malaria parasite have been with human kind since the dawn of time and most likely had its origin in the African continent (Lambert 2003:1). Although the disease was thought to have existed for many centuries, its present name was only given in the 18<sup>th</sup> century when the Italians named it malaria (mal-aria meaning bad or foul air). This name malaria according to the Italians, refers to bad air, in the early year, the symptoms of malarial fever were described and associated to the bites of certain insects. Malaria disease was attributed to swamps (Centre for Disease Control<sup>1</sup> 2010:1).

It was in the 5<sup>th</sup> century BC (before Christ), that, Hippocrates the father of the medicine first described clinical manifestations of malaria and logically related them to the time of the years or the places where the patients lived. The association of periodic fevers with stagnant waters and swamps (considered to be breeding places for Anopheles mosquitoes), promoted the Greeks and later the Romans to initiate an intervention method through drainage, which currently is still one of the effective methods of malaria control in some countries such as Sudan.

From 2700 BCE (before Common Era) -340 CE (before Christ), symptoms related to malaria had been described in several writings including ancient Chinese medical writings, Nei Ching, the canon medicine and among others (Babu et al 2004:1).

On 6<sup>th</sup> of November 1880, Charles Louise Alphonse, a French army surgeon first discovered parasites in the blood of patient suffering from malaria when he was conducting research at the military hospital of Bôna in Algeria which earned him the Nobel price (Centre for Disease Control<sup>1</sup> 2010:1-2; Babu et al 2004:2).

In 1886, an Italian neurophysiologist called Carmillo Golgi established that there were at least two forms of malaria and according to him these two forms are tertian malaria (fever every other day) and quartan malaria (fever every third day) (Centre for Disease Control<sup>1</sup> 2010:2).

When Alphonse first discovered the malaria parasite, he thought that, there was only one species called *Oscillaria Malariae*. However in 1890-1997, the two other human malaria parasites namely *Plasmodium Vivax* and *Plasmodium Malariae* parasites were discovered by Giovanni Batista Grassi and Raimondo Filetti (Italians). In 1897 William H. Welch (an American) named the malignant tertian malaria parasite, *Plasmodium Falciparum*. Later in 1922, John William Watson Stephens described the fourth human malaria parasite, *Plasmodium Ovale* (Babu et al 2004:5; Centre for Disease Control<sup>1</sup> 2010:2).

In the early 17<sup>th</sup> century, the bark of the cinchona tree was successfully used for treating intermittent fever. However the alkaloid quinine, the active ingredient, was not isolated until 1820. The major breakdown in the aetiology of the disease came in 1880 when *Plasmodium Falciparum* was discovered in a fresh blood film from a patient with malaria (Centre for Disease Control<sup>1</sup>, 2010:1-2).

During the 20th century, progress was made in vector control technology and in development of synthetic anti-malaria compounds. Larvicides in the form of oil and Paris green (a mixture of diesel oil and copper acetoarsenite) were introduced. These and other methods of mosquito's reduction, such as draining the breeding site, widespread use of nets, and use of cheap effective drugs such as Chloroquine proved useful in controlling malaria.

Dichlorodiphenyltrichloroethane (DDT) the first of the chlorinated organic insecticides was originally prepared in 1873, but it was only in 1939 that Paul Mulle discovered DDT as an important insecticide with high potency and of low toxicity. Due to this marvellous work, he was awarded a Nobel Prize in medicine and physiology in 1948. After World War II, the global use of DDT greatly increased, mainly because of its effectiveness against the mosquitoes that spread malaria and other biting insects such as lice that transmit typhus. The WHO estimated that during the use of DDT as

control measure, approximately 25 million lives was saved (Lambert 2003:4; Centre for Disease Control<sup>1</sup> 2010:2; International Persistent Organic Pollutants elimination project 2006:4-5; Kakkilaya 2006:8-9)

In 1955, the World Health Assembly meeting resolved that DDT should be adopted as a weapon for global malaria eradication. Two years later, the WHO launched a programme for world-wide malaria eradication. Unfortunately due to difficult access to health facilities; deterioration of health infrastructure; DDT's discovery as having high toxicity to fish; gradual development of mosquitoes; and to malaria resistance to insecticides and drugs respectively, the success of the campaign to eradicate malaria was impaired. Some countries such as India and Sri Lanka had sharp reductions in the number of cases, followed by increases to substantial levels after efforts ceased. Other nations had negligible progress (such as Indonesia, Afghanistan, Haiti, and Nicaragua). Some nations were excluded completely from the eradication campaign (sub-Saharan African countries). The emergence of drug resistance, widespread resistance to available insecticides, wars and massive population movements, difficulties in obtaining sustained funding from donor countries, and lack of community participation, made the long-term maintenance of the effort untenable. Completion of the eradication campaign was eventually abandoned to one of control (Centre for Disease Control<sup>1</sup>, 2010:3-4, Thiel 2005:5 & Lambert 2003:3).

Since 1969, the WHO revitalised the eradication strategy of malaria control based on assessment of localised control potentials. This ranges from a reduction in morbidity and mortality in poorly developed areas, to comprehensive campaign stressing personal protection rather than dependence on insecticide spraying. In 1990s, the WHO designed a global malaria control strategy (Rollback malaria control strategy) which aims to reduce malaria morbidity and mortality through local protection methods with more focus on intermittent preventive treatment (IPT) targeting pregnant women, distribution of insecticide treated nets (targeting pregnant women and children below five years of age) -- which combines vector control and personal protection, and prompt and correct diagnosis and treatment of any person suspected of having malaria with an effective drug within 24 hours of the onset of the symptoms. The latter includes provision of home treatment or care for the patients

who cannot have access to Western world health services and care-providers due to lack of services or socio-economic factors. In some communities early epidemic detection and indoor residual spraying with DDT and other insecticides had been and are still being used or re-introduced to control malaria outbreaks (WHO/UNCEF United Nation Children Fund 2005:13-16; Kakkilaya 2005:8-9; WHO<sup>3</sup> 2007:3-4).

In 1992 in Amsterdam, a meeting of ministers attended by 90 out of 95 ministers who represented countries where malaria is endemic was held to urge governments and health agencies to coordinate their initiatives and resources to fight the most serious health problems of humankind. The members reiterated that wide scale population movements, emergence of drug resistance, wide spread resistance to available insecticides, wars and environmental alterations resulting from development, are responsible for the disruption of malaria control measures hence promoting the increase of malaria cases. The ministerial conference on malaria concluded that the malaria-affected countries should identify local problems and priorities in their own unique circumstance to determine how malaria programme interventions could be organised and implemented (United Nation General Assembly 2001:1; Centre for Disease Control<sup>1</sup> 2010:5; WHO/UNCEF 2003:13).

Countries were also advised to determine their unique epidemiologic situation, availability of resources, and sustainability of operations before beginning or continuing expensive vector control programmes. Seeing that in some areas, mosquitoes are developing resistance (United Nation General Assembly 2001:1; WHO/UNCEF 2003:53-54; Hanson, Goodman, Lines, Meek, Bradley & Mills 2004:37).

It has been decided on this meeting that training in malaria control is needed at all levels (health personnel and community members) in most endemic countries. Malaria-free countries were also encouraged to continue engaging in their ongoing efforts to maintain their malaria-free status at the same time maintaining at least one malaria vigilance unit. In addition to prevention of malaria deaths and reduction of malaria morbidity, it was proposed that the endemic countries must reduce the socio-economic losses generated by malaria (United Nation General Assembly 2001:1 & Lambert 2003:3-4).

Countries need to shift from existing centralised control programmes to flexible, cost-effective and sustainable programmes suited to local conditions. Inter-sectoral collaboration at district, national and international levels is needed to sustain these community-based actions. In addition, the government of the endemic countries needs to mobilise adequate human and financial resources to effectively implement sustainable and effective malaria control programmes (Babu et al 2004:93; WHO/UNICEF 2003:13).

Since the abovementioned ministerial conference, governments have made some significant efforts to implement the global malaria control strategy. However, vector control, which was an essential component of malaria control, has become less effective in recent years, partly as a result of poor use of alternative control tools, inappropriate use of drugs and insecticides resulting in resistance of the malaria parasite and mosquitoes to the available drugs and insecticides, inadequate resources (including human resources) and infrastructure, and due to weak management. Thus, there is urgent need to search for alternative control strategies, which promote community participation (Nchinda 1998:399; WHO/UNICEF 2005:12-13).

## **2.2 TRANSMISSION OF MALARIA**

It was in 1897 that Ronald Ross, a British Officer in the Indian medical service, first demonstrated that the malaria parasite could be transmitted from infected patient to mosquitoes (Lambert 2003:2). Today it is clear that malaria is a tropical disease caused by infection with a parasite of the genus *Plasmodium* and is transmitted mainly to humans through the bite of an infected female *Anopheles* mosquito. It can however occasionally be transmitted directly from one person to another by unscreened blood transfusion and accidental inoculation or across placenta (Gill & Beeching 2004:55).

There are four species of human malaria parasite namely *Plasmodium Falciparum*, *Plasmodium Ovale*, *Plasmodium Vivax* and *Plasmodium Malariae*. *Plasmodium Falciparum* is the agent of severe, potentially fatal malaria, causing most of an

estimated 700,000-2.7 million deaths due to malaria annually, 90.0% of this is in young children in Africa.

*Plasmodium Vivax* and *Plasmodium Ovale* have dormant liver stage parasites, which can reactivate and cause malaria several months or years after the infected mosquito bite.

*Plasmodium Malariae* produces long-lasting infections and if left untreated can persist asymptotically in the human host for years, even for a lifetime (Gill & Beeching 2004:55; Donaldson & Donaldson 2003:425).

In nature the lifecycle of malaria parasites involves two distinct hosts (humans and Anopheles mosquitoes). Once the infective microscopic sporozoites are injected by mosquitoes into the body of humans during the blood meals, within 8 hours, the sporozoites disappear from the blood and enter the liver to undergo a series of division and changes (asexual fission). After a series of divisions in the liver, it forms a cyst-like structure called pre-erythrocytic schizont. This stage takes 6-9 days for *Plasmodium Falciparum*, *Vivax* and *Ovale*, and 12-16 days for *Malariae*. To complete later ruptures discharge tens of thousands of merozoites, then enter the red blood cells. The process of blood schizogony has then started. The duration of blood schizogony varies with the species of the parasite ---36-48 hours for *Plasmodium Falciparum*, 48 hours for both *plasmodium vivax* and *ovole*, and 72 hours for *Plasmodium Malariae* (Donaldson & Donaldson 2003:425-426).

For the other three *Plasmodia* (*Plasmodia Ovale*, *Plasmodia Vivax* and *Plasmodia Malariae*) the schizogony occurs in the peripheral circulating blood while for *plasmodium* the most dangerous type, the schizogony only occurs in capillaries deep within the body. Some of the merozoites that enter the red cells develop into gametocytes instead of schizonts. The gametocytes are the infective stage to the mosquitoes. When the subsequent female Anopheles ingest both male and the female gametocytes when she takes blood meal for her egg maturation, the second stage of the malaria lifecycle called sporogony (sexual) begins (Gill & Beeching 2004:55-57). The sporogony time required to complete maturation depends on multiple factors including the longevity of the adult female Anopheles. For example

at 20-21°C it can vary from 14-16 days, and 18-20 days in *Plasmodium Vivax*, 28-30 days *Plasmodium Falciparum* and *Plasmodium Malariae*. No development takes place below 15°C in *Plasmodium Vivax* and below 17°C in *Plasmodium Falciparum*, and all the parasites are inactive above 32-34°C (Babu et al 2005:9).

In addition to direct effect of temperature on development of the *Plasmodium*, change in temperature (increasing or decreasing), for example by mere a half degree centigrade can translate into a 30-100% increase or decrease of mosquito abundance hence increasing or decreasing the chance of malaria transmission (Patz & Olson 2006:5635).

The female Anopheles mosquito requires a blood meal to mature her eggs and hence she bites human beings. After getting infective bites from the Anopheles mosquito, a healthy person develops malaria fever after 10-15 days. Differently from the human host, the mosquito vector does not suffer from the presence of the parasite (Control of disease centre<sup>3</sup> 2010 & Babu et al 2004: 6, 10).

### **2.2.1 Lifecycle of mosquitoes**

The lifecycle of mosquitoes (the vector of malaria) covers four stages namely, egg, larva, pupa and adult. The time from the deposition of the eggs to the appearance of fully developed embryo, indicated by the appearance of first free-swimming larva, depends on the climatic factors and varies from species.

The adult may live from a few days to a few months. Shortly after emerging as an adult and generally before the first blood meal the adult Anopheles female mate; they mate once then store the sperm; lay a total of 50-1000 eggs in the form of 3 to 12 batches or as single one directly in water, over their lifetime -- depending on the amount of the blood taken. The entire lifecycle of the mosquito (from egg to adult) spreads over a total of 7-20 days depending on the Anopheles species and environmental conditions. When the condition is favourable with high humidity and a moderate temperature, the female Anopheles can survive for at least one month ---a time that could allow the parasite to develop and for the mosquito to take another blood meal. Thus the longevity of the adult female Anopheles mosquito is a major

factor in malaria transmission. A female Anopheles mosquito should survive an average period of at least 7-12 days after biting a malaria patient before infecting another healthy person with a subsequent bite, for the completion of the extrinsic cycle of development of the parasite.

Vector species differ in their choice of water for breeding, host feeding preferences, resting habits and the flight range of adult vectors hence needing special attention in planning control measures for interrupting the malaria transmission. Most Anopheles vectors are more active at dusk and sunrise, and rest inside houses for varying periods between successive meals. In planning malaria control projects in the tropics, appreciation of these basic differences in the habit of the Anopheles vector is a key factor to reducing malaria transmission through vector control (Centre Disease Control<sup>2</sup> 2010: ; Babu et al 2004:26).

### **2.3 DETERMINANT FACTORS FOR THE OCCURRENCE OF MALARIA**

Climatic conditions play a major role in facilitating the occurrence of malaria. For example, rainfall can create stagnant water bodies as breeding places for mosquitoes or in case of heavy rainfalls flush away mosquito eggs, larvae and pupa. Once the adult mosquitoes have emerged, ambient temperature, humidity and rain play an important part in their survival. The ideal climatic condition for malaria transmission is 25°C temperature and 65.0% humidity. Warmer ambient temperature of 25°C or more, shortens the duration of the *Plasmodium* parasite extrinsic cycle (sporogony phase) while at below minimum ambient temperature of 15°C for *Plasmodium Vivax* and 20°C for *Plasmodium Falciparum*, the sporogony phase cannot be completed hence reducing the number of the mosquitoes further resulting in the reduction of the malaria transmission in the area (Control of disease centre<sup>2</sup> 2010 & Babu et al 2004:14). This partly explains why malaria is more prevalent in warmer areas of the world especially the sub-Saharan African countries such as Sudan.

The biting behaviour of the female Anopheles is very important in the epidemiology of malaria transmission and it governs the selection of control methods. Mosquitoes feed on humans and predominantly outdoors and late at night. During hot and dry

periods of the year, considerable numbers of people sleep outdoors in tropical areas and consequently, they end up being bitten more frequently by exophagic mosquitoes<sup>1</sup>. Some mosquitoes prefer to feed or bite predominantly within forest or wooded areas, consequently men will get bitten more frequently when they visit such places, whereas other species prefer to bite indoors. It is clear that the behaviour of both people and mosquitoes plays very important roles in malaria transmission. In addition, some mosquitoes prefer to rest in forests, some outdoors, others rest indoors or in cattle shades, while others prefer to rest out doors, on vegetations or at their natural sites (Rozendaal 1997:11; Mahande, Mosha, Mahande & Kweka 2007:4-5; Murius, Muturi, Shililu, Mbogo, Mwangangi, Jacob, Irungu, Mukabana, Githure & Novaka 2008:3-4). Thus the anthropophilic<sup>2</sup>, endophagic<sup>3</sup> Anopheles species will have more frequent contacts with humans and hence be more effective malaria vectors.

Resistance of mosquitoes to insecticides also contributes to the occurrence of malaria. Factors related to human biological characteristic and individual behaviours can also influence an individual's malaria risk hence on large scale, increasing the intensity of transmission in the entire population (Rozendaal 1997:11; WHO/UNICEF 2005:11-12).

The resting and feeding behaviour of adult mosquitoes and their susceptibility to insecticides are important factors to be considered in planning malaria control measures. Thus malaria control campaigns such as spraying the interior part of house by DDT will only be effective if mosquito vectors are endophilic (resting indoors).

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<sup>1</sup> mosquitoes that feed outdoors on human

<sup>2</sup> feeding blood from humans

<sup>3</sup> biting indoors

## **2.4 EFFECT OF MALARIA ON COMMUNITIES**

Malaria does not only pose a risk to the health of individuals as a result of repeated infections in endemic areas during early life and adulthood, but also on households, health services, and ultimately on the economic growth of the communities and countries. Malaria therefore causes a vicious circle by affecting the health of the poorest in communities more than the higher socio economic individuals due to their lower resistance, preventing them to stay economically active, which then in turn affects their nutritional status, health and risk of contracting malaria again. Thus poor socio-economic conditions of the communities have direct bearing on the problem of malaria (Tyagi, Roy & Malhotra 2005:30). Furthermore, malaria is considered to be a behavioural as well as medical problem, for this reason, the social, cultural and economic factors of a particular community and country need to be understood and incorporated in to the design and implementation of malaria control programmes. This will promote the sustainability and ownership of the programme by the community (American Association for Advancement of Science 2001:1).

### **2.4.1 Effect on the health of communities**

As mentioned above malaria has the greatest effect on the world's poorest communities. While only 0.2% of the malaria global mortality is found amongst the world's richest population quintile, 57.9% of the global mortality due to malaria is concentrated amongst the world's poorest quintile. Similarly when the burden is measured in terms of disability-adjusted life years (DALYs), 58.0% of the total global burden due to malaria is found among the poorest 20.0% of the global population, while only 0.2% of total global DALYs are experienced by the richest 20.0%. In addition to this Saches and Malancy cited in Worrall et al (2003:12-13) demonstrated that there is a correlation between the presence of malaria in a country and the country's per capita gross domestic product. They further argued that there is an inverse relationship between the two and that malaria contributes to under-development.

In Africa, 30 million women living in malaria-endemic areas become pregnant each year. For these women, malaria is a threat both to themselves and to their babies, causing up to 200 000 newborn deaths each year. Pregnant mothers are more vulnerable to malaria than non-pregnant mothers because pregnancy reduces a woman's immunity to malaria, making her more susceptible to malaria infection and increasing the risk of illness, severe anaemia and death. For the unborn child, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery and low birth weight resulting to high child mortality (WHO 2003:4).

In Sudan, malaria is the leading cause of morbidity and mortality. The annual estimated number is 7.5 million cases and 35,000 deaths. It is responsible for 20-40% of out-patient attendances in health facilities and 30-40% of hospital admissions (Republic of the Sudan Federal Ministry of Health 2004:4).

The burden of malaria on mothers and their unborn babies had been established in a number of studies. The effect of malaria on birth weight was assessed in Central Sudan and it was found that 18.1 % of low birth weight was due to maternal malaria infection (Republic of the Sudan Federal Ministry of Health 2004:5) citing Taha (1995).

#### **2.4.2 Effect on economy of families and countries**

Additionally to high morbidity and mortality, malaria is known to negatively impact on socio-economic development of the African countries, costing African nations an estimated \$10-\$12 billion in lost gross domestic product each year (Bradburg Edward, Quinones & Ross 2005:1). A study conducted in Eritrea covering a period of 2000-2004 indicated that an average cost for treating an episode of uncomplicated malaria is about USA \$2.00 and about USA \$7.00 for severe cases. In addition, about seven to ten working days are lost per episode of malaria (Nyarango, Gebremeskel, Mebrhtu, Mufunda, Abdulmumini, Ogbamariam, Kosia, Gebremekel, Gunawardena, Ghebrat & Okbaldet 2006:2).

According to Worral et al (2002:13), results from a Nigerian community-based study confirmed the previous (above) discussion that malaria has a greater effect on the

poor. The study demonstrated that individuals with a mean income of below US\$1 per day were less likely to perceive malaria as a preventable disease, more likely to have fever and suffer more bouts of malaria per month when compared with individuals earning more than USA \$1 per day. Similar results were obtained in Lao of which 87.5% of the respondents (women) with positive slide parasitaemia were classified as having a low income of less than 5000 kip while only 12.5% were categorised as having a high income of more than 90,000 kip. (Worrall et al 2002:13-14) citing Sychareun et al. (2000).The majority of the women in this sample fell therefore within a lower income category. This study however found no statistical significant correlation between women's risk of developing malaria and their socio-economic status.

In the Sudan, the cost for treatment of uncomplicated malaria ranges from \$5.2-\$17.2. This figure not only includes the cost of treatment but also absence of work as it has been documented in Sudan that those affected by malaria were unable to work for 22% of the time during the course of the year (Republic of the Sudan Federal Ministry of health 2004:7).

In the Southern part of Sudan where Mundri East County is located, due to the fragmented nature of the health services information system, it is difficult to find hard documented evidence of the socio-economical impact malaria has on the community.

## **2.5 MALARIA CONTROL STRATEGIES**

A number of control methods such as chemoprophylaxis, bed nets, spraying, and management of malaria cases have been implemented in different communities.

### **2.5.1 Spraying.**

Before the World War II, advances in controlling mosquitoes breeding (aiming to control malaria) through drainage and environmental control were of key importance in the development of the Panama Canal and continued to be the major approach toward malaria control until after World War II. After the World War II, DDT and

Chloroquine were used to fight mosquitoes and malaria parasites respectively in addition to the previous methods. DDT was by then used as residual spraying on the walls and roofs of households to kill the mosquitoes that had just taken blood meal from sleeping householders while chloroquine was used to rapidly cure infected persons, hence preventing further transmission.

In 1995, the remarkable action of DDT and Chloroquine against mosquitoes and malaria parasites respectively probed the WHO to institute the global malaria eradication campaign. The campaign managed to eradicate malaria from Europe, the former Union of Soviet Socialist Republic (USSR), and several countries in Asia and the Caribbean. However in Africa where malaria was by far of the greatest importance, virtually nothing significant was achieved, except in some Southern African Countries, where some significant reduction in the malaria burden was observed (WHO 2006:1). Due to the logistical constraints and development of resistance by the malaria parasite and mosquito to the available insecticide (DDT) and drug (Chloroquine), the hope to eradicate mosquitoes hence eradicating malaria, failed. Despite the current understanding of: the molecular biology of the malaria parasite and the immunological response to it; in the development of diagnostic technology; methods of vector control; anti-malarial drugs; vaccines; and trials of a variety of malaria control strategies; the number of malaria cases continue to rise very rapidly particularly in under-developed, politically and economically unstable, countries. In addition to this, the case of malaria resurgence in the countries, where malaria was one time eradicated, is also increasing (Thiel 2005:8; WHO Recommendations Working Document 2005:11).

#### **2.5.1.1 *Indoor residual spraying (IRS)***

Due to controversies over the negative effect of DDT on the environment, some countries such as Angola, Uganda, Zambia and Tanzania adopted the IRS as strategy in areas prone to malaria epidemics (RTI 2005). IRS is one of the primary vector control interventions for reducing and interrupting malaria transmission especially in malaria epidemic prone areas. This method involves application of long lasting chemical insecticide such as DDT, pyrethroid, deltamethrin on the roofs and walls of all the houses and surfaces of domestic animal shelters in a specified

location in order to eliminate all adult vector mosquitoes that land and rest on those surfaces (WHO 2006:1).

Indoor residual spaying has been proved effective in reducing malaria infection and incidence and its use is cost-effective except some mosquitoes may develop resistance to some chemicals used in IRS, which may affect its cost-effectiveness. To overcome the challenge of vector mosquitoes developing resistance to IRS that could affect the control measures, WHO recommends the use of combined interventions when implementing malaria control programme (WHO 2005:7; WHO 2006:3).

### **2.5.2 Case management**

Prompt and effective treatment of malaria is believed to be essential in malaria control programmes especially in sub-Saharan Africa where the most fatal parasite (*Plasmodium Falciparum*) is the main causative agent (WHO/UNICEF2003:31). Globally there are several anti-malaria drugs that have or still being used for the treatment of malaria. Some of these act as anti-metabolite or act on nuclear division or act on species and stages of malaria parasite, in addition to this, some of these drugs are toxic to some people which may discourage their use for effective treatment (Babu et al 2004:34). Globally, anti-malaria drug resistance has become more challenging to malaria treatment. The cheapest and most widely available used anti-malaria drugs such chloroquine has lost its clinical effectiveness in most parts of Africa. Similarly *Plasmodium Falciparum* has developed resistance to other anti-malaria drugs such as Amodioquine, Fansidar and so on. This poses challenges to the world to develop new drugs that could replace the drugs that are no longer effective, and come up with new or revise the treatment guidelines (WHO/UNICEF 2003:32). For such guidelines to be effectively implemented, factors such as adherence to treatment regimen, cost, and drug management issues need to be taken in consideration. This further requires political and financial support, training of health workers, and sensitisation of the entire community (WHO/UNICEF 2003:33, WHO/UNICEF 2005:15).

Due to increasing malaria parasite resistance to monotherapy (use of one drug) with conventional anti-malarial drugs such as chloroquine and sulfadoxine-pyrimethamine (Fansidar), WHO recommends all the countries experiencing cases of resistance to use combination therapy such as Artemisinin-based combination therapy for treating cases of *Plasmodium Falciparum* (WHO/UNICEF 2005:14).

In Africa where the malaria transmission rate is high and there is poor accessibility to facility-based health care, to achieve high coverage of prompt and effective malaria treatment, roll back malaria strategy recommends home management of children under five years of age with anti-malarial drugs. To facilitate easy and effective implementation of home management of malaria roll back malaria further advocates education of mothers, training of community-level providers-including shopkeepers, and supplying pre-packed quality-assured drugs (WHO/UNICEF 2005:15).

To address the negative effect of malaria in pregnant women, WHO recommends use of intermittent presumptive treatment during the routine antenatal visit in malaria stable areas. This strategy includes provision of at least two treatment doses of anti-malarial drugs preferably sulfadoxine-pyrimethamine (Fansidar) (WHO/UNICEF 2005:17).

### **2.5.3 Chemoprophylaxis**

Chemoprophylaxis of malaria refers to the regular administration of anti-malarial drug or drugs to prevent clinical symptoms. It has been believed that drugs administered as prophylaxis act in one of the two ways: It destroys the malaria parasite when it enters the blood (schizonticide), and or prevents the parasites from invading the liver cells for further development (Gill & Beeching 2004:68).

Worldwide, the prophylaxis of malaria is recommended only to some groups of people such as travellers (non-immune travellers) from malaria free areas going to, or passing through endemic areas, and pregnant women living in endemic areas. The prophylactic administration of anti-malarial drugs in pregnancy is referred to as intermittent presumptive or preventive treatment and has been found to reduce placental malaria and low birth weight in first-born babies (Gill & Beeching 2004:68;

Donaldson & Donaldson 2003:426). As a measure to reduce the negative malaria consequences on pregnancy, WHO recommended that all pregnant women living in areas with stable *Plasmodium Falciparum* should be provided with at least two doses of intermittent preventive treatment of effective anti-malarial drugs during routine antenatal clinic visits (WHO/UNICEF 2005:17). Since chemoprophylaxis of malaria uses the same drugs used for treatment of malaria, it has suffered from the same challenges such as side-effects and development of resistance by the malaria parasite (Gill & Beeching 2004:69; Donaldson & Donaldson 2003:426).

Although malaria control in sub-Saharan Africa has focused upon the early treatment and appropriate administration of chemoprophylaxis with anti-malarial drugs such as chloroquine, sulfadoxine-pyrimethamine (Fansidar) and so on, the emergence and spread of resistance by *Plasmodium Falciparum* to these drugs has sparked research for alternative methods of malaria control such as insecticide treated nets (ITNs), possibilities of using combined anti-malarial therapy, and environmental control (Olliaro, Taylor & Rigal 2001:923-926; Kager 2002:1044).

Concerns about sustainability and cost, however, continued to pose an argument for the use of ITN's as part of malaria prevention and child survival strategies in sub-Saharan Africa. Some researchers argue that, cost and logistic needs of providing ITNs to communities are the major constraints to the sustainability of using ITNs as one of the malaria control measures in national malaria control programmes in sub-Saharan Africa (Kager 2002:1044; Guyatt, Ochola & Snow 2002:846 & 849). However in response to widespread of resistance of plasmodium falciparum to use of single drug (monotherapy) with conventional antimalarial drugs such as chloroquine and sulfadoxine-pyrimethamine, despite the existing treatment policies for treating *Plasmodium Falciparum*, the majority of African highly endemic countries recommended that pregnant women should have access to ITNs (WHO/UNICEF 2005:17).

#### 2.5.4 Use of bed nets

The use of ITNs has been proven to be very cost-effective and resulted in a 20% reduction in overall child mortality in Africa, equivalent to six deaths averted per year per 1000 children protected at cost of about USA \$5 per child. A total of 80 million children in Africa are currently at risk of contracting malaria and the use of ITNs could prevent 480,000 deaths per year. A meta analysis indicated that under stable malaria transmission in Africa, ITNs provide 46% protection against *Plasmodium Falciparum* while under unstable transmission such as in Asia and Latin America, ITNs provided 60% and 45% protection against *Plasmodium Falciparum* and *Plasmodium Vivax* respectively (WHO 2000:3-4).

Before the development of insecticide treated nets as a new technology in the mid 1980s, people in many countries were already using nets to protect themselves against biting insects and for cultural reasons. It was only in 1990s that the world accepted that an impregnated net (net treated with insecticide) offers better protection against malaria than untreated ones. Not only does the insecticide act as barrier to prevent biting from insects (including mosquitoes) but it also repels, inhibits, or kills insects attracted to bite people. Insecticide treated nets therefore provide protection both to individuals using them and to other community members.

The effect of ITNs is so significant that their use is considered to be one of the most effective methods for malaria prevention or control. However Takken (2002:1027) suggested untreated bed nets as an alternative option to treated bed nets, because of its advantages are threefold: no negative effects of insecticide use; avoidance of toxic chemicals at household levels; and financial savings. According to Takken (2002:1027), the untreated bed nets can provide (though less than insecticide treated nets) significant protection against mosquito bites if properly tucked in, maintained in good condition and is sufficiently large enough so that the sleepers do not make contact with the net.

Despite the evidence indicating the reduction in malaria-related morbidity and mortality due to insecticide treated nets, it is still difficult to encourage consistent and

appropriate use of bed nets. An estimate from Africa as a whole suggest that only 3% of children younger than five years of age sleep under insecticide treated nets, while up to ten times as many have been informed to sleep under any bed net (treated and untreated) (De La Cruz, Crookston, Dearden, Ivins, Gray, Alder & Davis 2006:2).

Insecticide treated bed nets (ITN's) protect by forming a barrier between humans and mosquitoes, which in turn prevents malaria transmission and significantly reducing the prevalence of malaria infection (Erhun, Agbani & Adesanya 2004:28). ITNs have the advantages that they can be set up in a few minutes over any bed or even a mat placed on the floor, indoor or outdoor. To be effective it should be large enough to cover the individual completely, proper knit, woven with an adequate thick thread and made of nylon, polyester or cotton. Various chemicals have been studied and found to be effective. Bed nets' traditional use was to protect people from the nuisance caused by night biting insects (Takken 2002:1023) cites Lindsay and Gibson (1988). In some African countries such as Gambia, bed nets are considered part of cultural tradition (Takken 2002:1023). The use of ITNs had been advocated in malaria endemic countries as an effective method for reducing the risk of malaria transmission. However, there have already been reported cases in laboratory and field studies of insecticide resistance against the pyrethroids (one of the chemical impregnated in the net). The mosquito's resistance may continue to increase hence threatening the success of this adopted malaria control strategy (Takken 2002:1022, 1024).

Though insecticide resistance may render pyrethroid ineffective for malaria control, it may not be the case with insecticide treated nets (treated with pyrethroids), because pyrethroids exerts three different effect on insects, namely: acting as killing agent when the insects comes in contact with the insecticides by landing on the net; it has an excito-repellent (irritating) action making insects only sit on the net for short time; and it contains volatiles that cause deterrence leading to fewer mosquitoes entering the rooms where ITNs are hanged (Takken 2002:1025) citing Landsay et al. (1991).

According to Takken (2002:1023) citing Rosendaal (1989), the use of insecticide treated bed nets resulted to a considerable reduction in morbidity and mortality

attributable to malaria, especially in young children. However, the same study found a few or no effect on malaria prevalence suggesting that ITN users were bitten by infected mosquitoes when they were still outside the nets.

Another study conducted in Tanzania showed significant reduction of between 55 and 75 % in malaria mortality rates of children between the ages 6 months and 2 years in villages using ITNs (Maxwell, Msuya, Sudi, Njunwa, Carmeiro & Curtis 2002:1003). The findings of the research conducted by Takken (2002:1025) revealed a reduction in biting by mosquitoes indoors in homes where ITNs were used. According to Takken (2002:1025), this effect (reduction in biting by mosquitoes) was due to the excito-repellent effect of insecticides (pyrethroids) that caused the mosquitoes, in particular the endophilic, to leave the rooms for the outdoors----hence posing threat of biting outdoors.

Researchers have conducted various field trials of ITNs for malaria control in the sub-Saharan African countries such as Burkina Faso, Gambia, Kenya, Tanzania, and Sudan (Okrah, Traore, Pale, Sommerfeld & Müller 2002:240-241; Minja, Schellenberg, Mukasa, Nathan, Abdulla, Mponda, Tanner, Lengeler & Obrist 2001:614; Hawley, Philips-Howard, Terkuile, Terlouw, Vulule, Ombok, Nahlen, Gimnig, Kariuki, Kolczak & Hightower 2003:123-124; Elsheikh 2006:108). Here also bed nets have been found very effective at reducing the number of bites where mosquitoes feed inside and late at night hence reducing the morbidity and mortality (Müller & John 2003:853).

In Eritrea it was found that the rate of the annual increase in the distribution of ITNs strongly correlates to the declining trend in malaria morbidity (Nyarango et al 2006:5).

Other findings indicated that the use of ITN's caused change in the mosquito's behaviour. For example, studies conducted in Tanzania (Kweka, Nkya, Mahande, Assenga, Moshia, Lyatuu, Massenga, Nyale, Mwakalinga & Lowassa 2008:11), in Papua New Guinea (Takken 2002:1026) citing Charlwood & Graves 1987 and in Kenya (Takken 2002:1026) citing Mbogo et al 1996 demonstrated that the mosquitoes shifted to feed on pigs and dogs, and changed their resting place to

outdoors instead of indoors. A similar study was conducted in Tanzania (Takken 2002:1025) citing Magesa et al (1991) indicated a shift from biting people to cattle. In addition to the change in host preference, mosquitoes changed their feeding time: feeding early in the evening when the hosts (humans) had not yet gone to sleep under the nets -- hence making them accessible (Takken 2002: 1025).

Utilisation of the ITNs at house-hold levels has been affected by multiple factors including the cost and logistics of both supplying impregnated bed nets and of regularly re-impregnating them; availability of the treated nets and insecticides for treating them; change of behaviour of the mosquito vectors; peoples knowledge and perceptions about malaria, when and how to do something about it and where to seek help; sleeping under bed net may be considered uncomfortable and hot; and believe that bed nets resemble a burial shroud. Some community members may only consider bed nets as the means of decreasing nuisance associated with mosquitoes (Kager 2002:1044; De La Cruz et al 2006:9). Reilley, Abeyasinghe and Pakianather (2002:748) in their study on barriers to prompt an effective treatment of malaria, found factors such as cost, feeling uncomfortable, too hot and stuffiness, and perception that bed nets cannot reduce the chance of getting malaria as the common complaints mentioned by the respondents.

A study conducted by Guyatt et al (2002:846 & 849) in Nyanza province of Western Kenya indicated that the cost of providing households with ITNs treated bed nets would be equivalent to paying for three children in primary school per year. According to Guyatt et al, (2002:846, 849), the aspiration of the poor rural communities in the use of ITNs as protective measure does not correlate with their ability to pay for it. Another option is to provide the nets free of charge or to provide long lasting insecticide treated nets, which will reduce the frequency of re-treatment.

A study conducted in Burkina Faso by Okrah et al (2002:246) found that only a minority of households, which owned mosquito nets, use them throughout the year. This same study found that 95.0% of those who own nets use them as a measure against the nuisance of mosquitoes and not as protection against malaria. Contrary to this finding a study conducted in Ghana in 2006 (De La Cruz et al 2006:8) showed that 90.0% of net users felt that sleeping under the net will protect against malaria.

Though the cost of purchasing and re-treatment of the bed nets is said to be one of the constraining factors, a study in Eritrea (Nyarango et al 2006:9) to evaluate the effect of insecticide treated nets and other methods used in control of malaria, indicated that 23.7% of insecticide treated nets were purchased privately by the households. The treatment of nets was rated to be 62.0% by respondents in this study. This finding attributed to the involvement of the community and token monetary incentives given to health agents in return to increased ITNs re-treatment. This finding supported similar findings from sub-Saharan African countries regarding influence of seasonal variations on mosquito net use (Okrah et al 2002:241 & Nuwaha 2002:466). Such findings are important when designing information, education and communication (IEC) programmes for ITN use. The information education communication programme should include awareness of the factors contributing to intensity of malaria transmission over time. (Kweka et al 2008:4)

In Southern Sudan, due to the post conflict situation the distribution of ITNs and the re-treatment thereof is very difficult to implement or sustain in the post conflict situation. Long lasting insecticide treated nets are the commonly used strategy at present, particularly in the rural and remote areas (Ministry of Health Government of Southern Sudan 2006:8).

### **2.5.5 Environmental control**

The understanding that the malaria parasite is transmitted to man by the female Anopheles mosquitoes helped to focus habitat-removal and to reduce the mosquito-human contact. In addition to the use of DDT as measure to environmental control in malaria control programmes, other environmental control methods need to be considered because of the emergence of mosquito-resistance to insecticides and malaria treatment drugs. The WHO recommends integral vector management as the best strategy to control malaria (WHO Recommendations Working Document 2005:30). The other possible methods could include the drainage of stagnant water, larvivorous fish and nematodes, which were experienced in Sudan, Uganda and South Africa as, explained below.

WHO recommends use of fish (for example tilapia) as one of the integrated malaria control measures because it serves both as vector control, provides income and source on nutrition to the community members (WHO<sup>3</sup> 2003:46).

The use of fish (*Gambusia affinis*) was and is still considered a potential method in the fight against malaria mosquitoes in the Northern part of Sudan particularly in Gezira irrigation scheme. The problem with this type of fish is that it cannot penetrate dense masses of aquatic vegetation -- hence requiring certain amount of vegetation control for it to be effective. It is believed that the large size *Gambusia affinis* (larger than 25 millimetres in length) and *Oreochromis niloticus* less than 150 millimetres in length could be of great benefit in controlling mosquito larvae in Gezira irrigation scheme of Sudan (WHO<sup>3</sup> 2003:30).

The larvivorous fish and nematodes could provide alternative environmental friendly control methods of malaria control in the wetlands, which are vast in Southern Sudan particularly in Mundri East County where there exists lots of standing/stagnant water bodies such as pools and wells.

In Uganda, environmental intervention such as the improvement of drainage around kitchen gardens, filling depressions in the roadway tracks and draining borrow and bricks pits reduced malaria prevalence by 11% and 36% in Kampala and Jinja respectively (R T I 2005:2).

In another separate development, Paris Green (*Paris Green is a common name for copper(II) acetoarsenite, an extremely toxic blue green chemical with four main uses: pigment, rodenticide, insecticide, and blue colorant for fireworks*), which is an effective, cheap and relative easy larvicide to apply was used with some success in South Africa in 1930. Between 1932 and 1938 a reduction of malaria cases was recorded from 1,021 to 57 among the railways staff in South Africa due to the successful application of a sustained larvicide's programme (Tren & Bate 2001:10).

## **2.6. DETERMINANTS IN THE SUCCESS OF MALARIA CONTROL**

There are several determinants that may lead to success or failure of malaria control programmes and these include socio-economic status of the community, community member's knowledge about malaria and its preventive measures, locations of the household in relation to the breeding site or rural versus urban, and occupation of the individual community member (Tyagi et al 2005:30; Goesch, Schwarz, Decker, Oyakhirome, Borchert, Kombila, Poetschke, Lell, Issifou, Kremsner & Grobusch 2008:2).

### **2.6.1 Effect of socio-economic status on malaria control methods**

Studies conducted in India (Tyagi et al 2005:30 &) and in Ghana (Goesch et al 2008:2) have indicated that the community's socio-economic status (such as education levels, occupation, location and type of housing and so on) is a big determinant in the success of malaria control. This is because, the socio-economic condition of communities have direct bearing on the control of malaria. Ignorance and poor health status of people contribute in creating source and spread of malaria and inhibits malaria control strategies (Alilio, Bygbjerg & Breman 2004:274-275).

A study conducted in Ghana (Goesch et al. 2008:2) indicated that the percentage of bed net users was significantly higher among families that were living under very simple conditions in a bad economic situation (lowest group of the economic score). In contrast, the same study found that the maintenance condition of the bed nets was directly related to the socio-economic status of the respondents. A higher monthly income and belonging to a higher group in the economic score were significantly associated with a sufficient condition of the bed nets.

### **2.6.2 Effect of education on malaria control measures**

Njama, Dorsey, Guwatudde, Greenhouse, Muis & Kanya (2003:685 & 689) conducted a study to assess the malaria-related knowledge, attitude and practices (KAP) among primary care givers, to describe the associations between primary care

givers' characteristics and positive knowledge, attitude and practices towards malaria and to identify independent predictors of childhood malaria incidence in urban settings in Uganda. This study found that high level caretakers' education was associated with positive malaria-related knowledge, attitudes and practices such as use of formal health care facilities, bed nets and knowledge of proper treatment. This study also found that care givers with a skilled occupation and households with property ownership were more likely to use malaria control measures such as use of bed nets.

Prevention of disease through better knowledge and awareness is the appropriate way to prevent the disease (Tyagi et al 2005:30). Muwaha (2002:462) in his study on people's perception of malaria in Mbarara, Uganda recommended that people should be educated on the connection between mosquitoes and malaria and on seeking biomedical treatment for convulsions. In addition, the successful malaria control programme requires sustained political commitments: integration of malaria control into the health system; coordination with relevant non-health sectors; full participation of communities; and mobilisation of adequate national and international human and financial resources.

### **2.6.3 Effect of occupation on malaria control measures**

According to Worrall et al (2003:16), citing Service (1991), certain occupations such as agricultural labourers exposes the individuals to the malaria vector and such occupation may also facilitate the spread of malaria by the migrating labour from the malaria endemic area to other malaria free locations. While migration subjects labourers at great risk of getting malaria, it is also believed to limit access to treatment as most agricultural sites are located away from the health facilities (Worrall et al 2003:16) citing Ghebreyesus et al (2000).

### **2.6.4 Effect of location and type of housing**

People living in the rural areas are believed to have a high risk of malaria for both epidemiological and socio-economic reasons. However due to better chance of getting education and income, urban dwellers are believed to be less exposed to

malaria (Basu et al 2003:17) citing Rashed et al (2000). A study conducted in Burkina Faso in 2003 by Yé, Hoshen, Louis Seraphin, Traore & Sauerborn (2006:1-5) found that children living in iron-sheet roofed houses have two times less risk of getting *Plasmodium Falciparum* as compared to those living in houses of mud roofs. In North-Central Sri Lanka, Konradsen, Amerasinghe, Van der Koek, Amerasinghe Perra & Piyaratne (2003:177) carried out a study (from mid-May 1996 to end of December 1998) to determine whether housing characteristics such as type and location could be used to further refine the residual insecticide-spraying programmes. According to Konradsen et al (2003:177) houses constructed closer than 750 meters to the main breeding site such as streams have a higher risk of harbouring *Anopheles Culicifacies* and significant risk of harbouring *Anopheles Subpictus* than houses constructed at least 750 meters away from main breeding sites. The same study found that poorly constructed houses have higher risk of harbouring the two above-mentioned species of mosquitoes than those that were complete and built with permanent house-construction materials (Konradsen et al 2003:179). Lack of screened windows exposes individuals to the out door mosquitoes hence increasing chance of contracting malaria (Worral et al 2003:17) The authors believe that houses that expose individuals to increased risk of contracting malaria infection are commonly used by the people of lower socio-economic group than those in the higher socio-economic group. Yé et al (2006:1) recommends that, when designing malaria interventions, house characteristics such as the type (mud, grass, iron-sheet and so on) and the location (near the water body, in the rural area and so on) should be given due considerations with particular attention paid to the children living in houses with mud or grass roofs.

## **2.7 ROLE OF COMMUNITY MEMBERS IN MALARIA CONTROL**

Participation of the community is widely argued to be an important factor in improving health outcomes and the performance of health systems (WHO<sup>3</sup> 2003:46). It is one of the main pillars of primary health care, which was formulated during the Alma Ata declaration in 1978 (Dennill, King & Swanepoel 1999:81-82; Green 1999:25-26). The declaration argues that by involving the families and the communities who, rather than being mere beneficiaries of health care, share the responsibility of caring for their health will promote individual involvement and self-

reliance. This means that families and communities need to get actively involved in creating and preserving a health environment; maintain preventive and promotional health activities such as malaria control; share information regarding their needs and wants with other stakeholders (including government); and implement health care priorities and manage the facilities (Dennill et al 1999:85-88; WHO<sup>3</sup> 2003:46-49; WHO Recommendations Working Document 2005:65). A malaria control programme is one of the programmes that necessitate community involvement. For the participation or involvement of the community to be meaningful, the views of the community should be sought and incorporated into any control measures (Deressa, Olana & Chibsa 2005:5, WHO<sup>3</sup> 2003:46; WHO Recommendations Working Document 2005:56).

Globally there has been improvement in the world's health, but in many countries, the infant mortality rate is still high probably due to malaria. Many health experts now believe that the way to rectify this is by transforming the medical techno-structure. The challenge for "the health for all" concept is to find a health service where people can play a major role. Community involvement is an important part of the WHO's concept of health for all (Dennill et al 1999: 2, 6, 81-82; WHO<sup>2</sup> 2003:6). To support this, the WHO (Dennill et al 1999:13-14) stated that, to reach a state of complete physical, mental and social well being (WHO definition of health), people must be enabled to realise aspirations, satisfy basic needs and change or cope with the environment. The WHO strongly believes that participation or involvement of communities have an important role in any health promotion or preventive measure. Community members should be empowered and allowed to have control over their own initiatives and activities; encouraged to draw on their own human and material resources in the community and enhance self-help support; people should develop knowledge and skills they need to make healthy choices by providing health information and health education; health professionals should share the responsibility of health preventive and promotive activities with individuals, community groups, health service institutions and government departments. WHO further recommends that health professionals must learn to work with the communities, identify the obstacles to any health prevention or promotive policies and ensure that multi-faceted approaches for the prevention of the health problem is

used (Dennill et al 1999:13-14; WHO<sup>3</sup> 2003:46-49; WHO Recommendations Working Document 2005:64-65).

Traditionally, malaria control strategies include primary prevention through vector control or using of personal preventive methods such as bed nets, mosquito repellents, chemoprophylaxis and finally, through effective case management by medication.

Rollback malaria strategic plan for the year 2001-2010 (Republic of the Sudan Federal Ministry of Health 2004:9) suggests different strategies such as early diagnosis and treatment, ITNs, close surveillance, insecticide spraying, development of health services and personal protection measures. The WHO (2008:4) recently recommended combination of tools and methods such as the use of long-lasting insecticide treated nets (LLTNs), artemisinin-based combined therapy (ACT), indoor residual spraying of insecticides and intermittent preventive treatment in pregnancy. The WHO also noted that effective malaria control is not the sole responsibility of the health sector but requires the collaboration of various public and private agencies as well as community participation (WHO Recommendations Working Document 2005:36-37) citing WHO (1993a). These measures could pave a breakthrough in malaria control in developing countries such as the Sudan and Uganda. The Sudan has adopted the WHO policy of using combined tools in controlling malaria.

The challenge in the recent years, however, has been towards increased community involvement because of inadequate funding in health sectors. In addition, development of insecticide resistant mosquitoes and resistance of malaria parasites to most of the available drugs requires that alternative control strategies be sought. All these would require enhanced, active community involvement for effective implementation at the health facility, village and household levels.

In support to the importance of community participation in malaria control, Okrah, et al (2002:245) stated, "It has repeatedly demonstrated that the effectiveness of malaria control in sub-Saharan Africa can be increased substantially through involving communities and particularly through training of the mothers of young children on correct anti-malaria drug use".

Community participation is important both in epidemic control and ongoing malaria control programme activities such as peri-domestic clean-ups, sanitation campaigns, mass-drug administration and treatment of malaria case.

Another separate study conducted in Ethiopia indicated that community involvement through village malaria workers contributed greatly in malaria epidemic control in 2000 (Deressa et al 2005:3, 8-9). Findings in the research conducted by Deressa et al revealed that the major reasons for the success of village malaria workers was the commitment of the community and local administrative bodies in supporting them; the supervision provided in the field by health workers; and the personal satisfaction they derived from being able to help their own community members (Deressa et al 2005:3, 8-9).

The challenge to community involvement or participation in health care provision as advocated in Primary Health Care (PHC) programmes is that, many health professionals are often not in the position to relinquish some power and control of health care provision to the community members, or to engage in activities that will infringe on their status and privileges. However, some health professionals believe that malaria prevention and control should be integrated into PHC, which requires communities to be responsible for their own health care by taking the necessary precautions and implementing the control measures with the support and guidance of a health worker. Unless certain health service providers are willing to promote community self-reliance tangible results will not be achieved. They should not see it as a threat to their power base. Wrong definition of the meaning of community and misuse of power by health professionals is bound to create conflict between the service and the community (Dennill et al 1999:95; Wayland & Crowder 2002:230).

To avoid creation of conflict between the local communities and the services provision, the goals, functions and outcomes of community participation programmes need to be defined and clearly explained to recipient communities. Communities should be oriented to the long and short-term benefits, of community participation programmes; local practices and beliefs needs to be understood; identification of local available capacities, resources and local information system is paramount; and there is a need to develop a monitoring system that will be carried out by the

community members so that they take more responsibility for control measures. In addition, a bottom-up strategy should be supported where community members with special talents, skills, and attributes are identified and encouraged to participate (Wayland 2002:231 & 243; WHO<sup>3</sup> 2003:46; WHO Recommendations Working Document 2005:66).

A successful health education campaign for malaria should be based on knowledge of environmental and psychological factors influencing the reactions of the population.

Organisation of the community and its participation in control of malaria will help to assure that health practices are permanently adopted. The most appropriate strategy for a malaria control campaign is a multi-dimensional approach in which interventions are planned by a multi-disciplinary inter-sectoral team and that also involves the community. Health education aiming at changing attitudes and behaviour, should take advantage of a wide range of the media. The health education should address the connection between the mosquitoes and the malaria and on seeking the biomedical treatment for malaria (Nuwaha 2002:462). In addition, the health education component should also include the importance of compliance to the treatment to avoid emergence of drug resistance, promote referral compliance, encourage adoption and correct use of ITNs, and inform the community members about the transmission and presentation (symptoms and signs including the complications) of malaria to enable them to early recognise malaria and seek early treatment from the reliable sources (from health workers).

## **2.8. IMPROVEMENT OF KNOWLEDGE, ATTITUDE AND INCORRECT PRACTICES.**

### **2.8.1 Community knowledge, attitude and practices (KAP)**

A local terminology for malaria in Africa is hard to find. In Africa, various tribes exist and each tribe has its own way of labelling malaria. There seems to be no standard term for malaria; all tribes use the term “fever” as reference to malaria. The implementation of malaria preventive measures can be related to the knowledge and

beliefs of people. When the risk of malaria is low, it is also difficult to implement control measures (Erhun et al 2004:25) citing Winch et al. (1994). Having the best tools for the prevention of malaria in place, may not necessarily lead to successful malaria control as the people in Africa have their own unique traditional perceptions about the cause of the disease and how it should be managed. Some diseases are perceived as more suitable to be treated with modern medicine while others are considered by many as the exclusive domain of the local traditional practitioners. The decision to seek medical attention for malaria at modern health services are often considered by some African people as the second or last option (Nchinda 1998:400; Sumba, Wong, Kanzaria, Johnson & John 2008:17).

According to Sumba et al (2008:11), understanding treatment-seeking behavior enables communities, national governments and international agencies to improve the efficacy of malaria interventions by implementing programmes tailored to a specific region.

Malaria-related knowledge, attitudes and practices have been studied in many rural and semi-urban multi-ethnic populations in Africa (Erhun et al 2004:25) citing Okrah et al. (2002). For example, to facilitate the design of malaria prevention and control programmes, Okrah et al (2002:240) conducted an exploratory and descriptive study using both qualitative and quantitative data collection approaches. Their study examined the malaria-related knowledge, attitudes and practices of the rural and semi-urban multi-ethnic population of Kossi province in North-Western Burkina Faso, before the establishment of a local ITNs programme. The findings of their study revealed that there was no specific word for malaria; rather the word "Soumaya" was used by members of the community to refer to malaria symptoms as well as any kind of fever. Although most respondents acknowledged the fact that mosquitoes transmit Soumaya (malaria), other aetiological factors such as humidity, exposure to rain and cold weather were also provided as causative factors. Respondents consistently identified "Soumaya" as the most prevalent serious disease in their community and indicated that it was usually treated by both traditional and western methods. The respondents indicated that the common preventive methods that were used include the use of mosquito nets, mosquito coils, insecticide sprays, traditional repellents, and drainage of stagnant water. Chloroquine prophylaxis for pregnant

women was also one of the preventive measures practised in the area. Forty-one percent of the respondents owned mosquito nets but 75.0% of them used their nets only during the rainy season. Only 12.0% used their nets throughout the year. In addition, 90% of those who owned the nets used it as a measure against the mosquito nuisance; 8.0% of the respondent reported using their nets for other reasons such as privacy, protection against cold, flies and falling debris (Okrah et al 2002:242-244).

It has been reported in countries in Sub-saharan Africa that measures such as use of bed nets were mainly aimed at the prevention of the nuisance of mosquito biting rather than against malaria (Okrah et al 2002:240, 242-246). Okrah (et al 2002:240, 242-246) suggest that the finding that bed nets be used to prevent the malaria mosquito from biting rather than as protection from malaria or incomplete use of treatment strategies against malaria is an incorrect measure. The correct facts for the control of malaria should be included in all information, education and communication messages within the framework of a malaria control programme. Furthermore, they suggest that barriers, such as the high cost of the nets that impact negatively on the control programme, should always be considered when implementing interventions.

Müller, Traore, Becher & Kouyate (2003:291 & 294), conducted a study to describe malaria morbidity, treatment-seeking behaviour, and mortality in a cohort of young children in rural settings of Burkino Faso. The common signs and symptoms by which the respondents in this study described malaria were fever (89.0%) of which 55.0% were blamed to *Falciparum Malariae*. The respondents in the same study also noticed the association of febrile episodes with diarrhoea, vomiting and cough. Vomiting was considered by 14.0% of the respondents as the most frequent symptom in febrile malaria; whereas 6.0% was of the opinion that vomiting was the more frequent symptom in non-febrile malaria.

In addition, convulsions and coma were associated with malaria by all of the respondents in the abovementioned study. Of these, 89.0% (n=1640) of 1884 (total respondents recorded in the study) respondents who indicated that they contracted malaria, 85.0% (n=1386) indicated that they received treatment for the fever

episodes. More than half of the respondents, namely 69.0% indicated that they used drugs or traditional remedies that were available in the household. Sixteen percent of the respondents who received treatment, received it from the local health centre; 13.0% obtained it in the village (shops, village health workers and traditional healers), and only 1.0% obtained it from the hospital (Müller et al 2003:290 & 292).

Müller et al. (2003: 292-294) were with opinion that, in addition to the knowledge on the malaria (fever), the treatment seeking behaviour amongst the rural community in Burkina Faso was determined by the availability of the village health workers, accessibility to the health centre and hospital and the severity of the disease.

Deressa, Ali and Enquoselassiel (1999:99, 100-103) in their research in a rural community in Butajira District of Southern Ethiopia on the knowledge, attitude and practice of the community on malaria, as well as the transmission of malaria and anti-malarial drugs, reported that 89.7% of the respondents mentioned fever; 87.5% headaches; and 81.3% mentioned chills and shivering as the symptoms of malaria. Only 66.0% of the respondents in this research knew that malaria is caused by the bite of infective mosquitoes and almost a half (43.7%) of them believed that malaria could be transmitted from person to person -- through the bite of infective mosquitoes--other factors mentioned are contact with malaria infected person, drinking unsafe water, eating contaminated food, and exposure to bad odour (Deressa et al 2005:101).

The fact that malaria transmission mainly occurs at night was mentioned by 73.2% of the respondents. Seventy one percent of the respondents stated that mosquitoes breed in stagnant water and rest in dark places inside houses during the daytime (mentioned by 43.3%). More than eighty five percent (85.7%) of the respondents believed that malaria is a preventable disease and that it could be prevented by chemoprophylaxis (62.4%), indoor residual sprays (stated by 39.6%) and 25% of the respondents indicated eliminating breeding site as the preventive measures. Ninety two percent of the respondents use the modern drugs such as chloroquine and sulfadoxine-pyremethamine for the treatment of malaria. However, some sizable number of the respondents admitted to have being using traditional medicine, leaves, roots and herbs (Deressa et al 2005:99). Deressa et al (2005:100) believe

that community perceptions relating to the causation, diagnosis, treatment and prevention are the main socio-cultural factors, which can influence malaria prevention and control.

Deressa et al (2005:100) were of the opinion that health workers at different levels of the health care delivery system should provide the community members with the relevant information about malaria to help them (community members) involve more in malaria control.

In Nigeria another study was conducted in South-Western Nigeria, to determine the knowledge of the symptoms of malaria, attitude towards preventive measures as well as treatment seeking behaviour among the community members of Ile-Ife community in 2004 (Erhun et al 2004:26). More than 60.0% of the respondents in this study were familiar with at least three signs/symptoms associated with malaria. The findings revealed that 35.5% of the respondents indicated that they made use of synthetic anti-malarial drugs; and 0.9% consulted herbalists and 13.4% used local herbs to treat malaria. Some of the respondents, namely 27.3% indicated that they went to the hospital, 18.2% just prayed and 1.7% administered spiritual/ritual waters as a cure. The remaining 3.0% of the respondents mentioned that they merely ignored the signs (Erhun et al 2004:27).

In addition to these findings, factors such as cost, level of education, religious beliefs, perceived safety, and convenience and respondents' state of health were found to influence the respondents' choice of malaria treatment and preventive methods. The finding indicated that, convenience and severity of the disease affected respondents' choice of treatment in more than 50.0% of the cases. The same study found that the use of untreated bed nets, fumigation and insecticide bed nets were not common among the studied communities though most of the respondents who are above secondary school education level expressed willingness to use such preventive measures. Based on these findings, the researcher suggested the intensification of malaria public enlightenment, provision of affordable and effective malaria preventive methods and provision of free malaria treatment at public hospitals (Erhun et al. 2004:25, 29).

Njama et al (2003:680) conducted another study in Uganda to examine the malaria-related knowledge, attitude and practices (KAP) among primary caregivers, to identify associations between primary caregivers' characteristics and positive KAP towards malaria, and to identify independent predictors of childhood malaria incidence in an urban-setting. The findings indicated that higher levels of education for the caregiver were associated with positive malaria-related knowledge, attitude and practices. Njama et al (2003:689) further found that caregivers with at least a secondary school education were more likely to know that chloroquine was the recommended treatment for malaria and knew the correct dose of chloroquine, and use of bed nets.

Further more in Burkina Faso, knowledge of the cause of malaria and its seriousness on the health of people and its impact on the socio-economic status of households is known to the rural populations. Most of the respondents from rural areas attributed the cause of malaria to the mosquito bites (Okrah et al 2002:243).

In Burkino Faso in 2002, modern and traditional methods were most frequently used by the community members to prevent and treat malaria, but the level of cost of modern treatment and preventive methods determines the type of preventive measures. The commonly practiced modern treatment by the local community was self-medication with paracetamol and chloroquine. Despite the incorrect dosages of chloroquine (used as single dose or daily for weeks) used by the community for treating malaria, the respondents believed that it was an effective treatment (Okrah et al 2002:243 &244).

As in most of the countries in Sub-Saharan Africa but depending on accessibility, cost and on whether the malaria is perceived by the community as a normal or an out of order illness, the respondents reported that malaria patients were usually taken to health workers when traditional herbal remedies failed. Most respondents were found to be quite aware of the symptoms of malaria (Okrah et al 2002:242-245).

A study done in Zambia in 2000 (Sharp, Wyk, Sikasole, Banda & Kleinschmidt 2002:735) indicated that 80.0% of respondents were able to mention that malaria

was caused by mosquitoes while 43.0% believed that drinking bad water causes malaria. Twenty seven percent claimed to use bed nets. Sharp et al (2002:735) further recommended community health education on malaria and its prevention.

Successful control of malaria depends upon a detailed knowledge of the epidemiology of malaria, including knowledge of the socio-economic factors that influence its prevalence. A number of recent studies have used rural and urban dwelling as variables in their analysis of risk factors and transmission rates indicated that malaria was associated with poverty that contributed to low utilisation of malaria preventive measures such as use of insecticide-treated bed nets (Worrall et al 2002:22 citing Hanson & Jones (2000); Goodman, Hanson, Mills, Wiseman & Worrall 2003:4; Worrall et al 2005:1056). According to Worrall et al (2002:17) citing Holtz et al (2002), a study conducted in Malawi revealed that rural residents have the highest risk for malaria parasitaemia in children under five years of age even in the use of bed nets. This was confirmed in a study conducted in Benin, where it was found that rural children had significantly more febrile episodes (1.93 children living in rural areas versus 0.34 children living in urban areas) and illness episodes (2.05 vs 0.40) (Worrall et al 2002:17) citing Rashed et al. (2000).

Reilley et al (2002:748-749) conducted a study in Northern Sri Lanka from November 2000 to January 2001 to determine the barriers to prompt and effective treatment of malaria. They found that despite the fact that malaria was acknowledged by the community as the most common source of fever and is a serious disease; the use of bed nets was not perceived to reduce the likelihood of getting malaria. The perception of malaria as a routine illness promotes the taking of paracetamol to relieve the fever as an easy and adequate response. In addition, the findings revealed that the respondents disliked the taking chloroquine because of doubts about its efficacy and safety. Reilley et al (2002:749) were of the opinion that public awareness campaigns are important to encourage people to promptly seek medical care and to adhere to the treatment regime and preventive measures.

De La Cruz et al (2006:2) also conducted a study in Ghana to determine who slept under the bed nets. In their study, they found that most of the respondents knew that malaria is transmitted by mosquitoes. However 20.6% of mothers whose children

use bed nets and 12.3% of mothers whose children do not use the bed nets thought that over working causes malaria. De La Cruz et al (2006:2) also noticed that ninety percent (of 20.6%) of the mothers whose children slept under the bed nets and seventy seven percent (of the 12.3%) of the mothers whose children do not use bed nets, felt that sleeping under a net would protect them against malaria. According to De La Cruz et al (2006:2), factors such as region of residence; greater food security; and caregivers' beliefs about the symptoms; causation and groups who are most vulnerable to malaria; were found to be most closely associated with bed net use. Based on these findings De La Cruz et al (2006:2) concluded that having knowledge about malaria does not always translate into improved bed net use. They further emphasised that cultural-based ideas about malaria may vary between communities but integrating it into traditional health education message may enhance the effectiveness of public efforts (De La Cruz et al 2006:2).

## **2.9. CONCLUSION**

The fight against malaria has been waged for centuries and centuries. Most of the methods employed involve the modern technologies such as use of modern drugs for treatment and prophylaxis, protective measures by mosquito nets (treated or untreated), spraying by using modern insecticides, and other environmental control measures such as the use of larvicides by fish. In addition, most researches on malaria were aimed at the scientific knowledge about malaria (life cycle, transmission, treatment and preventive methods). To have effective malaria control, there is need to conduct research on alternative control strategies, which promote community participation.

This chapter examined the historical background of malaria, past control measures carried out globally, in Africa and in Sudan particularly. The chapter further reviewed the existing research findings on knowledge, attitudes and practices of the community regarding the malaria control. The burdens impacting on members of the community and households due to malaria have also been examined in this chapter. In the next chapter the methodology used in this study is discussed.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 INTRODUCTION

In the previous chapter important aspects relevant to the research found in the literature have been discussed.

This chapter outlines the procedure used to obtain data which includes the research design, the research population, the sampling techniques, the research instruments used as well the ethical aspects involved in this study.

This study was conducted in Mundri East County of Western Equatoria state in Southern Sudan. The county (the county is an equivalent of a district) is situated in the Eastern part of the Western Equatoria State, bordering Terekeka and Juba counties in the East, Yirol County in the North, Western Mundri County in the West and Lainya County in the South. See map in annexure H1 and H2. This area is geologically predominantly flat with two main rivers through which the water drains to the north of the county. These two rivers, the Äyi and Tapari Rivers are the major source of water for the county during the dry season. The other sources of water in the county are seasonal streams or rivers, boreholes and seasonal hand-dug wells or ponds.

The county has only one distinct productive Payam<sup>1</sup> with fertile soil. The other four Payams are less productive with shallow or less fertile soil, which has low water holding capacity, creating a drainage problem in low slopes and along the rivers (STARBASE 2005:7).

The communities in this area are clustered into villages in specific geographical areas like in fertile land, fishing villages and trading centres, and near streams or

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<sup>1</sup> an administrative area which is equivalent to a sub-district

rivers. This is further divided into administrative areas, like Payam, Bomas<sup>2</sup> and villages.

There is one county hospital, three PHC centres and 15 PHC units in the county.

The county has only two health facilities (including the hospital) that have laboratory facilities. Therefore it is possible that many people who present themselves to the health facilities either go without being diagnosed or they are over diagnosed clinically as malaria cases.

The main rainy season is from April to October with June as a dry spell in between. The average rainfall ranges between 1,100 mm in less productive areas to 1,300 mm in the most productive parts (STARBASE 2005:7).

The county covers an estimated area of about 7625 square kilometres with an estimated population of 64,915. The entire Country is a malaria endemic area. Almost all the community members living in the County are peasant farmers growing subsistence crops such as cassava, sorghum, groundnut, sesame and sweet potatoes. Other economic activities include fishing, rearing cattle and goats (livestock), collecting honey and hunting wild animals. The community members in the County practice a cross-borders trade with other Counties like Juba, Mvolo, and Mundri West and countries such as Uganda.

The following diseases which are largely preventable and treatable contribute to the burden of diseases in Mundri East: Malaria (25%), diarrhoea (15%), acute respiratory infection (14%) (Oxfam GB 2007:15)

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<sup>2</sup> the smallest administrative division headed by Boma Administrator

## **3.2 AIM OF THE RESEARCH**

The aim of the research is to study the knowledge of community members of the rural areas in Mundri East County; what practices they have implemented; and to identify the major problems encountered by the community that hinder the control of malaria.

### **3.2.1 Research questions**

The following research questions have been derived from the problem statement provided in chapter 1 and directed the research process.

- What knowledge did the members of the rural community of Mundri East County, Southern Sudan, have on malaria, its transmission, treatment and control?
- What did the members of the rural community of Mundri East County do to control malaria?
- What inhibiting factors hindered the malaria control activities at household level in this rural community?

## **3.3 SUMMARY OF THE MODUS OPERANDI THAT WAS FOLLOWED**

The researcher ensured that the following steps were followed when collecting data for this research project:

- A preparatory study on the topic to be studied was undertaken in order to provide back-ground information necessary for proceeding with the required research.
- An appropriate methodology was chosen, as well as the sample, and sampling method.
- Key concepts were defined or explained.
- An interview schedule, composed of open-ended and closed-ended questions was developed and thoroughly discussed with the supervisors who have many years of experience in the development of research instruments.

- Other sources such as text books, health facility records containing information on the community knowledge and practices about malaria and control were consulted and used, when developing the research instrument.
- The interview schedule was first discussed with a statistician working with the AIDS support organisation (TASO) in Uganda then submitted for approval to a statistician at University of South Africa (UNISA) as well as to the supervisors who were supervising this dissertation.
- The interview schedule was translated from English into local Moru language.
- The researcher applied to the Ministry of Health for Government of the Southern Sudan for permission to conduct the research project.
- The researcher also obtained permission to conduct the research project from Mundri-East county authority and local chiefs of the research areas as well as from the Research and Ethics committee in the Department of Health Studies, UNISA.
- Three data collectors with a medical background were selected from the selected areas.
- All three data collectors were then trained on quantitative data collection methods for four days and were continuously assisted by the researcher during the data collection period to collect quality and accurate data.
- The eligible respondents were selected using a multi-stage cluster sampling technique.
- Informed consent was obtained from the respondents who fulfilled the criteria of eligibility.
- The research instrument was tested using seven (approximately 10% of the sampled population) respondents from one Payam, which was not part of the final research but were part of the county where the research was conducted.
- The necessary adjustments were made to the research instrument and the final copy was produced and photocopied.
- Permission was again obtained from the respondents prior to conducting the interviews.
- The personal interviews were conducted with the respondents using the corrected interview schedules.

- The data collected were entered into the computer using Statistical Package for Social Scientists (SPSS) for windows version 15 computer program and were analysed under the guidance of the supervisors and a statistician.
- The analysed data were presented in discussions, graphs, tables, and percentages as discussed in chapter 4 and 5.

### **3.4 RESEARCH METHODOLOGY**

A quantitative, explorative, descriptive, study was conducted among the community at household level in Mundri East County using pre-tested interview schedules.

#### **3.4.1 Quantitative research design**

A quantitative study is a structured (or systematic collection of numerical information or data) investigation of event(s) or interest that yields numerical information amenable for statistical analysis (Polit & Beck 2004:15 & 729). The aim of this research was to assess the knowledge and control practices implemented by members of the community, and identify the extent of the major problems encountered by the community in controlling malaria at household level in the rural areas in Mundri East County, Southern Sudan. Therefore in this research, the quantitative study was considered to be the most appropriate paradigm in which to study variables such as knowledge and control practices and problems that impede the control of malaria.

#### **3.4.2 Explorative research design**

Explorative design aims to investigate something new or without existing sufficient information available about the event concerned, guided by a general interest, or to prepare a further study, or to develop methods (Ahuja 2001:134; Burns & Grove 2005:717). In explorative research, the researcher starts with some events of interest until the full nature of the entire event is investigated including the manner in which the particular event or phenomenon is presented together with its associated factors (Polit & Beck 2004:718). When used in qualitative research (which is not the

case with this research), a researcher conducting an explorative study carries out an in-depth investigation and description of a single variable, process or phenomenon to reach at complete description and explanation. Thus explorative researcher usually explores or investigates the phenomenon or variables or population of interest (Ahuja 2001:134-135; Polit & Beck 2004:20). Though this (explorative) type of design is mainly used in qualitative research, it is also used in quantitative research especially when the formulation of the research proposal includes consultation of the secondary data source to get insight in the subject and its various facts (Ahuja 2001:136; Clauvery, Nayak, Girija & Meenakshi 2003:51). The disadvantages of most exploratory studies include lack of representativeness and the fact that their findings are very rudimentary; examine a new interest or when the subject of study itself is relatively (somewhat) new (Babbie et al 2001:81).

However, due to the lack of documented research findings on the knowledge, practice and major problems facing the community in controlling malaria at the household level in the area of study, the researcher consulted secondary data sources from other countries, and utilised structured research method to collect data, which also qualifies part of this research design as explorative in nature.

### **3.4.3 Descriptive research design**

The aim of the descriptive design is to investigate and describe aspects of events, phenomena and subjects of interest in real life situations and provides an accurate account of characteristics of particular individuals, situations or groups (Ahuja 2001:131; Burns & Grove 2009:233). The focus of a descriptive study is to discover new meaning, describe the phenomena as it exist, determines the frequency with which a particular event occurs, and categorises the information. In this design (descriptive), the data is either collected at a single situation pertaining to a single time period (cross-sectional design) or over a period of time using the same research subjects (longitudinal design). A descriptive researcher conducts the study in a natural setting without manipulation or change of the environment (Ahuja 2001:131-132; Burns & Grove 2009:232). Therefore since this study is set to study the knowledge of the community in relation to malaria control in a rural area under a natural setting (without manipulation from the researcher), the research design is

also descriptive in nature. This is because the researcher used a single cross-sectional design for collecting the field data. A single cross-sectional design means collection of field research data in a single situation pertaining to a single time period (Ahuja 2001:131). In addition to this, the focus of this research design was to investigate and describe the community members' knowledge and practices regarding the malaria transmission and control in rural areas of Mundri East County.

### **3.5 THE RESEARCH POPULATION**

According to Mbabazi (2007:27), it is necessary for a researcher to clearly define the research population prior to taking the decision of carrying out the sampling. Polit and Beck (2004:28) and Desai (2008:207) refer to the research population as all those people or subjects, events or phenomena with the characteristics (such as age limit, occupation and so on), which the researcher wants to study within the context of a particular research problem, purpose or questions. However Burns and Grove (2005:41) were of the opinion that a research population should be considered as the target population, the whole or total set of individuals or elements who (that) meet the sampling criteria. Sampling criteria refers to the essential characteristics of the membership in the target population (Burns & Grove 2009:342). Katebire (2007:37) supported this by saying that a research population should only include those people or events who (which) have something in common in relation to the phenomenon the researcher is studying.

In this study, the research population includes the entire population of Mundri East county, which is estimated to be 64,915 (this is just an estimate because the result of the census for the year 2008 is not yet available) and the sampled population were those people with malaria or who had malaria in the last month and were 18-60 years old, which were 68 respondents in total.

### **3.6. SAMPLING**

Sampling is the selection of part of total materials or subjects to represent the entire materials or subjects (Desai 2008:203). Burns and Grove (2009:346) refer to the sampling as the process of selecting subjects who are representative of the

population or events being studied. Burns and Grove (2003:496) define sampling as the process of selecting a group of people, events, behaviours, or other elements that are representative of the population being studied. Sampling is further defined by Gari and Judith (2002:242) and Polit and Beck (2004:731) as a process of selecting a portion or sub-set (sample) of the designated population to represent the entire population, events or phenomenon. Sampling is considered necessary when the population is relatively large and is physically inaccessible (Mbabazi 2007:36).

The main aim of sampling is to enable the researcher get knowledge about the total unit (target or whole population) undergoing study by collecting information on a few units (sampled population) and extend his/her inference about the selected(sample) population or subjects to the whole population (Cauvery et al 2003:96).

In this research, sampling refers to the ways of how the Payams, Bomas, villages and the respondents were selected for the study.

### **3.6.1 The sample**

A sample is the selected portion of the target population or subject for study and is expected to represent the population where they are selected from (Burns & Grove 2009:239). A sample is recommended in situations where the population of study is too big and widely dispersed or unknown (Katebire 2007:37)

In this research, the researcher chose to use a sample of the population rather than studying the entire target population because of the following reasons:

- This large population would take long and a lot of money to study.
- It is a vast area with a scattered population which would need costly logistics such as vehicles or motor bikes for the researcher and data collectors to access all of them.

Due to the above-mentioned reasons, the researcher used multi-stage cluster sampling as an appropriate method for data collection in this research.

According to Cauvery et al (2003:101), cluster sampling is a sampling method in which the population is divided into groups and a sample is drawn from it to represent the population. Selection of the subjects for study from the clusters could be done in ones (single stage) or at various stages (multi-stage sampling).

Multi-stage sampling is one of types of the probability sampling techniques in which the selection of the subject or population is done in various stages but only the last sample of the subjects or population is studied. Cluster sampling is a type of sampling method that can be used in a situation when the researcher finds it difficult to get a complete list of the members of a population to be studied but can only get a complete list of groups (clusters) of the population (Cozby 2002:131; Burns & Grove 2009:239). In addition to this De Vos et al (2002:206) and Cauvery (2003:102) recommended the use of cluster sampling in a situation where a random sample would produce a list of subjects so widely scattered that surveying them would prove to be far too expensive. Cluster sampling is also believed to save time and reduce the cost of the study by concentrating on the field of study in a specific section or geographic location (Cauvery et al 2003:102). Cluster sampling though believed to be the most relevant sampling method for this study, it is not total free of challenges or disadvantages.

The following are the possible disadvantages of this sampling method: reduction in the precision of the results due to multi-stage sample selection (this was addressed by consulting the supervisors and a statistician), and the representativeness of the sample is sometimes affected (this was addressed by calculating the sample of each cluster proportionately). In Mundri East County, where this research was conducted, the population is sparsely scattered over a wide area and there was no sampling frame such as a list of names or household numbers. Coupled with this, the researcher didn't have enough funds at hand for collecting data from the entire population and covering the whole area, as such the researcher resorted to the cluster sampling technique ensuring that an adequate number of clusters were included to maintain the accuracy of the findings. De Vos et al (2002:206) believes that the more clusters are included in the study, the more representative of the population the sample will be, and less errors will occur.

### 3.6.2 Sampling procedure

In social research, the success of the outcome of the findings relies on the sampling procedures used to collect data from a sample of subjects selected from a target population to study the problem that is affecting the entire population (Katebire 2007:40). Therefore there are two main groups of the sampling procedure or technique and they are referred to as probability sampling, which is adopted in quantitative research and non-probability sampling, which is considered most favorable for qualitative research. Probability sampling is further considered to structured scientific approaches, which is based on the principle of randomness that gives equal chance of being selected in a sample to each item or element within a population of the study hence it is considered best in the large structured quantitative study because it reduces or eliminates bias (Katebire 2007:40).

There are five sub-types or groups of probability sampling including: *Simple random sampling* - this gives each individual in the target population equal chance of being selected but it requires a sample frame; *Systematic sampling* this is also called interval sampling and it also requires an existing sampling frame; *stratified sampling*- in this the population (target) is divided into homogeneous group or strata based on main attributes or traits (for example age, sex, occupation and so on) required for study; *cluster sampling* - this involves random selection of areas that has already been determined; and *multi-stage sampling* - this is similar to cluster sampling but it involves more than one stage of selecting the subjects. It was appropriate in this study to use the latter since Mundri East County is administratively divided into Payams, Bomas and Villages. The researcher used the same boundaries as clusters. Cluster sampling was finally used as follows:

In the process of the sampling, the County was clustered into Payams of which a half of the Payams were selected by recording all the Payams on small balls (a golf ball), mixed thoroughly by shaking it, then picked one ball after every shaking until the required number was reached. The selected Payams was further clustered into Bomas (Bomas are the same as parishes). The names of the individual Bomas were written on a small ball (a golf ball) and then put in a container with lid and shaken vigorously. Then a ball was picked, the name written down and put back into the

contained. When the Boma's name was re-picked, it was not written down but only recorded once and this procedure was followed until the required numbers of Bomas were selected. Half of the total Bomas were selected. The same procedure was applied in the selection of villages.

Households were selected systematically after standing in the middle of the village (as identified by the Boma Administrator or Chief of the area), and a pencil was spun to show the direction. Thus to select the households systematically the following procedure was followed: First the sample ratio was calculated. The sample ratio is the number of elements in the population divided by the number of elements in the sample. In this case it was the total number of households in the selected villages (1608) divided by the sample of households (70) - equals 23. Then every 23<sup>rd</sup> household was selected, starting with the first, in the direction pointed out by the pencil. In cases where there were not enough households in that direction to complete the sample, the pencil was spun again at the centre of the village to determine the next direction. This procedure was followed until the correct numbers of households for that village have been sampled. Where there were no cases of malaria in the household at that moment or in the last month, the next immediate household was included in the study.

To avoid interviewing the respondents only from one household, the researcher decided to take only one respondent per household. The respondents were asked to decide the actual place of the interview and whether they would like to be accompanied by one of their relatives (after it was explained how confidentiality of the information would be ensured) or interviewed without someone present.

### **3.6.3 Sample size**

According to Burns and Grove (2009:358) the sample size is the number of subjects, events, behaviours or situations that fulfilled the criteria of selection and is examined in a study to represent the whole aggregation. The size of the sample is always an important factor when the researcher carries out the sampling because the size of the sample has direct effect upon accuracy, time, cost and administration of the study (Cauvery et al 2003:106). Mbabazi (2007:36) believes that factors such as

size of the population, time and cost of the study could dictate the size of the sample to be select for the study.

In this research the sample size is the number of the respondents interviewed (one respondent per household). A total of 68 out of 70 respondents were ultimately interviewed for this study. This sample size (70) had been discussed and agreed upon with the research supervisors. The reason for this sample size is firstly, to be sufficiently representative of the target population and secondly, large enough so that the "central limit theorem"<sup>3</sup> can be applied for the purpose of statistical inference. This sample size was proportionately distributed in sampling the respondents from the selected villages. (See table 3.1).

**Table 3.1: Proportional distribution of sample**

| Village      | Number of Households | Proportion of population | Sample size |
|--------------|----------------------|--------------------------|-------------|
| Wandi        | 170                  | 0.106                    | 7           |
| Kedi'ba      | 483                  | 0.300                    | 21          |
| Lui          | 760                  | 0.473                    | 33          |
| Lozoh        | 70                   | 0.044                    | 3           |
| Iye'ba 1     | 45                   | 0.028                    | 2           |
| Minga        | 80                   | 0.050                    | 3           |
| <b>Total</b> | <b>1608</b>          | <b>1</b>                 | <b>70</b>   |

The determining factors for the selection of the above samplings includes cost and the time used for this study, vastness of the area (Mundri East County), large size of the target population (64,915), sparsely distributed population, lack of complete sample frame (list where the sample could be selected) and need for the results to be accurate. The breakdown of the respondents interviewed as per the Payams and Bomas is attached in annexure E.

Two respondents, after they have been selected, decide not to take part in the research.

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<sup>3</sup> Central limit theorem provides partial explanation of the prevalence of the normal probability distribution.

### **3.6.4 Criteria for inclusion and exclusion in the sample**

To ensure that the respondents have fulfilled the criteria of selection so that the sample could be representative of the target population the following had to be applied.

#### **3.6.4.1 *Inclusion criteria***

The respondents had to have the following features for inclusion in the study:

- any adult person (male or female)
- between the ages 18-60 years (need not necessarily be the head of the household)
- has lived in the area for not less than one month
- has had malaria in the past one month (diagnosed clinically or laboratory confirmed).

#### **3.6.4.2 *Exclusion Criteria***

The following individuals did not qualify for inclusion:

- all children less or younger than 18 years of age
- an adult who has lived in the area for less than one month
- an adult who did not live in the selected area
- those who were absent for two consecutive visits by data collectors.

### **3.7 DATA COLLECTION**

Data collection normally requires creation of a proper setting for the collection of relevant data from a sample or population of interest using appropriate tools (Mbabazi 2007:27). The aim of research is to make any attempt to collect relevant, reliable and valid data. Collection of relevant, reliable and valid data usual depends on the techniques and the tools used during the process (Desai 2008:71-72).

According to Burns and Grove (2009:421) data collection refers to the process that the researcher uses to obtain research subjects and data for the study.

Data collection is also considered as identification of subjects and the precise, systematic gathering of data relevant to the research purpose or the specific objectives, questions or the hypotheses of a study (Burns & Grove 2003:45, 479). It is noted that the data collection methods employed in descriptive design include, interviews and an interview schedule (Brink & Wood 1998:293; Katebire 2007:82-83).

Although Brink and Woods (1998:295) believe that interviews should be validated through the use of observation techniques to see if respondents actually do what they say this could not be done due to the restriction of the research for a dissertation. The interview as data collection method was chosen for this research because most of the population in the area of the study were illiterate. Cauvery et al (2003:87) supported the use of interview schedules in underdeveloped communities with a large number of illiterate people.

### **3.8 RESEARCH INSTRUMENT**

The research instruments refer to tools used by the researcher for data collection (Mbabazi 2007:37). There are various types of research instruments including the questionnaire, interview schedule, and checklist. In this research, the research instrument was a structured interview schedule, which was used for data collection. To ensure that the data collected were accurate, the instrument schedule was carefully studied and translated from English to the local Moru language by experts. See annexure D for translated schedule and letter from translators).

#### **3.8.1 The structured interview**

In a structured interview an interview schedule is used to collect data and has the following advantages: it uses a guide or schedule, which helps the interviewers in conducting the interview; the same questions are asked to all the respondents; it allows the use of closed-ended questions in which responses of the respondents are

restricted to fixed pre-designed alternatives. In summary, the data obtained from an interview that used a pre-tested interview schedule is easier to quantify and analyse by computer than an unstructured interview because data is collected from all respondents in a quantified comparable and uniform manner. However, a structured interview also has its own limitations, such as that the interviewer does not have the freedom to deviate from the format of questions included in the interview schedule making the interview somewhat rigid, hence limiting the ability of the interviewers from probing further (Cauvery 2003:139; Katebire 2007:84).

### **3.8.2 The interview schedule**

The interview schedule consisted of questions with predetermined choices from which the respondents could choose (Cauvery et al 2003:138-139 & Katebire 2007:82-84).

According to Cauvery et al (2003:87), an interview schedule is a detailed, classified, and planned list of items on which information is required for the research. Desai (2008:144) considers the interview schedule as a set of questions, which is asked and completed in by an interviewer in a face-to-to face situation with another person. In this research, the interview schedule containing both structured closed-ended and open-ended questions was used in one-to-one field interviews with the participants at household level to collect information on what they know about malaria and what they did to control it. All the responses of the respondents were recorded on the schedule by the data collectors and cross-checked by the supervisor and researcher to ensure the quality.

The interview schedule was developed through the following steps: Firstly, the researcher made a thorough secondary data (references) consultation of the research topic to help provide some clues in formulation of the research and data collection questions. Secondly, the researcher drafted the first and subsequent copies of the interview schedule and submitted it to the supervisors until it was accepted by them. Thirdly, the interview schedule was presented to the statistician and the research committee. After it was approved, it was pre-tested. Further

adjustments were made and the final interview schedule was then used to collect data.

This interview schedule had to consider the following criteria:

- it had to be governed by the nature of the research purpose and questions
- respondents' characteristics such as ability and willingness to participate had to be taken into account
- the time the respondents had to take part in the study had to be considered.

On average the interview and completion of the schedule took one hour and ten minutes.

The questions were logically arranged, simple, concise and directed towards producing uniformity of understanding among the respondents (proved by the pre-testing process with 46 participants), and started with general questions such as biographical information of the respondents and epidemiological information to awaken the interest of the respondents before getting engaged in the true research issue. To avoid the problem of recall, the questions were only directed to the most recent events (maximum of three months in the past) and the most familiar units of information.

The majority of the questions were closed-ended for the following reasons. Closed-ended questions:

- provide greater uniformity of responses (it exposed all the participants to the same response categories)
- saves money and time because it is easy to analyse
- provide standard answers (answers provided for the respondents to choose from)
- do not need a lot of thinking or explanatory statements by the respondents or data collectors because the meaning of the questions are often clear
- are easy to administer, thus little time is taken to complete answering the questions especially when it is well designed, hence increasing the response rate.

However, the closed-ended questions in this research instrument also had its disadvantages such as:

- it was difficult to construct
- that biasness could have been introduced as the respondents merely had to choose from the given alternatives that may not reflect her/his real opinion or attitude (Cauvery et al 2003:151; Mbabazi 2007:72).

Though most of the questions were closed-ended, some open-ended questions were also included because they

- are flexible
- provide insight in respondents' understanding to the researcher
- help the researcher to clarifies doubts or misunderstandings
- are easy to design and provides freedom to the respondents to answer questions hence giving chance for getting better answers, and
- allow the researcher to find the appropriate answer categories from the respondents

However, open-ended questions like closed-ended questions also have their own weaknesses such as it could be difficult to answer, difficult to analyse hence forcing the researcher to design a coding frame to classify various answers. This may remove the clarity in answers given by the respondents and the researcher could get irrelevant data, because the responses were not standardised as in the closed-ended questions (Cauvery 2003:150; Mbabazi 2007:72).

### ***3.8.2.1 The format of the interview schedule***

The format of the interview schedule refers to the general model which provides guidelines on how the questions were arranged in sequence and in logical order of relationship to each other in terms of the type, of the questions to be asked, clarity of the questions and the length of the questions (Ahuja 2001:195). A structured interview schedule was selected for this research because it fitted the needs of the research (Polit & Hungler 2004:349; Burns & Grove 2009:396; Lobiondo-Wood & Haber 2002:301).

The interview schedule used in this research was composed of the following six sections:

**Section A: Biographical information of the respondents**

- This section included questions on the biographical and socio-demographic information of the respondents, such as name, age, sex, marital status, and number of dependents, level of education, occupation and sources of income.

**Section B: Respondents knowledge on malaria**

- This section included questions that tested the level of the knowledge of the respondents on transmission, treatment and control of malaria. Questions such as “What causes malaria?”, “How is malaria transmitted?”, “How is malaria prevented?” and so forth were asked.

**Section C: Treatment of malaria**

- In this section, questions were included to determine what and to what extent malaria control measures have been implemented by the community members. Here the questions such as: “What do you do when a family members contracts malaria?”, “Where does the patient suffering from malaria go for help?” and so forth were asked.

**Section D: Measures taken to control malaria.**

- Questions have been included to determine the measures taken to control malaria. For example, questions such as “What action have you taken around the house to prevent or inhibit mosquito breeding?” were included.

### **Section E: Factors preventing implementation of malaria preventive measures**

- Here questions were asked to identify the common factors that inhibit implementation of malaria preventive measures in the rural area of Mundri East County.

### **Section F: Health education received on malaria**

This section comprised questions to determine which health education the respondents received on various aspects related to malaria, as well as the source of the health education they received.

#### **3.8.2.2 *The coding of the interview schedule***

In consultation with the statistician a separate code was provided for each variable that include a letter of the alphabet representing for example A = 1, B = 2, C = 3 or responses such yes =1, no =2 and so forth. See the interview schedule in annexure C.

#### **3.8.3 Selection and training of data collectors**

The success of any research depends on the collection of data by the researcher or data collectors. The fundamental issues pertaining to the collection of data are the appropriate selection of the data collection instrument and the selection of the right data collectors to use the selected tools for the accurate collection of the required data or information (Cauvery et al 2003:83-95). Cauvery et al (2003:133) recommends that, prior to data collection, the selected data collectors should undergo training on the purpose of the data collection and what actually is required.

In this research, the researcher used three data collectors to assist in data collection. The three data collectors all have a medical background and had participated at least once before in data collection activities. All three data collectors were selected

from the selected areas. This was to avoid resistance from the respondents since they could not be considered as strangers.

The data collectors were first approached by the researcher on individual basis and briefed about the objectives of the planned research project and they were asked whether they would assist the researcher in data collection using the interview schedule and that it may take about seven days. The initial identification of these data collectors was done through the community leaders on verbal discussion, requesting to give the names of their people who have experiences in surveys. After having secured the individuals' approval, the final approval was obtained from their supervisors of respective work places (for those who are employees) to avoid interference with their work. A four-days training workshop (18-22 January 2010) was organised for the training of the three data collectors on quantitative data collection methods as described below:

- *The orientation session:* During this session the data collectors were informed of the purpose of the research, their role in the process and methodology that will be used.
- *The data collection instrument:* During this session the questions in the interview schedule were read and unclear or difficult terms in the schedule were clarified, and demonstrations were given in the conducting of an interview and completion of the interview schedule. The data collectors were given the opportunity to practise their skills in the workshop using other data collectors as interviewees. Thereafter the data collectors interviewed respondents in the field and at the same time the instrument was pre-tested. See the section under "*Pre-testing of the research instrument*".
- *Discussion and feedback:* During this session the process was reviewed and all the problems encountered during the pre-test and other training sessions were discussed.

To ensure quality training, all the training sessions were closely assisted and supervised by the researcher. The topics covered during the four days training included areas such as the purpose of the data collection and what actually is required, the method of sample selection, how to approach the respondents, in

adequate and accurate completing of the interview schedules and in absorbing the research ethic when collecting the data from the respondents. Additionally during the training, all the data collectors were trained to

- introduce themselves to the respondents and whom they are representing
- tell the respondents how they were selected
- adopt the approach as the situation permits (if the respondents asks to be interviewed next day, it should be respected)
- create a relationship of confidence and understanding or rapport
- conduct the interview in a relaxed manner
- ask only the questions in the interview schedule
- ask the questions exactly as they are put in the interview schedule to avoid misinterpretation by the interviewer
- clarify any question that was not understood by the respondents.

The details of data collectors' training conducted at Lui in Lozoh Payam can be found in annexure F.

#### **3.8.4 Pre-testing of the research instrument**

In research, pre-testing is undertaken to test the tools to be used for data collection (Cosby 2001:172). According to Ahuja (2001:151), pre-testing is the process where the research instrument is tested in the field, making use of respondents with similar characteristics as those in the sample of the main study. The purpose of carrying out pre-testing include estimating the duration of the main research and testing the effectiveness of data collection tools; to check if all the questions framed in the schedule are properly understood by the interviewers and interviewees or if there is a need for some changes, to test the responses of respondents to the method of data collection; to check the approaches used by the data collectors towards the respondents and to estimate the level of response by the respondents.

In this study, the interview schedule was field tested from 20<sup>th</sup> to 21<sup>st</sup> January 2010 at U'du village of Lozoh Payam on 10 respondents who were not part of the main study to ensure that it collected required information.

The pre-testing of the instrument commenced during the training of the data collectors, as it was used as part of the training among the data collectors but later was carried out at the community level. During the pre-test period, the data collectors were provided some refreshments at the beginning of the exercise (at 09H00) and meal at lunch time (14H00).

The result of the pre-test showed that the instruments had the capacity to collect the required information. The only change made were corrections of spelling errors, numbering of the questions on the schedule to avoid over sighting the question, item number D3 of question 31 and item E12 was totally removed from question number 44 as this was not found to be relevant to the research population. Line spacing was also made to provide enough spaces for the interviewers to jot down responses of the respondents in the open-ended questions.

### **3.8.5 Data collection procedures**

Before the research could be conducted the permission of community leaders had to be obtained. See the discussion of the ethical consideration in this chapter. Before commencing the data collection, the nature of the research was properly explained to the selected respondents. The interviews were carried out after the informed consent was obtained from the respondents. See annexure G, as well as the discussion elsewhere in this chapter.

Information to the general community regarding the research was explained in the churches on Sunday of 10 January 2010. Prior to the Sunday (on Friday and Sunday) the researcher consulted the priests in charge of four main churches requesting for at least 15 minutes immediately after the closing of the services but before people moved out from the church so that the information regarding the research and data collection process could be passed to the general public.

The actual data collection commenced on the 1<sup>st</sup> July 2010 and ended on 10<sup>th</sup> July 2010 (10 days) excluding the Sunday. On average, interviewing a respondent lasted one hour and ten minutes. Each respondent was interviewed at their individual homesteads but isolated from the rest of the family members.

### **3.8.5.1      *Editing of the field data***

Data editing refers to the process of checking the data collected from the field during research to detect errors and omissions and to see that they are corrected and the schedule prepared for tabulation. It is the first and most crucial stage in data processing (data processing includes editing, coding and tabulation). When the data was carefully edited, incorrect, incomplete and inconsistencies in the answers were identified and rectified (Cauvery et al 2003:137; Desai 2008:159).

The researcher and the research supervisor (one of the data collectors who had more experience in data collection and who were appointed as supervisor to assist the researcher in carrying out supervision during the data collection process) supervised the data collectors during the data collection process to ensure correct collection of data.

The collected data was edited and corrections were made and filed on a daily basis. During the process of data editing, all completed interview schedules were checked by the researcher in the presence of the data collectors to see whether they were complete and all questions have been answered, whether the schedules were uniform and all the entries were made according to the instructions provided in the schedule, and whether there were some inconsistencies in the answers provided by the respondents. Any missing information was carefully checked with the help of the data collectors and the necessary corrections were made based on the explanation of the data collectors as to why the respondents did not provide answers to some questions.

### **3.8.5.2      *Data management***

All data collected was grouped under similar questions and topics during analysis to support each other and increase validity. The coded data was entered in the SPSS computer software for analysis.

### **3.8.5.3. Data analysis**

Data analysis means studying the tabulated data in order to determine inbuilt facts or meaning. For this to happen, it involves breaking down of the complex factors or data into simpler ones (such as grouping and coding) and putting the parts in new arrangement (for example in tabulations and charts) for easy interpretation (Cauvery et al 2003:196).

In this research the raw data collected with the interview schedule was edited (cleaned) and then entered into computer for analysis using SPSS version 15 of computer software. Frequency tables were initially drawn for the analysed data, the findings discussed and then where appropriately presented in pie and bar graphs with clear titles and scales for interpretation.

To reduce the number of the tables to manageable number, tables in this research presents more than one variable.

## **3.9 RELIABILITY AND VALIDITY OF THE RESEARCH**

According to Mbabazi (2007:116), all research instruments used for quantitative data should always be valid, reliable and free from error, and practical. Mbabazi (2007:116) further explained this statement by saying that the data should not be contaminated (including unnecessary attributes) and not deficient (including lacking important attributes). Mbabazi (2007:116) explains that the collected data should be free of sample selection errors, interviewing errors; construction schedules mistakes and recording of findings errors. In this research, the two main quantitative measures, used for assessing its quality, are discussed below.

### **3.9.1 Reliability**

The reliability is the ability of the research tool to consistently measure what is intended to measure (Mbabazi 2007:118). Polit and Beck (2004:461) define reliability as the instrument's ability to consistently measure the attributes intended to be examined. Reliability is also referred to by Cozby (2004:85) as the consistency or

the stability of measure of behaviour. Some researchers like Babbie and Mouton (2001:123) and Burns and Grove (2009:374) refer to the reliability as the extent to which the instruments yield the same result on repeated measures. Thus in research, reliability is considered to be a function of consistency and its failure is referred to as a random error. This means that reliability is concerned with consistency, accuracy, precision (exactness of the measure used in an observation or description of an attribute), stability (instrument's ability to produce the same result with repeated testing), equivalence (when the tool produces the same results when equivalent or parallel instruments or procedures are used) and homogeneity (means all the items in a tool, measure the same concept or characteristic). Polit and Beck (2004:461), consider reliability of an instrument as the major criterion for assessing quality and adequacy of quantitative data. For the research findings to be reliable the research instruments should accurately reflect or measure true scores of the attributes. Thus reliability in this research was ensured through the following procedures:

- three data collectors were used to collect the data instead of using only one data collector or researcher
- the data collection tool was revised by the supervisor and joint-supervisor prior to collection of raw data
- the data collection tool was translated into local Moru language to make it more understandable to the subjects and the data collectors
- the service of a translator/editor, who is proficient in both English and Moru, was acquired to determine whether the translations were done correctly. See annexure D
- data collectors were selected from the local area and they were thoroughly trained to use the tools for collecting the expected data
- the researcher cross checked the data collected before the data collectors were released and before the data was submitted to the statistician for analysis. In case of the missing data, the data collector was asked to go back to verify or re-collect the data
- the data collection tool was pre-tested, to avoid words that might be vague or that assumed too much about the respondents and to ensure that it yielded

the information required, used positively phrased questions, and contain short and simple questions

### **3.9.2 Validity**

Validity means the ability to produce findings that are in agreement with conceptual or theoretical values or an ability of an instrument to determine how well the instrument or measurement tool measures the concept being studied (Burns & Grove 2009: 376; Polit & Beck 2004: 422). According to Burns and Grove (2003:274), no instrument is absolutely valid, thus validity varies from sample to sample and from one situation to another. According to Mbabazi et al (2007:117), there are several ways for determining validity in a study namely face-validity, content validity, and criterion-validity and construct validity.

*Face validity* refers to the ability of measurement to accurately assess the intended variables (Cozby 2004:90). *Criterion-validity* is also referred to as predictive validity and is used to predict or estimate the probability of a specific outcome in a given situation that can be achieved through research (Babbie & Mouton 2001:123, Burns & Grove 2003:494; Mbabazi 2007:117). *Construct validity* looks at what the test measures and how it is measured, and *content-validity* refers to extent, which method of measurement includes all elements relevant to the concept being measured (Burns & Grove 2003:274; Mbabazi 2007:117).

In this research, the following procedures were followed to ensure the validity

#### **3.9.2.1 Face validity**

Face-validity was addressed in this study by formulating questions that covered knowledge on malaria, practices on malaria control, and measures taken and the barriers in control of malaria. It was tested for face validity by:

- discussing the interview schedule with the supervisors (who have wider experience in the use of reliable instruments) prior to actual data collection. See annexure C.

- pre-testing the questionnaire, to avoid words that were vague or would yield data that was not in-line with the research questions.

### **3.9.2.2      *Content validity***

To ensure content validity in this research, the following measures were taken:

- the interview schedule was formulated after studying the literature and other studies conducted on the topic and then cross-checked by the supervisor and joint-supervisor concentrating on the content
- the interview schedule was pre-tested and necessary corrections made before the main study (LoBiondo-Wood & Haber 2002:314)

### **3.9.2.3      *Construct validity***

Construct validity was ensured through:

- the extensive review of existing documents and internet exploration was done to obtain information on the topic of the current research to add to its construct validity
- the supervisors of the study and the statistician felt that there were logical relationship among variables.

## **3.10    ETHICAL CONSIDERATIONS**

Research ethics are a guiding set of principles intended to assist researchers in conducting ethical studies (Burke et al 2004:94, 96). De Vos et al (2002:63) refer to research ethics as a set of moral principles that are suggested by individual or group. According to Katebire (2007:48), all types of research involving or impacting upon humans, should conform to the highest standards of academic integrity and ethical practices.

In observance of the ethical issues that might have affected the undertaking of this study, the following aspects were considered.

### **3.10.1 Permission to collect data**

Before commencing collecting data for this research, a written permission and approval was secured from the scientific professional Research and Ethics committee of the Department of Health Studies, University of South Africa (see annexure B) and Ministry of Health for Government of South Sudan (see annexure A).

### **3.10.2 The right to self-determination**

Each respondent in the research was given full freedom to decide to take part in the research or not without any penalty or special treatment.

### **3.10.3 Right to privacy**

Privacy refers to the freedom a person or an individual has to determine the time extent, and general circumstances under which private information will be shared with or withheld from others (LoBiondo-Wood & Haber 2002:274). Privacy in this research refers to an isolated open place but not closed place so as to avoid suspect from the other family members especially when the respondent is of the opposite sex.

In this research, prior to interviewing the respondent, the purpose of research was thoroughly explained to the respondent and the other family members. After having understood the purpose and accepted to be interviewed, the respondent was asked to choose the venue where she/he could be interviewed. Though all the interviews were conducted at the respondents' homesteads, the interviewees were interviewed in the privacy of their own homes, without other members of the family present.

### **3.10.4 The right to confidentiality and anonymity**

Anonymity here refers to the principle that the identity of an individual is kept secret while the confidentiality concerns with protection of the information gathered from the subjects (Mouton 2001:244; De Vos 2002:67-68). Mouton (2001: 243) is of the

opinion that any research that involves acquisition of material and information from the subjects, should be based on mutual trust, and should ensure that the rights, interest and sensitivities of those undergoing study are protected.

In this research, the following were observed:

- no name of respondents was entered onto the interview schedule during the interviews
- the respondents were given full freedom to decide to take part in the research without coercion or special treatment without any penalty if they decided not to take part
- the confidentiality of the respondents was guaranteed by not sharing any of the collected information with others. This means that all data collected will remain confidential until permission is obtained from the respondents and the authorities to make the findings known such as an article published in a journal

### **3.10.5 The right to fair treatment**

The right to fair treatment is considered a basic principle of justice and it states that people should be fairly treated and should receive what is due for them or owned by them (Burns & Grove 2009:189).

In this research the researcher ensured fair treatment by the following:

- respondents were informed about the aim of the study and asked to feel free to participate or to refuse to participate without any mistreatment
- the researcher and data collectors respected the respondents' time and attempted not to waste too much time during the interview. They also respected the fact that the interviews were conducted in the private homes of the respondents and attempted not to violate their private space while conducting the interviews

- the researcher and the data collectors ensured that those who refused to participate or declined to answer more questions during the interview were not harassed nor reported to the authorities

### **3.10.6 The right to protection from discomfort and harm**

Burns and Grove (2003:166 & Burns & Grove 2005:189) recommend all the researchers not to harm the research subjects or respondents, but rather do good things (protect their rights) when conducting research. In this research, the researcher took special precautions to ensure that the respondents did not come to any harm. Special precautions were taken not to link any of respondents (by ensuring confidentiality and anonymity) to the findings of this research. In addition, interviews were conducted in the privacy of participant's own homes, where they felt comfortable, and they were not made to travel to another venue to be interviewed

### **3.10.7 Informed consent**

According to Burke and Larry (2004:102, 105), informed consent is a written agreement between the researcher and respondent, which makes the respondent competent and legally free of the desire of others to make a decision as to whether to participate or reject to participate in a given study. Burke and Larry (2004:102) were of the opinion that informed consent should include the descriptions of all the features of the study that might reasonably influence the participant's willingness to participate.

In this research, the following information was discussed with every interviewee and a written consent document was provided to them to sign. The following information was included in the written consent forms:

- the purpose of the research
- the objectives of the research
- the time that would be taken during the interview
- the type of participation expected from the subjects
- how results could be used

- how confidentiality and anonymity would be ensured
- indication that the subject is free to participate or refuse to participate without being rewarded or punished. The researcher and the data collectors were introduced to the respondents, their roles in the research process and their qualifications were discussed

A copy of the consent form has been included in annexure G.

### **3.10.8 Research benefits**

The participants and patients were all informed that they would not receive any monetary or in-kind benefits from the study. They were also informed that the findings of this research would be of benefit to the organisations or government when planning malaria control programmes in the area except that none of them (respondents) will be identified or linked to any of the findings neither by name nor location.

### **3.11 CONCLUSION**

This chapter highlighted the study design, study setting, the target population, the sample and sampling procedures and data management including measures of validity and reliability. Ethical aspects pertaining to the research that had to be considered were discussed.

The findings from this study are discussed in the following chapter.

## **CHAPTER 4**

### **DATA ANALYSIS AND INTERPRETATION**

#### **4.1 INTRODUCTION**

This chapter follows three chapters which contained the overview of the study, literature review and the research methodology that was used to conduct this research. A quantitative, explorative and descriptive research design was applied in this research. This chapter focuses on the interpretation and discussion of the findings of the research. The research questions and objectives formed the framework for the dissertation.

#### **4.2 RESEARCH OBJECTIVES AND RESEARCH QUESTIONS**

The aim of the research was to study the knowledge of community members of the rural Mundri East County; what practices they have implemented; and to identify the major problems encountered by the community that hamper the control of malaria.

##### **4.2.1 Research questions**

The following research questions have been derived from the aim and directed the research process:

- What knowledge do the members of the rural community of the Mundri East County, Southern Sudan, have on malaria, its transmission, treatment and control?

- What do the members of the rural community of the Mundri East County, Southern Sudan, do themselves to control on malaria?
- What inhibiting factors hinder the malaria control activities on household level in the rural community of the Mundri East County, Southern Sudan?

### **4.3 FINDINGS OF THE RESEARCH**

Data were collected from 68 respondents at household levels by means of an interview schedule consisting of eight sections. The data of the closed questions were analysed using the Statistical Package for Social Sciences (SPSS) program, version 15.0. The open-ended questions were analysed by the researcher. The answers of the respondents were categorised according to themes that appeared the most often, analysed, presented in percentages where possible and then discussed. The analysed data has been presented according to the sections of the interview schedule.

#### **4.3.1 Section A: Biographical data**

This section dealt with the respondents' biographical data including age, gender, and marital status, highest level of education, occupation, and main source of income.

##### **4.3.1.1 Item A1: Respondents' age (N=68)**

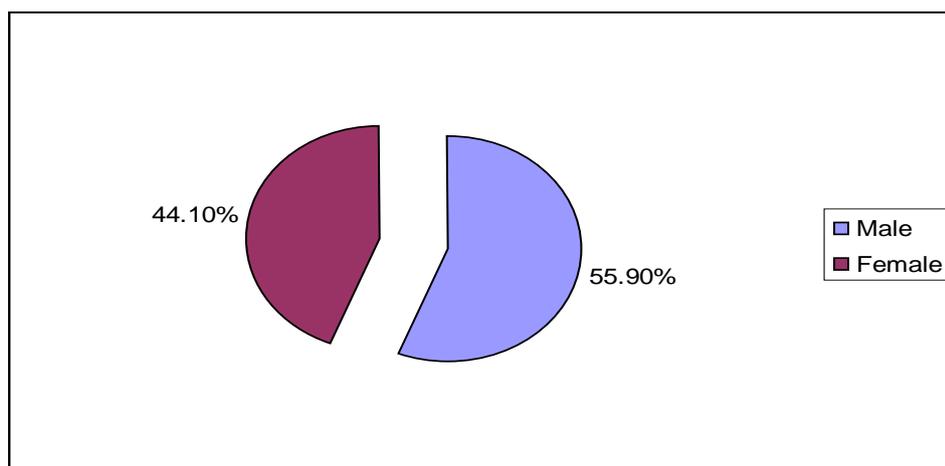
Of the respondents 16.2% (n=11) fell within the age bracket 28-32; and 14.7% (n=10) within the age brackets 18-22 (which were the youngest group) and 43-47 years (14.7%; n=10). The oldest respondents 10.3% (n=7) were older than 53 years. These findings is similar to the findings of the Public Health Assessment conducted in Mundri East County on 20<sup>th</sup> March to 12 April by Oxfam GB in 2010 , which indicated that the majority of the respondents fell within the age range of 25-28 and those who were 60 years or above were the least (Oxfam GB Baseline assessment report 2010:10).

**Table 4.1: Age of respondents (Item A.1) (N=68)**

| Age in years       | Frequency | Percentage |
|--------------------|-----------|------------|
| 18-22              | 10        | 14.7       |
| 23-27              | 8         | 11.8       |
| 28-32              | 11        | 16.2       |
| 33-37              | 8         | 11.8       |
| 38-42              | 8         | 11.8       |
| 43-47              | 10        | 14.7       |
| 48-52              | 6         | 8.8        |
| 53 years and older | 7         | 10.3       |
| <b>Total</b>       | <b>68</b> | <b>100</b> |

#### 4.3.1.2 Item A2: *Respondents' gender* (N=68)

There were more males than females in the sample. Of the respondents, 55.9% (n=38) were males and 44.1% (n=30) were females. The finding of this study is in line with the result of the public Health Assessment report conducted by Oxfam Great Britain (GB) in 2010. The findings of the assessment report indicated that there were more male (53.0 %,) than female (47.0%) (A baseline assessment report Oxfam GB 2010:9). This finding was also supported by the finding of another separate baseline assessment conducted by Oxfam GB in Mundri East County in 2007, in which the finding indicated that there were more males (132) than females (8). South Sudan Centre for census, statistics and evaluation indicated that there are more male (4.29 million) than female (3.97 million) (South Sudan Centre for Census, statistics and evaluation 2010:2). Sudan household and population census of 2008 indicated contrary to these findings with more females (13400) than males (11748) (Oxfam Baseline Assessment 2010:7).



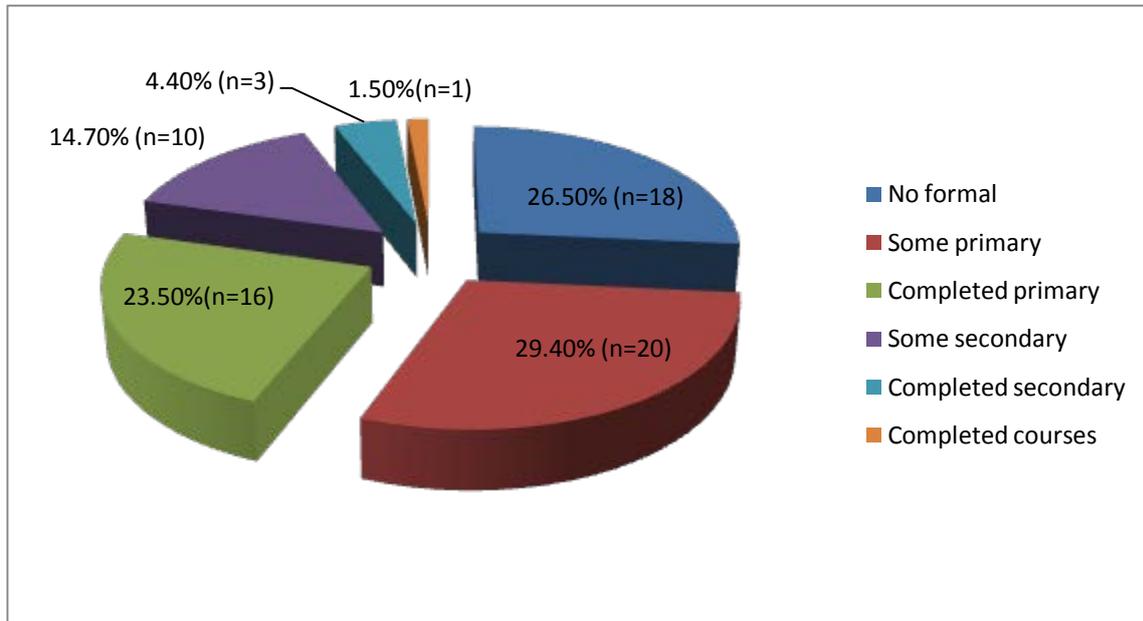
**Figure 4.1: Gender of the respondents (Item A.2) N=68)**

#### **4.3.1.3 Item A.3: *Marital status of the respondents (N=68)***

Thirty-eight (55.9%) of the respondents were married, 14.7% (n=10) were single, 19.1% (n=13) were widowed, 4.4% (n=3) were divorced and 5.9% (n=4) were living together.

#### **4.3.1.4 Item A.4: *Respondents' highest level of education (N=68)***

The respondents had generally limited schooling as 26.5% (n=18) had no formal education, 29.4% (n=20) had some primary school education, and 23.5% (n=16) completed primary school. Only 14.7% (n=10) had some secondary schooling, 4.4% (n=3) completed secondary school training and 1.5% (n=1) completed some other courses. An assessment conducted in Mundri (when it was still only one County) on June 5<sup>th</sup> 2005 indicated that only 387 (1.9%) respondents out of 20377 respondents reached secondary school education level (STARBASE 2005:14). This indicated that the level of education among the community in Mundri in general and Mundri East in particular is low. In general, the literacy level in Southern Sudan is very low with only 27% of the 15 year and above population is literate. Of this 40% are male and only 16% female (South Sudan Centre for census, Statistics and Evaluation 2010:1-2). This may have implications on planning of the health education on malaria control programmes.



**Figure 4.2: Level of education of respondents (Item A.5) (N=68)**

#### **4.3.1.5 Item A.5: Occupations of respondents (N=68)**

The findings revealed a variety of occupations such as: Self employed 7.4% (n=5), small scale peasants 2.9% (n=2), farmers 30.9% (n=21), pastors 7.4% (n=5), own businesses (7.4% (n=5), health workers 4.4% (n=3), teachers 8.8% (n=6) and other 5.9% (n=4). Twenty-five percent (n=17) of the respondents were unemployed. In this finding, the majority of the respondents practise farming as their primary source of earning living. According to South Sudan centre for census, statistics and evaluation, 78% of the rural population in Southern Sudan depend on farming and animal husbandry as their main source of living (South Sudan centre for census, statistic and evaluation 2010:1).

#### **4.3.1.6 Item A.6: Respondents' main source of income (N=68)**

Only 14.7% (n=10) of the respondents obtained a salary every month, the other respondents' main source of income was the selling of: undetermined produce (27.9% (n=19), livestock 5.9% (n=4), grass and firewood 13.2% (n=9), honey 5.9%

(n=4 and fish 5.9% (n=4). Four (5.9%) respondents indicated that their income originated from “other” sources, and 25% (n=17) had no income.

#### **4.3.2 Section B: Knowledge on malaria**

To determine the knowledge of the community members in relation to malaria, several questions were asked regarding the definition of malaria, the name of malaria in the local language, causes of malaria, transmission route of malaria, symptoms and signs of malaria, prevention of malaria and control measures against mosquitoes.

##### **4.3.2.1 Item B1: Respondents’ explanation of what malaria is (N=68)**

The findings of this analysed open-ended question indicated that all the respondents (100.0%; n=100) knew what malaria was as they either said that it was an infectious disease, sickness, or dangerous disease and further described it as a disease caused by mosquitoes with subsequent body pains and headache or “*drio’ba*”. This result is similar to the study conducted in Burkina Faso (Okrah et al 2002:242). Having knowledge about the symptoms/signs of malaria and perceiving malaria as a dangerous disease had been found as one of the determining factors in seeking health care services (Erhun et al 2005:27).

##### **4.3.2.2 Item B2: Respondents’ explanation of what malaria is called in their own language (N=68)**

Ninety seven percent (n=66) of respondents said *malaria* in local language (Moru language) is called “*drio’ba*” literally meaning headache, 1% (n=1) each mentioned karandini/driob’ba, karandini, adravo (meaning sickness) respectively as the local name for the malaria. This was also an open-ended question.

#### 4.3.2.3 Item B3: *Respondent's explanation of what caused malaria (N=68)*

The findings of this open-ended question revealed that the respondents knew what causes malaria as the majority (95.5%; n=65) of the responses were: mosquito bites, bite of the female *Anopheles* mosquito. One respondent (1.5%) said the disease was caused by "moving in hot sun"; another respondent (1.5%) that dirty water caused it and another (1.5%; n=1) that blood transfusion caused malaria. Despite the fact that some of the respondents were health workers as indicated in item 4.3.1.5, none of the respondents indicated that malaria was caused by a parasite called *Plasmodium* (Gill & Beeching 2004:55) though they were able to identify infected female *Anopheles* as one of the transmitters of malaria.

#### 4.3.2.4 Item B4: *Knowledge about the route of transmission (N=68)*

Respondents' knowledge was assessed by asking them to identify if malaria could be transmitted through the following ways:

- ***Through the bite of infected female Anopheles mosquito***

All the respondents (100.0%; n=68) answered correctly.

- ***Through handling of contaminated food (N=68)***

The findings of this research indicated that 25% (n=17) of the respondents associated the transmission of malaria with handling of contaminated food but 75% (n=51) knew that malaria cannot be transmitted by handling contaminated food.

- ***Through drinking contaminated water (N=68)***

Half (50.0%) of the respondents indicated that malaria cannot be transmitted through drinking contaminated water while the other half 34 (50.0%) of the respondents believed that malaria can be transmitted through drinking contaminated water.

- ***Through sexual intercourse (N=68)***

The majority (91.2%) of the respondents indicated that malaria cannot be transmitted through sexual intercourse. However, 7.4 % ( n=5) of the respondents believed that

malaria can be transmitted through sexual intercourse. One (1.5%) respondent didn't know whether malaria can be transmitted through sexual intercourse.

In a study done by Dinho (2009:153) in Bukumbi village, Tanzania, most of the respondents who were the parents of children younger than 5 years who contracted malaria, namely 75.0%, indicated that one could contract malaria by drinking contaminated water, and 60.0%, were of the opinion that malaria could be contracted through sexual intercourse. Ignorance as illustrated by the findings of both of these studies can have serious implications for the control of malaria at grass roots level.

#### 4.3.2.5 Item B5: *Knowledge about symptoms of malaria (N=68)*

The findings of the analysed data of this question indicated that the respondents knew at least 3 symptoms of malaria. The majority of the respondents indicated correctly that fever and headache (85.3%; n=58) are symptoms of malaria. Rigours were only mentioned by 14.7% (n=10). The symptoms have been presented in table 4.2.

**Table 4.2: Respondents' knowledge of symptoms of malaria (N=68)**

| Symptom                     | Percentage respondents | of | Number respondents | of |
|-----------------------------|------------------------|----|--------------------|----|
| Fever                       | 85.3                   |    | 58                 |    |
| Headache                    | 85.3                   |    | 58                 |    |
| Vomiting                    | 75.0                   |    | 51                 |    |
| General body pains          | 30.8                   |    | 21                 |    |
| Diarrhoea                   | 20.5                   |    | 14                 |    |
| Shivering/Coldness (rigors) | 14.7                   |    | 10                 |    |
| Loss of appetite            | 10.2                   |    | 7                  |    |
| Redish eyes                 | 5.8                    |    | 4                  |    |
| Dizziness                   | 5.8                    |    | 4                  |    |
| Constipation                | 5.8                    |    | 4                  |    |

None of the respondents mentioned other symptoms and signs such as convulsions, loss of consciousness, yellow eyes and urine (jaundice), dark urine (haemoglobin urea) and breathing difficulties or respiratory distress (acidotic breathing) (Gill & Beeching 2004:59-61). A study conducted in South-Western Nigeria indicated similar knowledge of respondents on malaria symptoms and signs (Erhun et al 2005:27).

#### **4.3.2.6 Item B6: Knowledge about malaria prevention (N=68)**

In this open-ended question the respondents were asked how malaria could be prevented. The majority of the respondents (85.3%; n=58) only provided one answer to this question. Of the respondents (95.5%; n=65) indicated that people should sleep under a mosquito net, whereas 14.7% (n=10) said that people should receive “*early treatment for malaria*”; 10.2% (n=7) indicated that stagnant water should be drained and 4.4% (n=3) said that people should “*clear around the compound*”. “*Cleanliness*” was another method to prevent malaria mentioned by 4.4% (n=3) of the respondents, as well as “*not to drink dirty water*”, “*don’t eat dirty food*” and “*not [to] enter dirty water*” was mentioned by the same number of respondents.

Of all the respondents, none of them mentioned drug prophylaxis or intermittent presumptive therapy for the selected groups (pregnant mothers and people from malaria free areas) and education of people about the risk of malaria (Gill & Beeching 2004:71).

#### **4.3.2.7 Item B7: Knowledge about the measures of controlling mosquito breeding around the house (N=68)**

All the respondents (100.0%; n=68) provided two methods each. The findings of this open-ended question revealed that the respondents knew how to prevent mosquitoes from breeding around the house. Of the respondents 58.5% (n=38) gave answers related to the clearing of bushes and grass around the house; 23.5%

(n=16) indicated that stagnant water should be drained and “*containers that could hold water should be discarded or emptied*” (33.8%; n=23); 17.6% (n=12) suggested that the house should be sprayed with insecticides; 10.2% (n=7) said that potholes should be closed; 14.7% (n=10) said that rubbish around the house should be disposed of; 4.4% (n=3) suggested that the house “*should be mudded*”; 4.4% (n=3) said that nothing could be done to control mosquito breeding around the house; and 4.4% (n=3) had no idea what could be done. This finding indicated that most of the respondents had knowledge of how to control mosquitoes from breeding around the homestead. Thus actual translation of this knowledge can be found under the subsections in item 4.4.6.1. In Dinho’s study (2009:100) more respondents, namely forty percent (n=16) indicated that environmental sanitation and draining of any accumulated water around the house are measures that could be taken to inhibit mosquito breeding.

#### **4.3.2.8 Item B8: Knowledge about prevention of mosquitoes bites on individuals (N=68)**

The findings of the analysis of this open-ended question revealed that all the respondents knew at least one of the most important methods to personally prevent malaria as 100.0% (n=68) of the respondents indicated that people should use mosquito bed nets. Most of the answers to this question were correct although a few respondents still felt that avoiding handling dirty water or personal hygiene could also prevent people of contracting malaria. Verbatim responses from respondents that best described the answers of the respondents have been listed below.

- “*Sleep under mosquito net*” (100.0%; n=68)
- “*Early medicinal treatment*” (32.3%; n=22). The medicine the respondents referred to most probably refers to prophylactic medication.
- “*Spray with insecticide*” (29.4%; n=20)
- “*Prepare a fire in dusk; using smoke of plant leaves (ngungu and ngutru)*” (22.1%; n=15)

- “*Dress [in] long sleeved shirt and trousers*” (20.5%; n=14)
- “*Cleanliness*” (4.9%; n=4)
- “*Drainage of accumulated water*” (4.9%; n=4)
- “*Avoid drinking dirty (infected) water, or “Children should not enter dirty water”* (2.9%; n=2).

None of the respondents mentioned the use of repellents or coils and gauze screen as protective measure for individuals. In addition to the above-mentioned measures except avoid drinking dirty or infected water”, Jamieson (2006:39) recommends the following as measures to protect individuals from mosquito bites: avoidance of sleeping near mosquito harbouring areas, avoidance of excess alcohol (to avoid falling asleep in heavily mosquito infected areas and wearing clothes that fully covers legs and arms when outdoors between sunset and sunrise.

#### **4.3.3 Section C: Treatment of malaria**

This section dealt with the common malaria treatment practices implemented by the community members of Mundri East County.

##### **4.3.3.1 Item C1: Action taken by the community when a member of household contracted malaria (N=68)**

The result of the study indicated a variety of actions taken by the community members when a member of the household contracted malaria. The commonly mentioned action according to the findings were, going to the nearest health facility (100.0%;n=68), buying drugs from the local shop (88.2%; n=60), did not do anything (1.5%; n=1) and took other steps (45.6%; n=31) such as “*making use of local herbs*”; “*using roots of some plants called lojiwa*” or “*kotomola*”; “*traditional herbs*”. This finding indicated that the health seeking behaviour of the community is more directed towards formal health care facilities than the informal health care system. A study conducted in Uganda indicated only 63% of the respondents seek malaria treatment

in the formal health facilities such as hospitals and clinics (Njama et al 2003:687-688). A study conducted in South-Western Nigeria to assess the community knowledge, attitude and practices (KAP) in 2004 indicated that only 27.3% of the respondents could consult formal health facilities when attacked by malaria (Erhun et al 2004:27). Nuwaha, in his study conducted in Uganda reported that most of his respondents did not seek treatment for malaria from the public health institutions (Nuwaha 2002:467).

#### **4.3.3.2 Item C2: *Frequency of consulting a traditional healer before seeking medical help (N=68)***

Only 2.9% (n=2) of the respondents reported to have consulted a traditional healer before seeking medical help when a member of the household contracted malaria while 97.1% (n=66) did not consult the traditional healer. This finding indicated that the rate of consultation of traditional healers among the community of Mundri East County during the malaria attack is lower as compared to seeking medical help. According to this finding, consultation of traditional healers during malaria attack was low as compared to the findings of other studies. For example a study conducted by Nuwaha in Uganda (2002:462 & 466) indicated that 21% (n=54) of the respondents go for traditional treatment first when suffering from malaria.

#### **4.3.3.3 Item C3: *Frequency of consulting a traditional healer for malaria treatment in the past six months (N=68)***

None of the respondents reported in this open-ended question that they consulted a traditional healer in the past six months, whereas 15.0% (n=6) of the respondents in the study by Dinho (2009:104) revealed that they had consulted these healers two to four times in the past.

#### **4.3.3.4 Item C4: *Type of care provided for malaria by traditional healer (N=68)***

This was an open-ended question aimed at exploring the care provided by the traditional healers. None of the respondents answered this question not even the two respondents (2.9%) who indicated in item 4.3.3.2 that they consulted traditional healers. The reason for this could be that they forgot what treatment they received as they did not consult the traditional healer in the past six months. Dinho (2009:105) found that the respondents that did consult traditional healers reported that they received a powder that was inserted in the nose of the baby for convulsions.

#### **4.3.3.5 Item C5: *The respondents' rating of the care provided by the traditional healer (N=68)***

Both the respondents (n=2) who indicated in 4.3.3.2 that they consulted a traditional healer indicated that they were satisfied with the services they received.

#### **4.3.3.6 Item C6: *Malaria medicine (both modern and traditional) used by the respondents (N=68)***

This was an open-ended question to allow the respondents the freedom to describe the medicine they used for the treatment of malaria. The respondents could all mention at least one type of drug, and all (100.0%; n=68) respondents mentioned quinine. The respondents indicated that they used the following malaria medication:

- Quinine (100.0%; n=68)
- Herbs such as Lojiwa (73.5%; n=50) and Kyakaru (58.8%; n=40)
- Chloroquine (73.5%; n=50)
- Coertem (14.7%; n=10)
- Fansidar (7.4%; n=5).

Though in Southern Sudan, the first line treatment for malaria is the Artesunate-Amodiaquine combination therapy, none of the respondents mentioned this combination. Coertem (Artemether + Lumefantrine) which is the second line drug for malaria treatment or and Quinine which is recommended for treating complicated malaria or malaria in the first trimester were the most commonly mentioned by the respondents (Ministry of Health, Government of Southern Sudan 2006:93 & 95) . The respondents who admitted to have used local herbs such as Lojiwa (73.5%; n=50) for malaria treatment were more than the respondents (45.6%; n=31) in item 4.3.3.1

#### **4.3.4 Section D: Measures taken to control malaria**

In this section a number of questions were asked to determine what measures the respondents themselves took to control malaria in and around their homes.

##### **4.3.4.1 Item D1: *Actions taken to inhibit mosquito breeding around the house (N=68)***

This was an open-ended question to enable the respondents to freely provide an answer before the closed-ended questions on the topic were asked. All the respondents could provide at least two correct answers. The following responses which represented the responses with the same themes were obtained:

- *“Cut the grasses (sic) around the homestead and burn it”* (73.5%; n=50)
- *“Drain accumulated water”* (100.0%; n=68)
- *“Spraying of houses (with mosquito spray - insecticides)”* (100.0%; n=68)
- *“Throw away containers that could collect water”* (58.8%; n=40)
- *“Clean the house and wash the clothes”* (29.4%; n=20)

#### **4.3.4.2 Item D2: Frequency in which certain action were taken to inhibit mosquito breeding around the house**

##### **4.3.4.2.1 Item D2.1: Frequency in which any accumulation of water around the house is drained (N=68)**

Of the respondents 39.7% (n=27) indicated that they drained accumulated water around the house every day, 19.1% (n=13) said they did it at least once a week, 4.4% (n=3) 1-3 times a month, 27.9% (n=19) very seldom and 8.8% (n=6) said they have never been doing it. Not all the respondents who stated in item 4.3.4.1 that drainage of accumulated water around the house could reduce the breeding sites for malaria did practise the drainage measure in their home. Dinho (2009:106) found that 42.5% (n=17) of the respondents in her study drained water accumulating around the house,

##### **4.3.4.2.2 Item D2.2: Frequency in which bushes along water banks are cleared (N=68)**

The findings revealed that 20.6% (n=14) cleared bushes around the house every day, 16.2% (n=11) indicated that they did it 1-3 times a month, 11.8% (n=8) did it seldom and 51.5% (n=35) said they have never done it. In item 4.3.4.1, no respondent identified bush clearance as a measure to inhibit mosquitoes breeding near or around the house. According to Erhun et al (2005:28) this measure (bush clearance) is less effective in controlling mosquitoes breeding.

##### **4.3.4.2.3 Item D2.3: Frequency in which grass is cut short around the house (N=68)**

Of the respondents 5.8% (n=4) indicated that they cut the grass short around the house every day, 23.5% (n=16) said they did it at least once a month, 39.7% (n=27) did it 1-3 times a month, 30.9% (n=21) did it very seldom and the rest of the respondents 1.5% (n=1) reported to have never done this. The respondents who identified cutting the grass short around the houses in item 4.3.4.1 were less than respondents who admitted to be practising this method. These findings are in line

with the findings of Dinho (2009:106) who reported that 12.5% (n=5) of the respondents in her study indicated that they kept the grass short in an attempt to prevent mosquitoes breeding.

**4.3.4.2.4 Item D2.4: Frequency in which all containers likely to hold water are disposed of (N=68)**

Of the respondents 45.6% (n=31) indicated that they always disposed of containers that could hold water every day, 10.3% (n=7) said they did it at least once a month, 2.9% (n=20) did it 1-3 times a month, 35.3% (n=24) very seldom did it and 5.9% (n=4) have never done it. The respondents who indicated that they indeed discarded containers that were likely to hold water which could become breeding places for mosquitoes were more than the results of item 4.3.4.1 which were 58.8% (n=40). However the frequency of disposal varies.

**4.3.4.3 Item D3: Frequency in which other measures are taken to control mosquito numbers in the home (N=68)**

In this section a number of questions were asked to determine how other respondents took certain measures to control mosquito numbers in the home.

**4.3.4.3.1 Item D3.1: Frequency in which the outside of the house was sprayed with insecticide (N=68)**

The findings indicated that prevention of malaria at household level through spraying the outside of the house is very low. Of all the respondents interviewed, only 2.9% (n=2) reported that they sprayed the outside of their house every day, 2.9% (n=2) reported to have sprayed at least once a week, 5.9% (n=4) indicated 1-3 times a month, 20.6% (n=14) said they seldom sprayed and the majority 67% (n=46) of the respondents never sprayed. Though the findings in item 4.3.4.1 indicated that all the respondents knew the importance of spraying the house as preventive measure for

controlling mosquitoes, most of them did not practise this method. The low response in spraying the outside of the house could be explained by the findings in items 4.3.1.4, 4.3.1.5 and 4.3.1.6.

#### 4.3.4.3.2 Item D3.2: Frequency of respondents using mosquito coils to repel mosquitoes (N=68)

Regarding the use of mosquito coils to repel mosquitoes, most 67% (n=46) of the respondents said they never used it, 26.5% (n=18) admitted to have seldom used it, 2.9% (n=2) said they use it 1-3 time a month, 1.5% (n=1) mentioned to have been using it once a week and another one respondent 1.5% (n=1) reported to have been using it every day. This finding is in line with the findings of Dinho (2009:111) who reported that 77.5% (n=31) of her respondents indicated that they had never used mosquito coils, 10.0% (n=4) used it seldom, 5.0% (n=2) used it every day, 5.0% (n=2) used it at least once per week and one respondent (2.5%) used it 1-3 times per month. Most of the respondents (77.5%; n=31) in the study of Dinho (2009:111) also indicated that they never used mosquito coils to repel mosquitoes.

#### 4.3.3.3.3 Item D3.3: Frequency of respondents making use of traditional medicine such as certain leaves to repel mosquitoes (N=68)

Use of the traditional medicine as methods for controlling mosquito numbers was widely practised in the study area, as 38.2% (n=26) used it every day, 11.8 (n=8) used it at least once a week, 32.4% (n=22) of respondents said they seldom used and the remaining 17.6% (n=12) admitted that they never used traditional medicine as a measure to control mosquito numbers at household level. This finding is in contrast with the finding of Dinho (2009:112) as the majority of the respondents in her study (97.5%, n=39) revealed that they had never used traditional medicines.

4.3.3.3.4 Item D3.4: Frequency in which the respondents dressed their children with clothes that covered their arms and legs to prevent mosquito bites (N=68)

Of the respondents, 75.0% (n=51) reported that they dressed their children with clothes that covered their arms and legs every day, one respondent (1.5%) said he/she did it at least once a week, 7.4% (n=5) stated that they seldom did it and 16.2% (n=11) of the respondents admitted to have never done it.

4.3.4.3.5 Item D3.5: Frequency in which the respondents applied mosquito repellents on the skin of their children (N=68)

Regarding the application of repellent on the skin of children as mosquito control measure, only 4.4% (n=3) of respondents indicated that they did it 1-3 times a month, 13.2% (n=9) said they seldom did it and the majority 82.4% (n=56) reported to have never done it. This finding is in line with the finding in the study by Dinho (2009:14) where majority of the respondents (97.5%; n=39) had never applied repellent to the skins of their children.

4.3.4.3.6 Item D3.6: Frequency in which the respondents sprayed the inside of their homes with insecticide to kill mosquitoes (N=68)

Of the respondents 26.5% (n=18) revealed that they did spray the inside of their homes every day, 5.9% (n=4) indicated that they did spray at least once a month, 13.2% (n=9) reported that they seldom sprayed the inside of their homes, while the remaining 54.4% (n=37) of the respondents admitted to have never sprayed the inside of their houses as a measure to kill mosquitoes. The findings of the open-ended question in item 4.3.4.1 revealed that the respondents knew that the spraying of the inside or outside of homes with insecticide could kill mosquitoes but the findings of items 4.3.4.3.1 and 4.3.4.3.6 indicated that most of the respondents have never done it themselves. This finding indicates that respondents are knowledgeable

about the importance of spraying inside of their houses but they might be prevented by the factors mentioned in items 4.3.1.4, 4.3.1.5 and 4.3.1.6.

4.3.4.3.7 Item D3.7: Frequency in which the respondents make smoky fires at dusk to keep mosquitoes away (N=68)

Regarding the use of smoky fire to keep away mosquitoes, most (76.5%; n=52) of the respondents indicated that they made smoky fire at dusk in their homes every day, one respondents said he did make 1-3 times a month, 16.2% (n=11) reported to have seldom done and 5.9% (n=4) said they did not.

**4.3.4.4 Item D4.1 & 5.2: Use of mosquito gauze screen to keep away mosquitoes (N=68)**

All the respondents (100.0%; n=68) confirmed that all the openings of their homes and doors were covered with mosquito gauze (Item D4.1 & D5.1). The analysis of the data collected from pre-test indicated that none of the respondents have mosquito gauze screen in openings of their homes. This needs further research.

4.3.4.5 Item D6: Children have mosquito nets (N=68)

The finding indicated that the majority, 91.2% (n=62) of the respondents owned mosquito net(s) for their children while 8.8% (n=6) did not have any. All the children in the study conducted by Dinho (2009: 119) had the nets as the nets were issued by the Tanzanian government.

4.3.4.5.1 Item D6.1: Reasons for not having mosquito nets (N=6)

In this open-ended question the respondents had to provide reasons for not having mosquito nets for their children. Of the respondents who did not have mosquito nets, 33.3% (n=2) reported that they received it in 2007 so it has got torn, 50.0% % (n=3)

said they were not given any mosquito nets as it was not distributed in their area, and 16.7% (n=1) said the mosquito nets were only distributed to some people in their area. Nobody reported to have bought mosquito nets themselves.

**4.3.4.6 Item D7: *Mosquito nets were given to the respondents free of charge (N=68)***

The respondents who did have mosquito nets for their children 91.2% (n=62) obtained the nets free of charge.

**4.3.4.7 Item D8: *Reason for using mosquito nets (N=68)***

In this section a number of questions were asked to determine the reasons for using mosquito nets at household levels.

**4.3.4.7.1 Item D8.1: *Frequency in which the respondents used mosquito nets to prevent mosquito bites (N=68)***

All the respondents (n=68) indicated that mosquito nets were used to prevent mosquito bites.

**4.3.4.7.2. Item D8.2: *Frequency in which the respondents used mosquito nets to ensure privacy (N=68)***

Of the respondents (22.1%; n=15) indicated that they also used mosquito nets to ensure privacy while 77% (n=53) did not use mosquito nets for privacy.

#### 4.3.4.7.3 Item D8.3: Frequency in which the respondents used mosquito nets to prevent bites from other insects (N=68)

Of the respondents 86.8% (n=56) said they also used mosquito nets to prevent bites from other insects and the remaining 17.6% (n=12) respondents said they didn't use it to prevent bites from other insects.

#### 4.3.4.7.4 Item D8.4 & D8.4.1: Frequency in which the respondents used mosquito nets for "other" reasons (N=68)

Of the respondents 22.1% (n=15) reported to have been using mosquito net(s) as preventive measure to other reasons such as to kill head louse (1.5%; n=1), prevention of cold weather (80%; n=55), protection of children from falling off bed (7.3; n=5) and one respondent who reported to have been using mosquito net as protective measure for other reasons did not mention the specific reason for using it. While the remaining 76.5% (n=52) of the 68 respondents who were interviewed denied using mosquito net(s) for other reasons.

Though all the respondents knew the correct use of mosquito nets as they indicated in item 4.3.4.7.1, it is not known if the nets were used all seasons. A study conducted in Burkina Faso indicated that most of the respondents who used nets did so mainly during the rainy season (Okrah et al 2001:240).

#### 4.3.4.8 Item D9: *Type of mosquito net preferred (N=68)*

When asked as to what type of mosquito net would the respondent prefer, 20.6% (n=14) chose treated demuria (thick fibred cloth made from cotton) net, 8.8% (n=6) mentioned untreated demuria net, 57.4% (n=39) preferred treated mesh nets, another 8.8% (n=6) chose untreated mesh nets and a significant number 4.4% (n=3) preferred untreated thob (a long piece of cloth used as dress for women in Sudan and Arabic countries).

#### 4.3.4.8.1 Item D9.1: Reason for the choice of the type of mosquito net (N=68)

This was an open-ended question and some respondents gave two reasons for using the type of mosquito net.

The majority of respondents 86.7% (n=59) mentioned that the mosquito nets “kills mosquitoes” and “prevents mosquito bites” (80.0%; n=55), and 91.2% (n=62) indicated that they also use this type of mosquito nets because it is thick and it keeps them warm. Of the respondents 22.1% (n=15) mentioned that it is the only type available in the shops.

#### 4.3.4.9 Item D10: *Condition of mosquito nets (N=62)*

Of those who owned mosquito net(s) at their homes as in item 4.3.4.5, 66.2% (n=41) admitted that the net were in good condition. The total number of the respondents reduced 62 because the analysis was based only on those who admitted to own the mosquito nets.

##### 4.3.4.9.1 Item D10.1: Reasons for poor condition of mosquito nets (N=41)

Reasons provided by 32.3% (n=20) of the respondents, who answered in items 4.3.4.5 Item D6 that their mosquito nets were in a poor condition, were mostly that the mosquito nets were very old. The following are two verbatim responses that represent the answers of the respondents.

*“We have it for a long time”; “It was distributed since (sic) a long time ago”*

#### 4.3.4.10 Item D11: *Whether respondents would be willing to buy mosquito nets that were on sale (N=68)*

When the respondents were asked whether they would be willing to buy mosquito nets when available on sale, 57.3% (n=39) expressed readiness to buy while 42.6% (n=29) said they would not.

4.3.4.10.1 Item D11.1: Reason why respondents would not buy the mosquito nets when they are on sale (N=29).

The reasons given for not buying mosquito nets (42.6%; n=29) when they are on sale at the shops is that they “*Would never be able to afford a mosquito net, not even when it is on sale.*” This verbatim response of the respondents represents the answers provided by them.

#### **4.3.4.11 Item D12: *Treatment of mosquito nets (N=62)***

Of the respondents who owned mosquito nets as indicated in item 4.3.4.5, 61.3% (n=38) indicated that the nets are treated, 11.3% (n=7) said the nets are not treated, 25.8 % (n=16) did not know whether the nets were treated and one respondent (1.6%) did not respond.

4.3.4.11.1 Item D12.1: Mosquito nets were not treated (N=7)

Those who said their mosquito nets were not treated, gave “I don’t know” 33.8% (n=23) as the only reason except one of them 1.5% (n=1) said the net was bought from the market so he/she didn’t know whether it was treated or not.

4.3.4.11.2 Item D12.2: Type of insecticide the mosquito nets were treated with insecticide (N=7)

None of the respondents could name the insecticide used to treat the mosquito nets.

#### **4.3.4.12 Item D13: *Frequency of mosquito net treatment (N=68)***

Regarding the frequencies of treatment of the mosquito nets at household levels, 97.1% (n=66) of the respondents who owned nets indicated that they had not been treating their nets at household level and two respondents (2.9%) did not answer the question.

#### 4.3.5 Section E: Factors inhibiting the implementation of preventive malaria measures

In this section a number of questions were asked to explore the inhibiting factors to the implementation of malaria control measures in the area of study.

##### 4.3.5.1 Agreement to listed statements

Respondents had to indicate to what extent they agree with the following listed statement:

##### 4.3.5.1.1 Item E1.1: Lack of money for buying the equipment used for malaria control (N=68)

Lack of money for buying the equipment for malaria control was identified by 79.4% (n=53) respondents as one of the inhibiting factors to malaria preventive measures.

Only 8.8% (n=6) respondents did not believe that lack of money hindered the implementation of malaria preventive measures and 11.8% (n=8) remained neutral. Of the respondents who believed that lack of money for buying the equipment for malaria control was among the inhibiting factors, 44.1% (n=30) agreed with the statement and 35.3% (n=24) strongly agreed with the statement.

**Table 4.3: Lack of money to buy equipment (Item E1.1) (N=68)**

| I have money to buy equipment for malaria control | Frequency | Percentage |
|---------------------------------------------------|-----------|------------|
| Strongly agreed                                   | 6         | 8.8        |
| Agreed                                            |           |            |
| Neutral                                           | 8         | 11.8       |
| Disagreed                                         | 30        | 44.1       |
| Strongly disagreed                                | 24        | 35.3       |
| Total                                             | 68        | 100        |

#### 4.3.5.1.2 Item E1.2: Have time to consistently spray the home (N=68)

Of the respondents 44.1% (n=30) reported that they did not have time to consistently spray their homes. Of these 30 respondents, 27.9% (n=19) disagreed with the idea and 16.2% (n=11) strongly disagreed with the ideas of having time. However, 22.1% (n=15) of the respondents agreed with the statement that they had enough time to spray their homes and another 16.2% strongly agreed that they had enough time, and 17.6% (n=12) of respondents remained neutral.

**Table 4.4 No time to consistently spray the home (N=68)**

| Have time to consistently spray home | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| Strongly agreed                      | 15        | 22.1       |
| Agreed                               | 11        | 16.2       |
| Neutral                              | 12        | 17.6       |
| Disagreed                            | 19        | 27.9       |
| Strongly disagreed                   | 11        | 16.2       |
| Total                                | 68        | 100        |

#### 4.3.5.1.3 Item E1.3: No energy to spray the home so often (N=68)

In general, having energy to regularly spray the homes as malaria preventive measures was not identified as one of inhibiting factor in the study area by majority (48.5) of the respondents. Of these 30.9% (n=21) strongly agreed and another 17.6% (n=12) agreed with the statement that they have energy to spray their homes so often as a malaria preventive measure. Opposed to this, 41.1% (n=28) of the respondents identified lack of energy to consistently spray the homes as a hindering factor to the implementation of malaria preventive measures. Of the respondents 27.9% (n=19) disagreed and another 13.2% (n=9) strongly disagreed with statement of having energy to spray their homes as malaria preventive measure. A significant number (17.6%, n=12) of the respondents remained neutral.

**Table 4.5: Have energy to spray home so often (N=68).**

| <b>I have energy to spray home so often</b> | <b>Frequency</b> | <b>Percentage</b> |
|---------------------------------------------|------------------|-------------------|
| Strongly agreed                             | 21               | 30.9              |
| Agreed                                      | 12               | 17.6              |
| Neutral                                     | 7                | 10.3              |
| Disagreed                                   | 19               | 27.9              |
| Strongly disagreed                          | 9                | 13.2              |
| Total                                       | 68               | 100               |

#### 4.3.5.1.4 Item E1.4: Availability of equipment to spray the home (N=68)

When the respondents were asked to say whether they have the equipment, only 1.5% (n=1) reported that he/she had equipment for spraying his/her home, 94.1% (n=64) said they did not have, two participants (2.9%) remained neutral and one respondent (1.5%; n=1) gave no response. This finding does not correspond with the finding in 4.3.5.1.3 because even if the respondents had enough energy to spray their household, lack of equipment would impair their effort.

**Table 4.6: Have the equipment to spray my home (N=68).**

| <b>E.1.4: I have the equipment to spray my home</b> | <b>Frequency</b> | <b>Percentage</b> |
|-----------------------------------------------------|------------------|-------------------|
| Agreed                                              | 1                | 1.5               |
| Neutral                                             | 2                | 2.9               |
| Disagreed                                           | 41               | 60.3              |
| Strongly disagreed                                  | 23               | 33.8              |
| No response                                         | 1                | 1.5               |
| Total                                               | 68               | 100               |

#### 4.3.5.1.5 Item E1.5: Ability to replace broken gauze screens for all the openings at home (N=68)

Although the respondents indicated in item 4.1 and 4.2 that all the openings in their homes were covered with gauze screens and that it was currently in a good condition 86.8% (n=59) of respondents reported that they would be unable to replace

any broken gauze screens if it should break and 3.0% (n=2) agreed that they would be able and 10.3% (n=7) stayed neutral.

**Table 4.7: Ability to replace broken gauze screens for all the openings at home (N=68)**

| I can replace broken gauze screens for all the openings of my home | Frequency | Percentage |
|--------------------------------------------------------------------|-----------|------------|
| Strongly agreed                                                    | 1         | 1.5        |
| Agreed                                                             | 1         | 1.5        |
| Neutral                                                            | 7         | 10.3       |
| Disagreed                                                          | 28        | 41.2       |
| Strongly disagreed                                                 | 31        | 45.6       |
| Total                                                              | 68        | 100        |

4.3.5.1.6 Item E1.6: Treat/drain accumulation of water around the home (N=68)

Of the respondents, 44.1 (n=30) strongly agreed and 19.1% (n=13) agreed that they can treat/drain accumulation of water around their homes while 14.7% (n=10) disagreed and another 13.2% (n=9) strongly disagreed that they can treat/drain the accumulation of water around their home. 8.8% (n=6) respondents did not give their response. Though treatment/drainage of stagnant water around the house was identified as one of the effective malaria preventive measures in item 4.3.4.1, not all of them agreed to practice this method.

**Table 4.8: Treat/drain accumulation of water around the home (N=68).**

| I can treat/drain accumulation of water around the home | Frequency | Percentage |
|---------------------------------------------------------|-----------|------------|
| Strongly agreed                                         | 30        | 44.1       |
| Agreed                                                  | 13        | 19.1       |
| Neutral                                                 | 6         | 8.8        |
| Disagreed                                               | 10        | 14.7       |
| Strongly disagreed                                      | 9         | 13.2       |
| Total                                                   | 68        | 100        |

4.3.5.1.7 Item E1.7: Availability of equipment for spraying mosquitoes in my village (N=68)

Most 92.6% (n=63) of the respondents agreed that lack of equipment to spray mosquitoes in their village hindered the malaria preventive measure, 4.4% of the respondents strongly agreed that they have equipment in their village to spray mosquitoes. However another significant number (2.9%, n=2) of the respondents did not either agree or disagreed that their village had equipment to spray mosquitoes. This finding corresponds to the finding in item 4.3.5.1.4 because lack of the equipment in the entire village for spraying mosquitoes resulted to the lack of the same equipment in the individual homes.

**Table 4.9: The availability of equipment to spray homes in my village (Item E 1.7)**

| Equipment to spray homes are available in my village | Frequency | Percentage |
|------------------------------------------------------|-----------|------------|
| Strongly agreed                                      | 3         | 4.4        |
| Neutral                                              | 2         | 2.9        |
| Disagreed                                            | 34        | 50         |
| Strongly disagreed                                   | 29        | 42.6       |
| Total                                                | 68        | 100        |

4.3.5.1.8 Item E1.8: Mosquito repellent is always available in my village (N=68)

Among the respondents, 95% (52.9%; n=36 strongly agreed and 42.6%; n=29 agreed) revealed that they did not have mosquito repellents at home for repelling mosquitoes and the remaining 4.4% (n=3) respondents remained neutral.

**Table 4.10: Mosquito repellent is always available in my village (N=68)**

| Mosquito repellent is always available in my village | Frequency | Percentage |
|------------------------------------------------------|-----------|------------|
| Neutral                                              | 3         | 4.4        |
| Disagreed                                            | 36        | 52.9       |
| Strongly disagreed                                   | 29        | 42.6       |
| Total                                                | 68        | 100        |

#### 4.3.5.1.9 Item E1.9: Controlling malaria is waste of time since people can still get it (N=68)

In general, 69.1% (n=47) of all the respondents (67.6%, strongly agreed and 1.5% agreed) reported that it is waste of time combating malaria since people could contract it any way. However twenty-eight percent (n=19) of the respondents (5.9% disagreed and 22.1% strongly disagreed) disagreed with the statement that combating malaria is a waste of time since the people could contract it in any way. This finding is in contrast with the finding of Dinho (2009:128) where the majority (90.0%; n=36) of the respondents strongly disagreed that it is a waste of time to attempt to combat malaria.

**Table 4.11: It's a waste of time to combat malaria, since people get it (N=68)**

| It's a waste of time to combat malaria, since people get it anyway | Frequency | Percentage |
|--------------------------------------------------------------------|-----------|------------|
| Strongly agreed                                                    | 46        | 67.6       |
| Agreed                                                             | 1         | 1.5        |
| Neutral                                                            | 2         | 2.9        |
| Disagreed                                                          | 4         | 5.9        |
| Strongly disagreed                                                 | 15        | 22.1       |
| Total                                                              | 68        | 100        |

#### 4.3.6 Section F: Health education received on malaria

In this section a number of questions were asked to determine whether the respondents received any health education from health workers or from other sources, what they have learnt and so forth. When targeting malaria control interventions in rural areas, it's important to educate the community members on the factors contributing to malaria transmission over time (Kweka, Nkya, Mahande, Assenga, Mosha, Lyatuu, Massenga, Nyale, Mwakalinga &Lowassa 2008:4)

#### **4.3.6.1 Item F1: *Health education received in the past three months from health services (N=68)***

The result indicated that 19.1% (n=13) of respondents received health education on malaria twice in the past three months, 10.2% (n=7) received it only once and 70.6% (n=48) never received any health education from health services in the past three months in their village. In this finding, the majority of the respondents did not receive health education in the past three months when the study was conducted. Creating awareness among the community members through health education regarding malaria control measures is believed to be effective way of implementing malaria prevention or control intervention. Erhum et al (2005:29) and Tyagi et al (2005:31) recommended that education of the community members on the malaria control measures can result in high achievement of malaria control.

#### **4.3.6.2 Item F2.1-2.5: *Source of health education (N=68)***

All the respondents, namely 100 (n=68) indicated that they have heard about malaria. According to them health personnel (88.2%; n=60) were the most common source, a member of community (83.8%; n=57) were the second common source and radio broadcasts (29.4%; n=20) followed by printed media (8.8%, n=6). Although the respondents did not specify what the source was 4.4% (n=3) said they received health education on malaria from other sources. The findings in item 4.3.6.1 indicated that majority (70.6%, n=48) of the respondents didn't receive health education from health services facilities in the past three months. However they did admit that they had received health education on malaria control from the health personnel in the previous three months. The majority of respondents (88.2%; n=60) mentioned to have received health education on malaria from the health personnel. This may mean that some of them though have not received it from health service facilities; they might have received it from the health personnel during the home visit activities conducted by the health workers. None of the respondents indicated that they received health education from "other" sources than those provided in the interview schedule.

**4.3.6.3 Item F3: *Last time respondents received health education about malaria (N=68)***

Of the respondents who reported to have received information on malaria, only 4.4% (n=3) received it during the past (one) month, 44.1% (n=30) received it 2 to 6 months ago, 5.9% (n=4) received it 7 to 12 months ago and 2.9% (n=2) respondents received it more than one year ago. Of the respondents 20.6% (n=14) could not remember the last time they received health education, and 22.1% (n=15) indicated that they never received any health education on malaria. This findings differs from the finding in 4.3.6.1 where it was found that as much as 70.6% (n=48) never received any health education from health workers. This discrepancy is perhaps due to the fact that some respondents have received health education from other sources as discussed in 4.3.6.2.

**4.3.6.4 Item F4: *Helpfulness of the health education about malaria (N=68)***

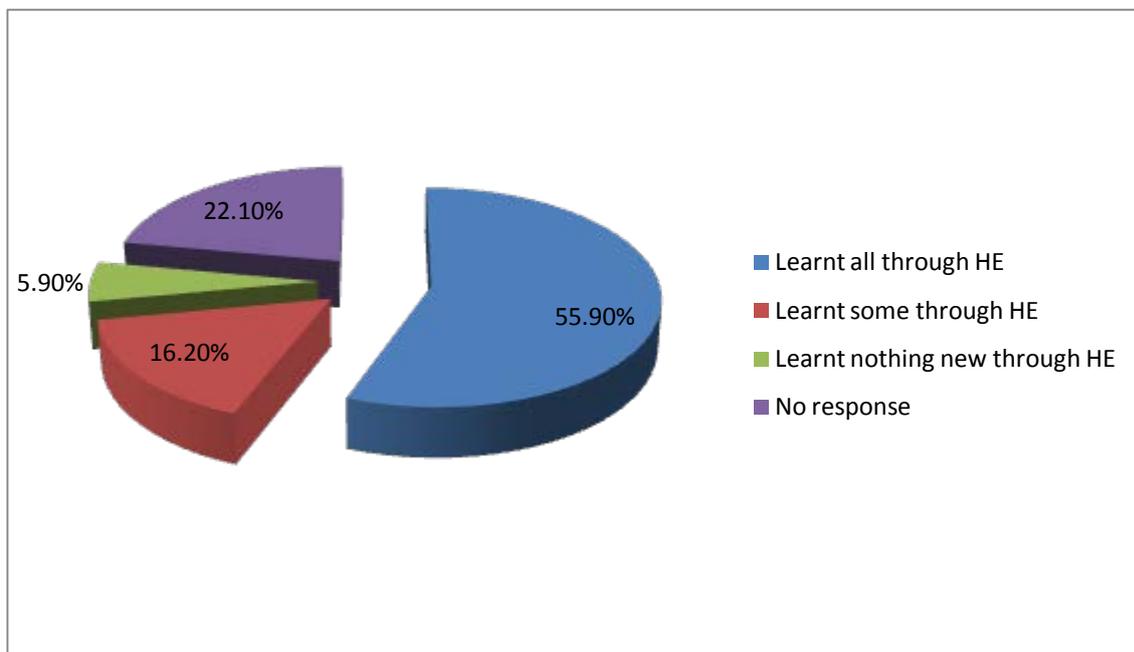
Of the respondents who received information about malaria, 27.9% (n= 2) rated it as most helpful, 17.6% (n=19) said it was helpful, 19.1% (n=12) considered it as somewhat helpful, one respondent (1.5%) said it was not very helpful, almost half of them 32.4% (n=22) did not know whether the health education they received was of any help and one respondent (1.5%) did not respond. The findings in item 4.3.1 showed that the general education level of the community in the rural areas of Mundri East County is lower with 26.5% (n=18) of respondents without any formal education. A study conducted by Njama et al (2003:685,690) indicated that high level of caretakers' education associates with positive malaria-related knowledge, attitudes and practices such as use of formal health care facilities, bed nets and knowledge of proper treatment.

#### 4.3.6.5 Item F5: *Appropriateness of the health education message received (N=68)*

In this item a number of statements were made to determine what the respondents have learned about malaria through health education and whether they have known this before.

##### 4.3.6.5.1 Item F5.1: Learned that malaria is a dangerous disease (N=68)

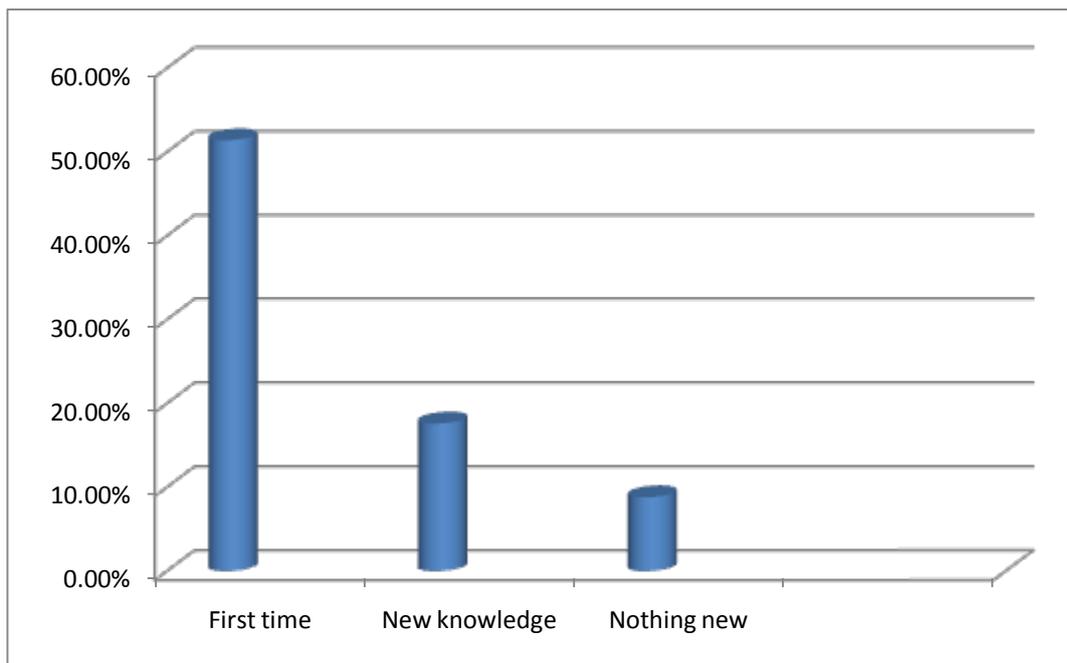
Among the respondents interviewed, 55.9% (n=38) admitted that it was the first time that they have learnt through health education that malaria is a dangerous disease, 16.2% (n=11) reported that through health education they gained some knowledge about how dangerous malaria is, 5.9% (n=4) said that health education did not teach them anything new about malaria and 15 respondents (22.1%) did not give their views on the health education they received.



**Figure 4.12: Percentage of respondents that learnt through health education that malaria is a dangerous disease (N=68).**

#### 4.3.6.5.2 Item F5.2: Learned how malaria could be prevented (N=68)

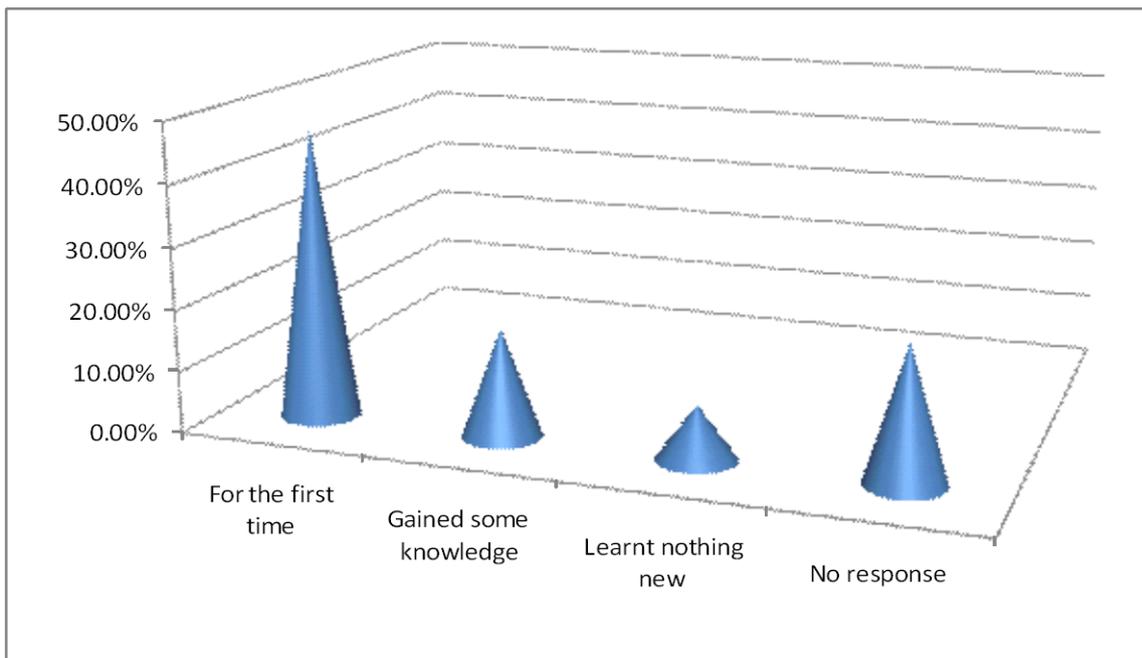
Regarding the prevention of malaria, more than a half (51.4%, n=35) of the respondents stated that it was their first time to be taught through health education on how to prevent malaria, 17.6% (n=12) said that they gained some knowledge through the health education concerning the malaria prevention, 8.8% (n=6) respondents claimed that they did not benefit anything from the health education they received regarding malaria prevention. See graph 4.13 below.



**Figure 4.13: How malaria could be prevented (N=68)**

#### 4.3.6.5.3 Item F5.3: Learned about the causes and symptoms of malaria (N=68)

Of the respondents, 47.1% (n=32) believed that it was through the health education that they first learnt of malaria causes and symptoms, 17.6% (n=12) concurred that they only gained some knowledge about the causes and the symptoms of malaria, 8.8% (n=6) said they did not learn anything new while 15 respondents declined to respond.



**Figure 4.14: The causes and symptoms of malaria (N=68)**

4.3.6.5.4 Item F5.4: Learned that children are more at risk of getting malaria (N=68)

About children being the most risk group of getting malaria among the other community groups, 47.1% (n=32) respondents stated that it was the first time they heard 25% (n=7) said that health education only gave them some knowledge, four (5.9%) respondents indicated that they did not learn anything new about this through health education and 22.1% (n=15) did not respond.

4.3.6.5.5 Item F5.5: Learned how malaria is transmitted (N=68)

Of the respondents 44.1% (n=30) admitted not to have learned about how malaria is transmitted except through the health education they received, 19.1% (n=13) revealed that they only received some new knowledge on this topic, 14.7% (n=10) did not benefit from the health education and 22.1% (n=15) did not respond. Though 10 respondents believed to have not benefited from the health education received and 15 respondents failed to respond, findings in the item 4.3.3.2 indicated that all

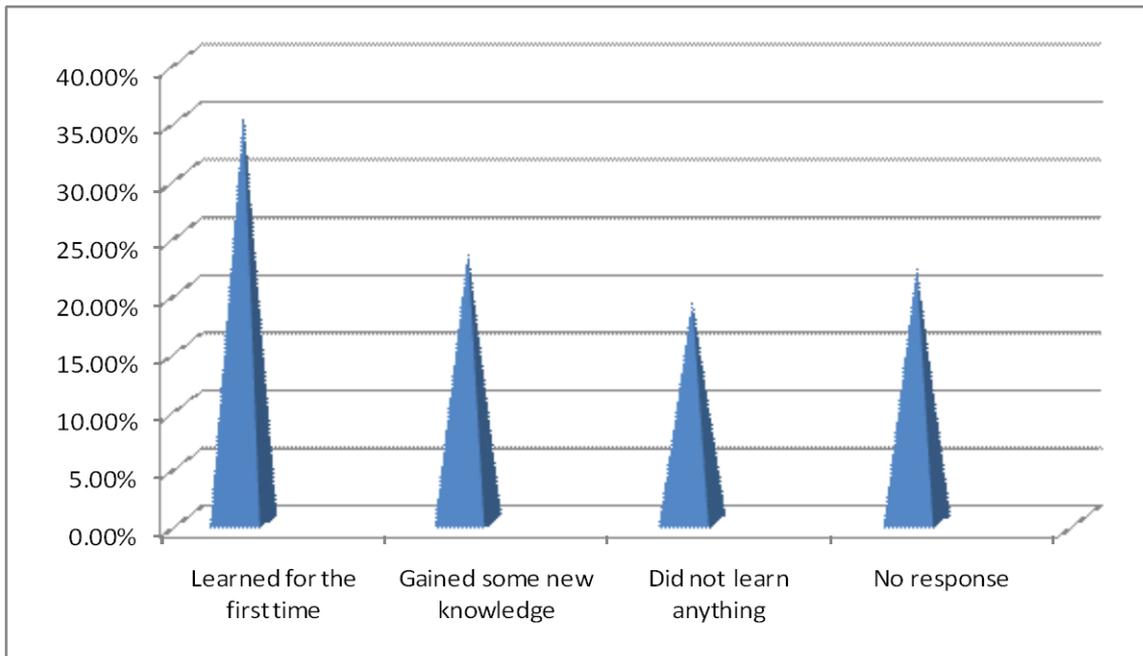
(100%) respondents were able to correctly mention bites of infected female Anopheles as the route of malaria transmission. However some respondents still held a mixed idea on the route of malaria transmission. Those who held mixed ideas also believed that malaria can be transmitted through the following:

- handling of contaminated food 25% (n=17)
- drinking contaminated water 50% (n=34)
- sexual intercourse 7.4% (n=5)

The three responses above by the respondents implied that there is still need for more health education in the community. Scientifically, malaria is believed to be transmitted through the bite of an infected female Anopheles, transfusion with blood of infected patient and through the placenta to the unborn foetus (Gill and Beeching 2004:55-56).

#### 4.3.6.5.6 Item F5.6: Learned how malaria is treated (N=68)

Of the respondents 35.3% (n=24) indicated that they learned for the first time during a health education session of how malaria is treated, 23.5% (n=16) reported that during the health education they only gained some new knowledge, 19.1% (n=13) indicated that they did not gain any new knowledge, and 22.1% (n=15) decided not to give a response. In items 4.3.3.1 and 4.3.3.6 it is clear that respondents take a variety of actions when their family member contracts malaria. This is an indication that the health education received has not been well understood.



**Figure 4.15: Learned how malaria is treated (N=68)**

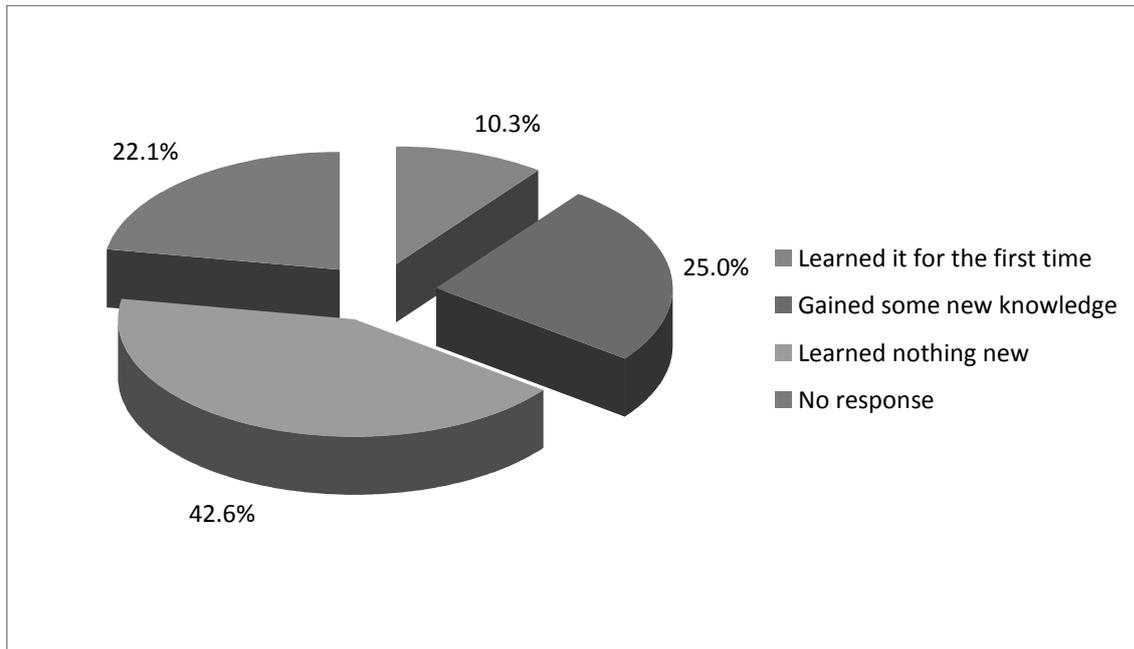
4.3.6.5.7 Item F5.7: Learned when to seek medical help for suspected cases (N=68)

Medical seeking behaviour plays an important role in the control of malaria. When the respondents were asked whether the health education they received had helped them as to when to seek medical help, only 20.6% (n=14) admitted that it was through health education that they first learned when to seek medication help for suspected malaria, 19.1% (n=13) of the respondents said they received some information, 38.2% (n=26) of the respondents reported that they learned nothing new and 22.1% (n=15) of the respondents did not answer the question.

4.3.6.5.8 Item F5.8: Learned when the patient's condition is improving or deteriorating

It is important for community members to know when the patient's condition is improving or deteriorating because this helps the person to decide when to seek medical help. In this regard, only 10.3% (n=7) respondents acknowledged receiving

information for the first time from the health education on this matter, 25.0% (n=17) stated that they only received some knowledge about this, 42.6% (n=29) indicated that they learned nothing new and 22.1% (n=15) respondents did not respond.



**Figure 4.16: Learned how to know when the patient's condition is improving or deteriorating (N=68)**

#### 4.3.6.5.9 Item 5.9: Learned how to prevent mosquitoes from breeding (N=68)

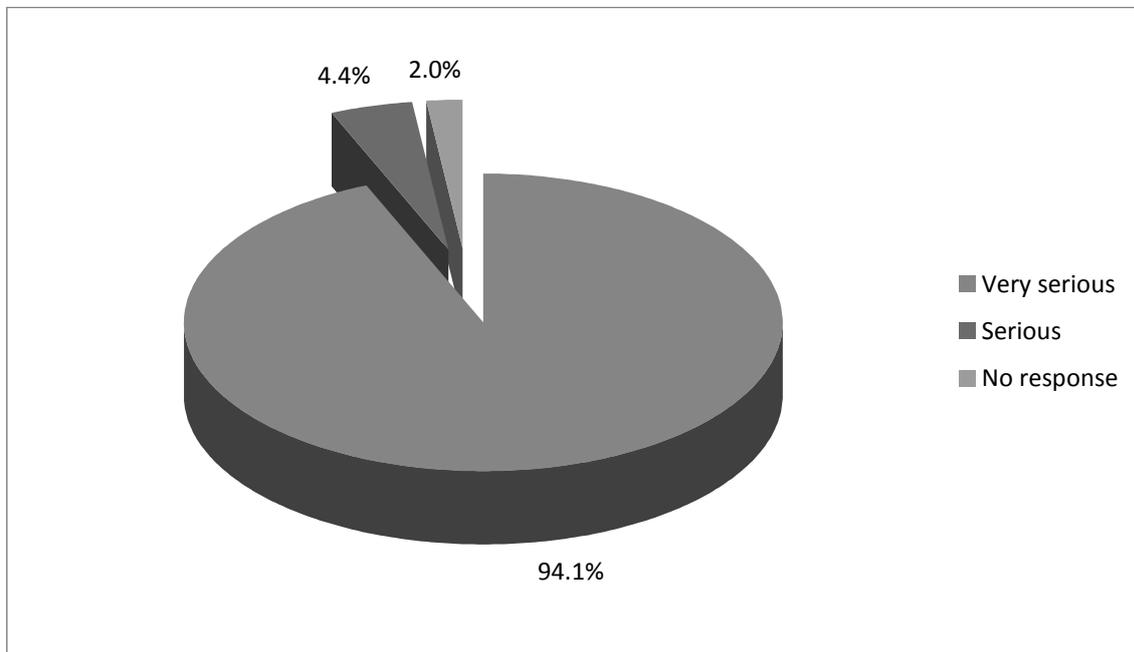
Of the respondents, 38.2% (n=26) revealed that they learned of how to prevent mosquitoes from breeding around the house for first time during the health education session they had, 29.9% (n=19) reported that they only learned some new knowledge, 11.8% (n=8) did not learn anything new and 20.1% (n=15) did not respond.

#### 4.3.7 Section G: Perception and experience on malaria

To clarify the common perceptions and experiences community members in Mundri East County had about malaria and malaria control programmes, a series of questions were asked.

#### 4.3.7.1 Item G1: *Seriousness of malaria (N=68)*

All respondents recognised malaria as a serious health problem in the area, of these respondents 94.1% (n=64) rated it as a very serious problem and 4.4% (n=3) rated it as a serious problem. One respondent did not respond.



**Figure 4.17: Seriousness of malaria (N=68)**

#### 4.3.7.2 Item G2: *Number of people who died of malaria this year (N=68)*

Of the respondents 67.6% (n=46) knew nobody who had died of malaria, 13.2% (n=9) revealed that they knew of 5 people, 7.4% (n=5) knew of two people, and 5.9% (n=4) each knew of one and three people respectively.

**4.3.7.3 Item G3: *Number of people the respondents know of who are currently ill with malaria (N=68)***

Of the respondents 33.8% (n=23) did not know anyone that were ill with malaria, 16.2% (n=11) knew of two people and 25.0% (n=17) knew one person and three people respectively.

**4.3.7.4 Item G4: *Number of malaria cases (or episodes) of malaria for each of the following age groups in the households of the respondents during the past three months (N=68)***

It is clear from the findings in this item that the most cases or episodes of malaria were present in children and particularly in the age group younger than 5 years. It is however difficult to correctly interpret the findings as the respondents were not asked how many children they had in each age group. It could be that where the respondents indicated that there were no cases or episodes it was because they did not have children in that age group. It is therefore more important to note the number of cases or episodes that occurred in each age group.

**4.3.7.4.1 Item G4.1 Children younger than five years (N=68)**

Of the respondents 57.4% (n=39) reported that there were one case or episode of malaria in their household, 25% (n=17) reported two cases, 8.8% (n=6) reported three cases and 8.8% (n=6) had no case of malaria in this age group.

**4.3.7.4.2 Item G4.2: Children between the ages of 6 and 10 years (N=68)**

In this age group the respondents 44.1% (n=30) reported no cases, 41.2 (n=28), 8.8% (n=6) reported four cases and 5.9% (n=4) reported two cases.

#### 4.3.7.4.3 Item G4.3: Children between the ages of 11 and 15 years (N=68)

Of the respondents 41.2% (n=28) revealed that there were no cases of malaria in their household for this age group, 33.8% (n=23) reported two cases, and 25.0% (n=17) one case.

#### 4.3.7.4.4 Item G4.4: Children older than 16 years (N=68)

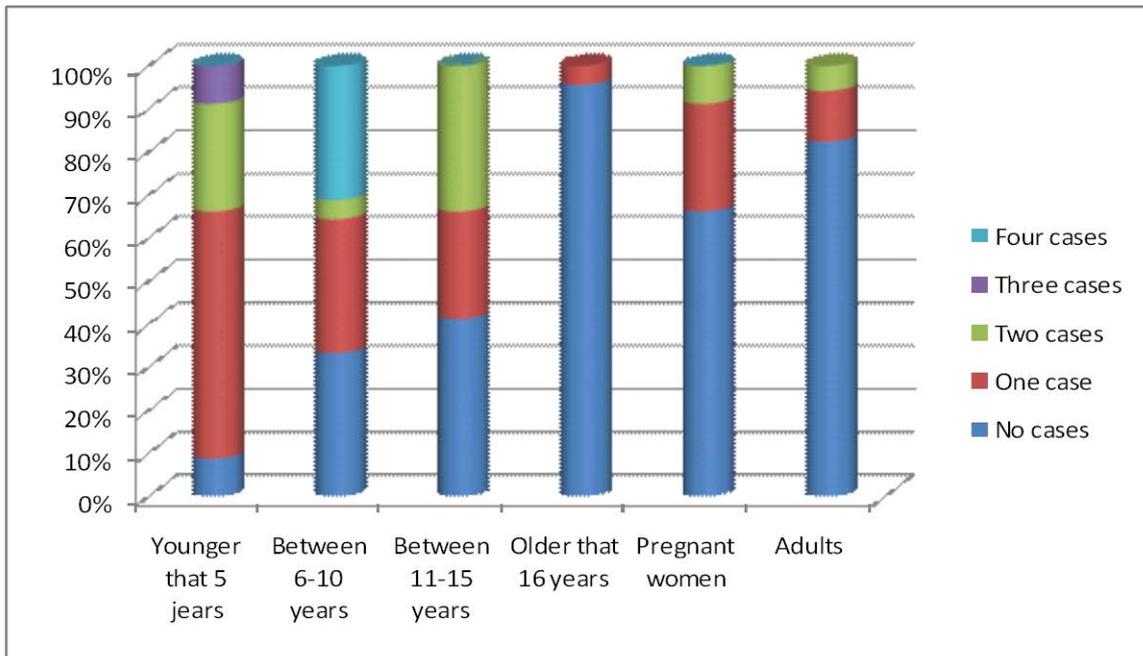
The majority of respondents 95.6% (n=65) reported no case, and 4.4% (n=3) reported one case.

#### 4.3.7.4.5 Item G4.5: Pregnant women (N=68)

The respondents 66.2% (n=45) reported no malaria episodes in pregnant women, 25.0% (n=17) reported one and 8.8% (n=6) reported two episodes. Pregnant women are at risk of contracting malaria, it could mean that the women in the families were not pregnant during this period, or took the necessary precautions.

#### 4.3.7.4.6 Item G4.6: Adults (N=68)

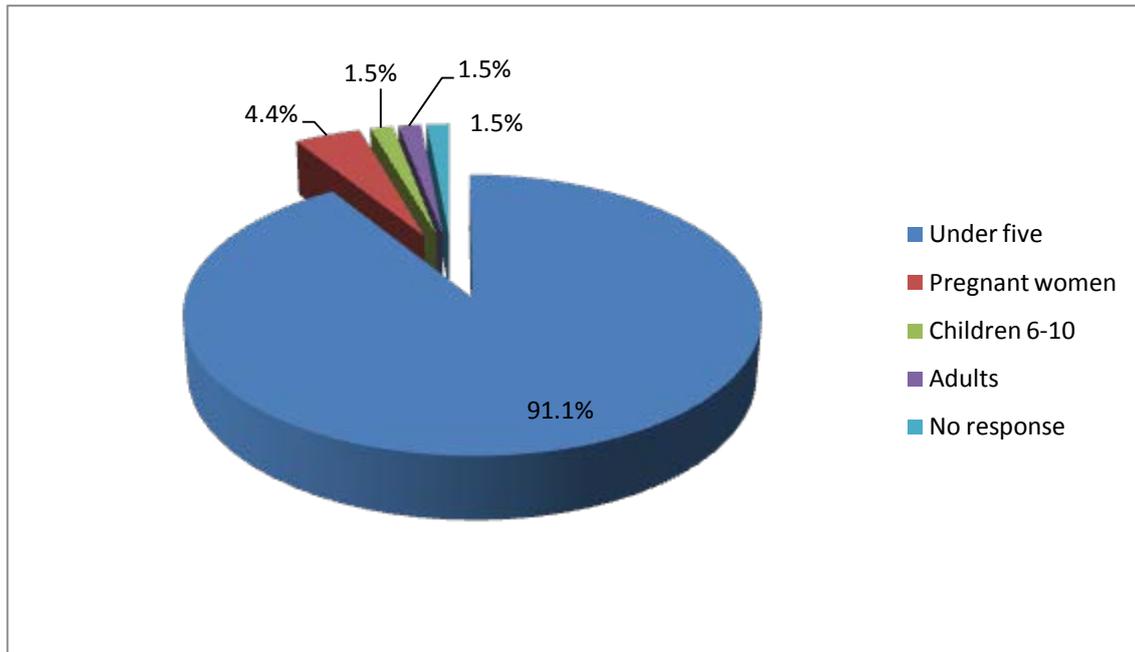
The respondents 82.4% (n=56) reported no malaria episodes among the adults in their households, 11.8% (n=8) reported one episode and 5.8% (n=4) reported two episodes.



**Figure 4.18: Number of cases (episodes) of malaria among age groups in households (N=68)**

**4.3.7.5 Item G5: Age group that should be protected most against malaria (N=68)**

Of the respondents, 91.1% (n=62) stated that the under five year old age group should be protected most, 4.4% (n=3) mentioned pregnant women, one (1.5%) respondent said children between the ages of six to ten years, one respondent (1.5%) believed that adults are to be protected most, and 1.5% (n=1) of the respondents gave no response. This relates to the action taken by the respondents in item 4.3.4.5.



**Figure 4.19: Persons that should be protected the most against malaria (N=68)**

**4.3.7.5.1 Item G5.1: Reasons why these age groups should be protected the most (N=68)**

All the respondents who answered this question 88.2% (n=60) mentioned the poor immunity of particularly children younger than 5 years and pregnant women.

**4.3.7.6 Item G6: Pregnant women who contracted malaria should be treated differently than other adults (N=68)**

Regarding the treatment of pregnant women suffering of malaria, 79.4% (n=64) of respondents believed that they (pregnant women) should be treated differently than other adults, 8.8% (n=6) said they should not be treated differently while 11.8% (n=8) were uncertain.

#### 4.3.7.6.1 Item G6.1: Reasons why pregnant women should be treated differently than other adults (N=68)

Of the 88.2% (n=60) respondents who answered this question 83.3% (n=50) said that pregnant women should be treated differently as the “*treatment is dangerous for the foetus*”, “*the patient could abort*”, and “*therefore should only be treated by a health worker*”. The other 16.7% (n=10) respondents did not provide a reason.

#### 4.3.8 Section H: Additional comments

The typical responses received from the respondents in this last item were

- “*I need more information on malaria.*”
- “*I need a mosquito net.*”

### 4.4 CONCLUSION

In this chapter, the analysed data collected for the study is summarized, compared with other studies conducted in other countries and the conclusions and recommendations for future interventions made.

It is necessary to conduct this study as there is no existing documented information regarding the community knowledge, attitudes and practices on malaria control measures been undertaken by some service providers in Mundri East County. The information got from this study is of great importance and will have direct effect on potential implementers of malaria control interventions.

The findings of this research revealed that most community members in Mundri East County have good knowledge of, attitude towards and practice of malaria control. Preventive measures such as use of mosquito nets are widely practiced in the area. However the local malaria prevention measures using local traditional herbs are also commonly practiced.

Malaria was identified as dangerous diseases by the population of the study area. They demonstrated clear understanding of the common symptoms of malaria such as headache, fever and rigor. However one of them mentioned symptoms and signs of severe malaria such as convulsions, loss of consciousness, yellow eyes and urine (jaundice), dark urine (haemoglobin urea) and breathing difficulties or respiratory distress (acidotic breathing).

It is therefore necessary to step up health education regarding the malaria as disease, its prevention and treatment. The health service providers need to actively involve the community members in malaria control interventions.

*Chapter 5 provides a summary, recommendations and conclusions based on the findings of the research. It also points out the limitations and areas for further research.*

## **CHAPTER 5**

# **SUMMARY, LIMITATIONS, RECOMMENDATIONS AND CONCLUSION**

### **5.1 INTRODUCTION**

The preceding chapter presented the data analysis, interpretation and presentation of the research findings in different forms including tables, pie charts, bar graphs and percentages. The current chapter deals with the research findings, discusses the limitations of this study, gives recommendations for practices, points out some possible areas for further investigation and concludes the study.

### **5.2 SUMMARY**

Worldwide, malaria poses a heavy burden on the health of individuals as a result of repeated infections in endemic areas during early life and adulthood, and their family members, health services, and ultimately on the economic growth of communities and countries. However, malaria affects the health of the poorest in communities more than the higher socio economic individuals due to their lower resistance, preventing them to stay economically active, which then in turn affects their nutritional status, health and risk of contracting malaria again (Tyagi et al 2005:30). The poor may not afford some malaria control interventions such as purchasing ITNs nets or regularly treat the nets due to their poor economic status. The move to control malaria in poor communities should be targeted towards free or subsidised provision of long lasting ITNs, Artemisinin-based combination therapies and indoor residual spraying of insecticide.

This study was necessary because its aim was to collect and document information regarding the community of the Mundri East County, Sudan – their

knowledge on malaria, their malaria control practices and inhibiting or promoting factors for future malaria control intervention at household levels.

The researcher used a quantitative, explorative and descriptive design when conducting this study.

Data was collected through personal (face-to-face) interviews using pre-tested interview schedules. The interview schedule covered the biographical information of the respondents, as well as questions set to attain the objectives of the research such as: respondents' knowledge on malaria, respondents' knowledge and practices of malaria treatment, measures taken by the respondents to prevent malaria at household levels, the common inhibiting factors to malaria preventive measures in area and health education received by the respondents on malaria. The interview schedule was administered to a total of 68 respondents at household level.

The research ethical issues were ensured by obtaining the ethical approval from the Research and Ethics Committee, University of South Africa and Ministry of Health-Government of Southern Sudan (MOH-GOSS). Before the respondents were interviewed, informed consent was obtained from respondents who fulfilled the criteria of eligibility. To avoid exposure of some sensitive information, data collected were kept strictly confidential.

All data collected were edited (cleaned), entered and analysed using the SPSS version 15. Frequency tables were initially drawn for the analysed data, the findings discussed and then where appropriate, presented in pie or bar graphs with clear titles and scales for interpretation as indicated in the previous chapter (Chapter 4).

The data in the interview schedule were analysed and presented according to the following sections:

- Section A: Demographical information of the respondents
- Section B: Respondents knowledge on malaria

- Section C: Treatment of malaria
- Section D: Measures taken to control malaria
- Section E: Factors preventing implementation of preventive measures
- Section F: Health education received on malaria

### **5.3 THE RESEARCH FINDINGS**

The findings were interpreted and presented under the main headings according to the research objectives. The important findings were:

#### **5.3.1 Respondents' biographical data**

The biographical findings covered were the respondent's age, sex, marital status, occupation, education and main source of income. A summary of the most important findings of respondents' biographical information collected during the study follows:

- The age of the respondents interviewed ranges from 18 to 65 years.
- Most of the respondents interviewed fell within the age group of 28-32 years and the lowest number of the respondents interviewed fell within age group of 48-52 year.
- The majority of the respondents (55.9%. n=38) were males with only 44.1% (n=30) female respondents.
- Of all the respondents interviewed, 55.9% were married or living together.
- Literacy levels could be considered low, as 26.5% (n=18) of the respondents had no formal education and another 29.4% (n=20) had some primary school education, which may not be enough to be literate.
- Most (30.9%, n=21) of the participants were subsistence farmers, 25 % (n=17) were not employed.

- The majority of the respondents were of low socio-economic status as their main sources of income depends on irregular selling of undetermined produce such as, livestock, grass and firewood, honey and fish as mentioned in item 4.3.1.8.

To have an effective malaria control programme for the community in Mundri East County, the planners need to design interventions that will take their low literacy and socio-economic levels in consideration. This means that the message designed for community education need to be simple and communicated to the audience using easily understandable methods. Malaria control measures such as mosquito nets should either be provided free or at subsidised rate.

### **5.3.2 Knowledge of the members of the rural community of the Mundri East County, Sudan, on malaria, its transmission, treatment and control**

All the respondents interviewed indicated that malaria is a dangerous infectious disease. According to the majority of the respondents (97.0%, n=66), *malaria* in local language (Moru language) is called “*drio’ba*” literally meaning headache. Some significant (1% each) called it karandini/driob’ba or karandini or adravo (meaning sickness) respectively. Karandini means outbreak (for example an outbreak of disease).

Most (95.5%; n=65) of the respondents associated transmission of malaria to the bites of the female *Anopheles* mosquito. One respondent (1.5%) also correctly identified blood transfusion as one of the routes of malaria transmission. However, other means such as “moving in hot sun”; dirty water; handling of contaminated food, drinking contaminated water and sexual intercourse 7.4 %(n=5) were mentioned by some respondents as transmission route of malaria. This is an indication that more health education is needed.

Scientifically malaria is only transmitted through the bite of an infected female *Anophelene*(s), transfusion of blood from infected person to none infected person and from the mother to foetus through the placenta (Gills & Beeching 2004:55-56). However the belief among the community that malaria could be

transmitted through sexual intercourse could be of help in promoting prevention of HIV/AIDS through the use of condoms.

All the respondents recognised malaria as a serious health problem in the area. Since malaria is considered as a dangerous infectious disease or sickness all the respondents knew at least 3 symptoms of malaria. Most of the respondents indicated correctly that fever and headache (85.3%; n=58) are symptoms of malaria. Some (14.7%, n=10) respondents also correctly mentioned rigours as one of the malaria symptoms.

None of the respondents could mention symptoms of severe malaria such as convulsions, loss of consciousness, yellow eyes and urine (jaundice), dark urine (haemoglobin urea) and breathing difficulties. Failure to associate such symptoms to malaria may lead to inappropriate health seeking behaviour.

Most of the respondents indicated to have seen at least one or two people who died of malaria in the past year. Since malaria is very common in the area, more than a half (66.2%; n=45) of the respondents reported to have known at least one person who was suffering from malaria during the time of the study. The majority of the cases occurred in children under the age of five years and pregnant mothers. However, other age groups were also affected. This is an indication that malaria is very common in the area and has been perceived as a serious health problem by the community members.

Due to the serious effect of malaria in children under the age of five years and pregnant mothers, most (91.1%; n=62) of the respondents identified under-five-year-old age group and pregnant mothers as the high risk groups who need to be protected most. This is mainly because of their low immunity. Of respondents (79.4%; n=64) indicated that pregnant mothers should be treated differently (or only treated by health workers) than other adults to avoid abortion.

Analysis of the respondents' responses to the question about the malaria preventive measures generated a variety of answers as indicated below:

- *"People should sleep under a mosquito net"* (95.5%, n = 65)

- *“People should receive early treatment”* (14.7%, n = 10)
- *“Drainage of the stagnant water around the home stead”* (10.2%, n = 7)
- *“Clear grass around the compound”* (4.4%, n = 3)
- *“Containers that could hold water should be discarded or emptied”* (33.8%; n=23)
- *“House should be sprayed with insecticides”* (17.6% (n=12)
- *“Rubbish around the house should be cleaned and disposed of”* 14.7% (n=10)
- [house] *“should be mudded”* (4.4%)
- *“Spray with insecticide”* (29.4%; n=20)
- *“Prepare a fire in dusk”; “Using smoke of plant leaves (ngungu and ngutru)”* (22.1%; n=15)
- *“Dress [in] long sleeved shirt and trousers”* (20.5%; n=14)
- *“Cleanliness”* (4.9%; n=4)
- *“People should not to drink dirty water, eat dirty food and/or not enter dirty water”* was also mentioned as malaria preventive measures by respondents (2.9%; n=2).
- *“Nothing could be done to control mosquito breeding around the house;”* (4.4% (n=3) and some respondents (4.4% (n=3) had no idea of malaria control measures.

Although the majority of the respondents have knowledge of malaria prevention by using mosquito nets and early treatment of malaria, none of them mentioned other malaria preventive measures such as mosquito repellent and use of mosquito gauze at the opening of the house to prevent mosquitoes entering the bedrooms.

The findings on the treatment of malaria revealed a variety of actions as mentioned by the respondents:

- consultation of the health workers in the nearest health facility (100.0%; n=68)
- purchasing drugs from the local shop (88.2%; n=60)

- taking other steps such as “*making use of local herbs*”; “*using roots of some plants called lojiwa*” or “*kotomola*”; “*traditional herbs*” (45.6%; n=31) and
- [doing] “*Nothing*” (1.5%; n=1).

The rate of consultation of traditional healers among the community of Mundri East County during a malaria attack is lower as compared to seeking medical help from the health facilities. However those who (two respondents) consulted the traditional healers during the malaria attack believed that the treatment provided by healers was effective though they could not remember exactly the type of the treatment they received from the traditional healers.

Regarding the malaria treatment, respondents reported to have been using a combination of both modern (Western medicine) and local traditional medicine (leaves and herbs). The most common medicines (both modern and traditional) used by the community members in Mundri East County when attacked by malaria are as listed below.

- Quinine (100.0%; n=68)
- Herbs such as Lojiwa (73.5%; n=50) and Kyakaru (58.8%; n=40)
- Chloroquine (73.5%; n=50)
- Coertem (14.7%; n=10)
- Fansidar (7.4%; n=5).

Although respondents mainly used the modern scientific medicines for treating malaria, none of them followed the recommended malaria treatment drugs for the Ministry of Health. It is not known whether the respondents used correct dosages as this was not asked during the interview. The danger of not adhering to the malaria treatment protocols designed by the Ministry of Health is that malaria may develop resistance to the potential drugs that are supposed to be preserved for treating severe or resistance cases. Such practice could be changed through health education to the community members and the drug seller.

### **3.3.3 Control measures implemented by members of the rural community of the Mundri East County, Sudan**

Apart from the use of mosquito nets which is summarised below, there were several other malaria control measures practised by the community members of Mundri East County namely, cutting the grass around the homestead and burning it, drainage of stagnant water around the houses, spraying of houses (with mosquito spray - insecticides), disposal of containers that could collect water, making smoky fires at dusk to keep away mosquitoes, dressing children with clothes that covered their arms and legs to prevent mosquito bites, and use of traditional medicine such as certain leaves to repel mosquitoes. Of the above-mentioned preventive measures, most commonly less used measures as mentioned by the respondents include spraying houses with insecticides. Under-utilisation of these preventive measures may be due to their cost implication as most of the respondents earn their living through selling of their produce as indicated in item 4.3.1.6 in chapter 4 of this research. Cost of purchasing the health services has been identified as one of the inhibiting factors to implementation of health services (Worrall et al 2002:13).

The importance of using mosquito gauze at doors and windows of the houses to prevent entrance of mosquitoes is not known to the community of Mundri East County as none of the respondents indicated that their homes had mosquito gauze.

The use of ITNs treated mosquito net as one of the effective measures to control malaria has been recommended by the World Health Organisation (WHO.2009:4) This is because an ITN not only acts as barrier to prevent biting from insects (including mosquitoes) but it also repels, inhibits, or kills insects attracted to bite people. Insecticide treated nets therefore provide protection both to individuals using them and to other community members. Thus the effect of ITNs is so significant that their use is considered to be one of the most effective methods for malaria prevention or control. However

Takken (2002:1027) recommended the use of untreated bed nets as an alternative option to treated bed nets, due to the fact that it has no negative effects of insecticide use; no toxic chemicals effect to the community at household levels; and the financial cost of bed net treatments. Takken (2002:1027) further state that the untreated bed nets can provide (though less than insecticide treated nets) significant protection against mosquito bites if used properly, maintained in good condition and is sufficiently large enough so that the sleepers do not make contact with the net.

The findings also revealed that 91.2% (n=62) of the respondents owned mosquito net(s) for their children. However those who owned the nets used it for various reasons including to prevent mosquito bites (100%), prevent bites from other insects (86%) and to ensure privacy (22.1%). Some respondents used mosquito nets for reasons such as to kill head louse, to protect their children from cold weather and from falling off the bed. None of the respondent associated the use of mosquito net with the prevention of malaria though all of them mentioned prevention of mosquito bites. It is also not known if the nets were used by the respondents throughout all the seasons. A study conducted in Burkina Faso indicated that most of the respondents who used nets did so mainly during the rainy season (Okrah et al 2001:240). Another study conducted by Okrah et al (2002:244) revealed high use of mosquito nets but the use was mainly to avoid mosquito nuisance but not to prevent malaria. Thus the effective use of mosquito nets (treated or not treated) to prevent malaria is to use it in all seasons and use it properly.

Regarding the respondents preferences of the type of mosquito nets, the findings indicated that different preferences exist. However the majority (57.4%; n=39) of the respondents prefer treated mess net to other types. Some respondents preferred to have treated demuria net (20.6%; n=14), untreated demuria net (8.8%; n=6), untreated mesh nets (8.8%, n=6) and untreated net made from thob (4.4%; n=3).

These mixed choices correspond with the mixed reasons mentioned by the respondents in items 4.3.4.8.1 in chapter 4 for owning or using the nets at their homes.

Owning mosquito nets in Mundri East County depends solely on free distribution as stated by 86.7% (n=59) respondents. This is mainly because the community could not afford to pay and treat the mosquito nets. Of the respondents 57.3% (n=39) expressed readiness to buy while 42.6% (n=29) said they would not. A study conducted by Guyat et al (2002:846) in Kenya revealed that the cost of buying mosquito nets has an influence on the use of mosquito nets as preventive measure for controlling malaria. Since most of the community members in Mundri East County earn their living through unsustainable livelihood such as selling of undetermined produce (27.9%; n=19), livestock (5.9%; n=4), grass and firewood (13.2%; n=9), honey (5.9%; n=4) and fish (5.9%; n=4), it would not be possible for the local community to buy mosquito nets. During the face-to-face interviews, some respondents stressed that they *“Would never be able to afford a mosquito net, not even when it is on sale.”*

Though 62 respondents owned nets as in item 4.3.4.5, only 61.3 % (n=38) of them said they nets were treated with insecticide, 10.3% (n=6) said their nets were not treated and 26.5 % did not know whether the nets were treated. None of those who owned the insecticide treated nets new the type of the insecticides used for treating their nets. Hence none of them bothered to treat their nets.

#### **5.3.4 Inhibiting factors which hindered the malaria control activities on household level in the rural community of the Mundri East County, South Sudan**

This finding revealed several factors that inhibited the implementation of malaria preventive measures that could be taken by the community members at household levels. According to the respondents the following were the inhibiting factors:

- lack of money for buying the equipments for malaria control was identified by 79.4% (n=53) respondents as one of the inhibiting factor to malaria preventive measures
- no time to consistently spray the homes was identified by 44.1% (n=30) of the respondents
- no energy to regularly spray the homes as malaria preventive measures was identified as an inhibiting factor in the study area by majority of respondents (40.1%, n=30),
- no equipment for spraying home (94.1%, n=64),
- lack of mosquito repellents in the area (95.5%, n=65),
- lack of knowledge that malaria could be prevented as 69.1% (n=47) of respondents stated that it is a waste of time combating malaria since people could contract it anyway

This state of affairs could mainly be summarised as lack of knowledge about malaria and its prevention, and resources (money, repellents and nets) for malaria prevention.

### **5.2.5 Health education received on malaria**

Education of community is important when targeting malaria control interventions in rural areas (Kweka et al 2008:4).

The findings of this study revealed the following important aspects of health education received by the respondents:

- All the respondents have had health education on malaria, however only few 29.3 % (n=20) of them had it in the past three months.
- Health workers were cited by the respondents as the most common sources of health education on malaria prevention followed by fellow community members.
- Other sources of passing health information to the community members such as radio and printed media were less mentioned by the respondents as the main sources of health education received on malaria. This could possibly be explained by the high level of poverty

in the area as could be justified by the nature of their occupation and sources of income as indicated in items 4.3.1.5 and 4.3.1.5 respectively, and low education level that could not allow them to read the printed information.

- The health education received was not regularly as only 4.4% (n=3) received it during the past (one) month. The rest of the respondents namely 44.1% (n=30) received it 2 to 6 months ago, 5.9% (n=4) received it 7 to 12 months ago, 2.9% (n=2) respondents received it more than one year ago and because of the long time lapse, 20.6% (n=14) of respondents could not remember the last time they received health education, and 22.1% (n=15) denied reception of any health education on malaria. For the people to retain the information received on disease prevention there is need to give simplified and regular messages using cultural acceptable methods.
- Most of the respondents, who received health education regardless of the time they received, stated that the information they received was helpful.
- To tackle the issue of malaria prevention in the area, the respondents suggested that health workers should provide them with mosquito nets and information on malaria. Such request coming from the community members who have low literacy level implied that malaria is actually the major health problem in the area. Thus community members are ready to accept the preventive measures that they perceived to be effective.

#### **5.4 LIMITATIONS**

The limitations associated to the findings of this research were the following:

- Though the findings indicated that some malaria control measures have been practised by the respondents, these have not been practically observed by the researcher or the data collectors as it was not part of the study to observe the measures taken by respondents. The findings would have been different if observation of the practice of the actual control measures were carried out during the study period.

- Lack of the sampling frame may not allow a subsequent researcher to include the same research subjects as their sample. Thus the subsequent research findings may differ from the current findings.
- The research area for this study covered only one county and one tribe. Thus if the subsequent study is conducted in different geographical locations with different tribes having different cultures, the findings may differ from this one.
- Most of the respondents in this study were able to correctly identify mosquitoes and vector that transmit malaria, which can be prevented by sleeping under mosquito nets. Although during the study, respondents were not asked to indicate whether they have some beliefs that prevent the use of mosquito nets or other measures that prevent mosquitoes from biting people, the findings of this study did not reveal any beliefs about malaria that could be harmful.

## **5.5 RECOMMENDATIONS**

The following recommendations have been derived from the findings:

Due to the long effect of the war in Southern Sudan and in Mundri East in particular, any malaria control interventions that is aiming to positively and sustainable impact positively on community's life in Mundri East County should address the

- poverty of the community members
- literacy level including provision of health education on the control of malaria
- delivery of health service in an accessible, affordable and sustainable manner
- regular provision of culturally sensitive and acceptable health education information to the community members using multi-media means
- evaluation of the health education provided to assess the impact of the message among the community members.

- planning of control interventions in line with traditional beliefs and cultural defined behaviour in mind. Thus such community beliefs or behaviours need to be classified as positive or beneficial, harmful and/or neutral for better intervention.
- intervention procedure should attempt to re-enforce or promote the positive or beneficial beliefs or behaviours. Harmful beliefs and behaviours should be modified culturally through acceptable means or strategies. Neutral beliefs or behaviours can be incorporated into the health education messages that encourage healthy behaviour or it (neutral behaviour or belief) can be left unchanged. In Mundri East County, the respondents displayed a number of beneficial beliefs and practices conducive to the control of malaria at the household or individual level.
- neutral beliefs could be used to promote positive or beneficial beliefs and practices among the community of Mundri East County. For example, the concept that malaria can be transmitted by eating contaminated food and drinking dirty water can be classified as neutral beliefs. The health education message that combines other community beliefs and cultural-based ideas about malaria causation and transmission such as eating contaminated food and so on with clear scientifically proved explanations of malaria transmission will improve the community's acceptance of health education messages and promote the adoption of appropriate preventive behaviours. In this case, the relationship of drinking dirty water and eating contaminated food to health hazards such as diarrhoea could be used to discourage these practices though they are not directly associated with transmission of malaria. Dirty water as mentioned by the respondents may refer to unprotected or open stagnant water that can provide good breeding places for mosquitoes hence promoting the transmission of malaria through the biting of the adult female Anophele. Explanation of such relationship to the community members will help them to understand the disease and encourage them to accept the preventive measures being undertaken in the area.

- To improve malaria control measures in Mundri East County, community members need to be educated on the relationship between mosquitoes and malaria, and the benefit of accepting cost effective preventive measures including early seeking of treatment from the health facilities or health personnel.
- There is a need for health education programmes that will measure the success of the health education message passed to the community. Since there exists control practices among the community that involves herbs and leaves, the ministry of health should conduct the research to find out how effective these measures are. If these measures are found effective, they need to be incorporated to the modern scientific malaria control measures.
- The findings of this study indicated that 97.1 %( n=66) of respondents who owned nets indicated that they had not been treating their nets at household level. Thus there is a need for health workers to educate the community members on the importance of treating their nets and which insecticide is the best for them to use and how and when to treat their nets.
- Since the insecticide is not available in the area, the Ministry of Health should put more emphasis on the distribution of long lasting insecticide treated nets (LLTNs). Provision of LLTNs in the local shops at subsidised cost needs to be promoted as 57.3% (n=39) of the respondents expressed readiness to purchase the nets if provided for sale.

## 5.6 AREAS FOR FURTHER RESEARCH

Areas for further research include the following:

- Research on the effectiveness of traditional methods of controlling malaria using local herbs such as *Lojiwa* and *Kyakaru* or leaves such as *ngungu* and *ngutru*
- Research on the practical implementation of the malaria control measures as mentioned by the respondents

- Research on which method has the most impact on the community regarding malaria control practice

Research on effectiveness of Herbs such as Lojiwa and Kyakaru as treatment of malaria.

## **5.7 CONCLUSION**

The findings of this study indicated that the rural communities in Mundri East County is one of the Southern Sudanese rural communities experiencing high burden of malaria due to poverty, lack of resources, lack of knowledge, education and training, as well as a lack of knowledge of malaria, unemployment or poor sources of income, low government support in the area of malaria control, and a high incidence rate of malaria enhanced by the nature of the environment that promoted the breeding of the mosquitoes.

Findings from this study indicated that many respondents failed to use bed nets and insecticide treated nets in particular. However, the majority of respondents possess at least some level of correct knowledge, other beliefs and attitudes related to malaria causation, preventive measures and treatment. The community's ability to adopt and comply with health interventions (prevention and treatment) is affected by their acceptance of the intervention, their understanding of the nature of the event or problem concerned and the relationship between the vector and the infection and socio-economic and cultural factors (De La Cruz et al 2006:7).

Malaria control intervention in the entire Southern Sudan and Mundri East in particular had been and is still been mainly implemented through or mainly with the assistance from international non-governmental organisation or indigenous organisation with financial assistance from outside donor. Local community malaria control measures have not been incorporated in the modern scientific malaria control methods. This has resulted in most of the community members not having knowledge of whether the mosquito nets distributed by the agencies were treated with insecticides or not. The other

implication is that the intervention may not be sustainable as most of the resources come from outside.

Due to the high prevalence of malaria in the areas, most community members are aware of its existence, have local name (drio'ba) for it and have some local preventive measures such as the use of local herbs. Such measures need scientific research. If proven to be effective, it could be incorporated in the community-based malaria control programmes as this will inflict less financial burden on the community members as compared to the modern scientific method.

Government commitments (local and National level), multi disciplinary, multi sectoral approach, which will involve community members in designing the intervention programme, resources mobilisation, implementation and monitoring and evaluation of the malaria control programme would help effective implementation of malaria control intervention in Mundri East County of Southern Sudan. In this study health personnel and a member of the community had been cited as the common sources of getting information on malaria. These sources need to be encouraged, strengthened and widely promoted.

Currently other malaria preventive measures such as, spraying, repellents and use of coils are not commonly in practice due to unavailability in the market. Thus there is need to make them available for those who are able to purchase them.

This study found that the use of mosquito nets as malaria preventive measure is widely practiced by the community in Mundri East County. Thus community members need to be trained on treatment of mosquito nets and the insecticides should be made available on free or subsidised cost.

The study revealed that community members have mixed preferences for the mosquito nets. Thus the distribution of mosquito nets to the community members, need to be geared to their preference ensuring that it is treated.

Community members need to be educated on the health issues and encouraged to control malaria disease by controlling mosquitoes from breeding in and around their homes by practicing environmental control methods such as draining stagnant water pools or by covering such water with a thin layer of oil to arrest the mosquitoes' breeding cycles.

Therefore health education should be conducted by the health personnel using cultural sensitive but evidence-based intervention and easily understandable channels to the community members. Proper training or health education to the community members such as mothers has been recommended as one of the effective measures in malaria control programme (Okrah et al 2002:245, Nuwaha 2002:462; Tyagi et al 2005:34).

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# ANNEXURE A

## MINISTRY OF HEALTH FOR GOVERNMENT OF SOUTH SUDAN



GOVERNMENT OF SOUTHERN SUDAN  
(GOSS)  
MINISTRY OF HEALTH



Our Ref:.....

Date: 18/12/2009.....

Your Ref:.....

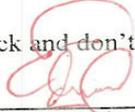
To: Mr. James Gassim Simon  
University of South Africa

### APPROVAL LETTER: Knowledge of and control practices for malaria in rural areas of East Mundri County, Southern Sudan

I am writing in response to the request for authorization for the proposed study of “**Knowledge of and control practices for malaria in rural areas of East Mundri County, Southern Sudan**”. After close review of the proposal, I am glad to inform you that the Ethics Committee Board at the Ministry of Health, Government of Southern Sudan (MOH-GOSS) has approved the study. The Ministry acknowledges the importance of getting baseline information aimed at providing evidence-based information for policy development and planning, as well as determining the community knowledge on malaria, prevention, control practices and identify gaps in malaria control.

Please, keep the Ministry informed incase of any changes regarding the study and on its progress. I look forward to the report, especially the recommendations that will be generated as a result of the study. Note that any information generated from this study should not be published without the consent of the MOH-GOSS.

Good luck and don't hesitate to get in touch should there be any queries.

  
\_\_\_\_\_  
**Dr. Edward Quirino Bepo**  
Director, Research and Planning  
Directorate of Research, Planning and Health System development  
Ministry of Health, GOSS

CC: Under secretary, MOH-GOSS

CC: Director General, Research, Planning & Health Sys Dev

Head Office: P.O. Box 88, Juba, Southern Sudan  
Tel: (+249-811820678/+249-811820134  
Email: infomohgoss@gmail.com

# ANNEXURE B

UNIVERSITY OF SOUTH AFRICA  
Health Studies Research & Ethics Committee  
(HSREC)  
College of Human Sciences

## CLEARANCE CERTIFICATE

12 November 2008

3439-884-8

Date of meeting: .....

Project No: .....

Project Title: **KNOWLEDGE AND CONTROL PRACTICES FOR MALARIA IN RURAL AREAS OF Mundri East County, SOUTHERN SUDAN.**

Researcher: **Mr JS Gassim**

Supervisor/Promoter: **Mrs MM van der Merwe**

Joint Supervisor/Joint Promoter: **Mrs JE Smith**

Department: **Health Studies**

Degree: **MPH**

### DECISION OF COMMITTEE

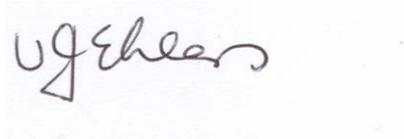


**Approved**

**Conditionally Approved**

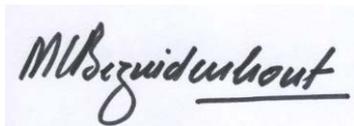
**23 August 2008**

Date: .....

A handwritten signature in black ink on a light blue background. The signature is written in a cursive style and appears to read 'VJ Ehlers'.

**Prof VJ EHLERS**

**RESEARCH COORDINATOR: DEPARTMENT OF HEALTH STUDIES**

A handwritten signature in black ink on a light blue background. The signature is written in a cursive style and appears to read 'MC Bezuidenhout'.

**Prof MC Bezuidenhout**

**ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES**

# ANNEXURE C

## INTERVIEW SCHEDULE

### Introduction

The objective of the research conducted is to establish the knowledge of Southern Sudanese citizens on malaria and what control measures they have implemented to safeguard themselves against malaria.

### Instructions

Please write your answer according to the key in the block provided in the right hand margin, or fill in your answer on the lines provided.

**Mr James Gassim Simon (E-mail: [gassimjames@yahoo.com](mailto:gassimjames@yahoo.com) and tel. No: +256772938688)** is a student in the University of South Africa. He is collecting this data for his master dissertation in public health. He has selected you to participate voluntarily in providing answers to the below question.

For office use

1-2 

|  |  |
|--|--|
|  |  |
|--|--|

Payam\_\_\_\_\_

Boma\_\_\_\_\_

Village\_\_\_\_\_

Serial number of H/H \_\_\_\_\_

Name of data collector \_\_\_\_\_

Date \_\_\_\_\_

Time started \_\_\_\_\_

Time ended \_\_\_\_\_

Checked by \_\_\_\_\_

## SECTION A: DEMOGRAPHICAL DATA

### A1 How old are you?

|      |                     |   |   |
|------|---------------------|---|---|
| Key: | 17 years or younger | = | 1 |
|      | 18 – 22 years       | = | 2 |
|      | 23 – 27 years       | = | 3 |
|      | 28 – 32 years       | = | 4 |
|      | 33 – 37 years       | = | 5 |
|      | 38 – 42 years       | = | 6 |
|      | 43 – 47 years       | = | 7 |
|      | 48 – 52 years       | = | 8 |

53 years or older = 9

**A2 Gender of respondent**

Key: Male = 1

Female = 2

**A3 What is your marital status?**

Key: Married = 1

Single = 2

Widow/Widower = 3

Divorced = 4

Living together = 5

Other = 6

If "Other", please specify: \_\_\_\_\_

**A4 What is your highest level of education?**

Key: No formal education = 1

Some primary school education = 2

Completed primary school = 3

Some Secondary School = 4

Completed secondary school = 5

Some University education = 6

Other courses = 7

**A5 What is your occupation?**

Key: Not employed = 1

Self employed = 2

Small scale peasant = 3

Farmer = 4

Pastor = 5

Own business = 6

Health worker = 7

Teacher = 8

**A6 What is your main source of income?**

Key: Selling of produce = 1

Salary = 2

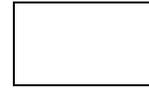
Livestock = 3

Selling grass/firewood = 4

Fish = 5

Honey = 6

Other = 7



**SECTION B: KNOWLEDGE OF MALARIA**

**B1 What is malaria?**

---

**B2 What is malaria called in your language?**

---

**B3 What causes malaria?**

---

---

**B4 Which of the following is/are the correct way(s) in which malaria is transmitted?**

Key: Yes = 1

No = 2

B4.1 You get malaria from the bite of an infected female anopheles mosquito

B4.2 It is transmitted directly, through contact between two people

B4.3 It is transmitted through the handling of contaminated food

B4.4 You can contract malaria by drinking contaminated water

B4.5 You can contract malaria through sexual intercourse

**B5 What are the symptoms of malaria with which a patient will present?**

---

---

---

**B6 How can malaria be prevented?**

---

---

**B7 What can be done to stop mosquito breeding around the house?**

---

---

---

**B8 What can be done to prevent mosquito bites on individuals?**

---

---

---

---

**SECTION C: TREATMENT OF MALARIA**

**C1 What did you do when you or a member of your household contracted malaria?**

Key: Yes = 1

No = 2

C1.1 Went to the nearest health facility

C1.2 Bought drugs from the local shop

C1.3 Did not do anything

C1.4 Took other steps

If "Other", please specify: \_\_\_\_\_ C1.4.1

**C2 Did you consult a traditional healer *before* seeking medical help?**

Key: Yes = 1

No = 2

**C3 How many times have you consulted a traditional healer in the past six months for malaria?**

**C4 What type of care did the traditional healer give you for malaria?**

---

---

**C5 How would you rate the effectiveness of the treatment provided by the traditional healer?**

|                         |   |   |
|-------------------------|---|---|
| Key: Very effective     | = | 1 |
| Effective               | = | 2 |
| Did help to some extent | = | 3 |
| Had little effect       | = | 4 |
| Did not help at all     | = | 5 |

**C6 Which medicines (both modern and traditional) do you commonly use for treating malaria?**

---

---

**SECTION D: MEASURES TAKEN TO CONTROL MALARIA**

**D1 What actions have you taken to inhibit mosquito breeding around the house?**

---

---

**D2 How often have you taken the following actions to inhibit mosquito breeding around the house?**

|                      |   |   |
|----------------------|---|---|
| Key: Every day       | = | 1 |
| At least once a week | = | 2 |
| 1-3 times a month    | = | 3 |
| Very seldom          | = | 4 |
| Have never done it   | = | 5 |

D2.1 Drain any accumulation of water around the house.

D2.2 Clear bushes along water banks.

D2.3 Cut grass short along the house.

D2.4 Dispose of all containers likely to hold water.

**D3 How often do you take the following measures to control mosquito numbers?**

|                      |   |   |
|----------------------|---|---|
| Every day            | = | 1 |
| At least once a week | = | 2 |
| 1 to 3 times a month | = | 3 |
| Very seldom          | = | 4 |
| Never                | = | 5 |

D3.1 Spray the outside of the house

D3.2 Use mosquito coils

D3.3 Make use of traditional medicine (Leaves of certain plants)

D3.4 Dress the child with clothes that covers his/her arms and legs

D3.5 Apply mosquito repellent on the skin of your child

D3.6 Spray the inside of the house

D3.7 Make smoky fires at dusk to keep mosquitoes away

**D4 Are the openings in your house covered with mosquito gauze?**

Key: Yes, all of the openings = 1

Only some of the openings = 2

None of the openings = 3

**D5 If yes, are the mosquito gauze screens intact? (Not torn or broken)**

Key: Yes, all of the screens = 1

Only some of the screens = 2

None of the screens = 3

**D6 Do you have mosquito-nets for your children?**

Key: Yes = 1

No = 2

**If your answer to question D6 is “No”, please explain why.**

---

---

Item D6.1\_

**D7 Did you receive the mosquito-nets free of charge?**

Key: Yes = 1

No = 2

D17

**D8 Please consider the following as a reason for using a mosquito-net:**

Key: Yes = 1

No = 2

D8.1 Prevent mosquitoes from biting

D8.2 For privacy

D8.3 To prevent bites from other insects

D8.4 Other reasons

**If "Other reasons", please specify:**

---

D8.4.1

**D9 Which type of mosquito-net would you prefer?**

Key: Treated demuria = 1

Untreated demuria = 2

Treated mesh = 3  
Untreated mesh = 4  
Treated thob = 5  
Untreated thob = 6

**Please give a reason for your choice:**

---

D9.1

**D10 Are the mosquito-nets in your home in a good condition?**

Key: Yes = 1

No = 2

**If your answer to question D10 is “No”, please explain why:**

---

D10.1

**D11 If you are provided the mosquito-net on sale, would you be willing to buy?**

Key: Yes = 1

No = 2

**If your answer to question D11 is “No”, please explain why:**

---

D11.1

**D12 Are the mosquito-net(s) in your house treated with insecticide?**

Key: Yes = 1

No = 2

**If your answer to question D12 is “No”, please explain why.**

---

D12.1

If your answer to question D12 is “Yes”, please specify what kind of insecticide you use to treat the mosquito-net.

---

D12.2

**D13 How often do you treat the mosquito-net(s) in your house with insecticide?**

- |                      |   |   |
|----------------------|---|---|
| Every 2 to 4 months  | = | 1 |
| Every 5 to 7 months  | = | 2 |
| Every 8 to 12 months | = | 3 |
| Once a year          | = | 4 |
| Never                | = | 5 |

## **SECTION E: FACTORS PREVENTING THE IMPLEMENTATION OF PREVENTIVE MEASURES**

**E1 Please indicate to which extent you agree or disagree with the following statements.**

- |                     |   |   |
|---------------------|---|---|
| Key: Strongly agree | = | 1 |
| Agree               | = | 2 |
| Neutral             | = | 3 |
| Disagree            | = | 4 |

Strongly disagree = 5

E1.1 I have enough money to spend on equipment to control malaria.

E1.2 I have the time to consistently spray the home.

E1.3 I have the energy to spray the home so often.

E1.4 I have the equipment to spray the home.

E1.5 I can replace broken gauze screens for all the openings of my home.

E1.6 I can treat/drain any accumulation of water around the house.

E1.7 The equipment to spray homes is always available in my village.

E1.8 Mosquito repellent is always available in my village.

E1.9 I feel it is a waste of time to attempt to combat malaria since people get it in any case.

**SECTION F: HEALTH EDUCATION RECEIVED ON MALARIA**

**F1 How many times over the past three months have you received health education on the prevention of malaria from any of the health services in your village?**

**F2 From which of the following sources have you received information on malaria?**

Key: Yes = 1

No = 2

F2.1 Radio broadcasts

F2.2 Printed media

F2.3 From a member of the community

F2.4 From health personnel

F2.5 Other sources

Please specify "Other" sources:

F2.5.1

---

**F3 When was the last time you received health education on malaria?**

- Key: During the past month = 1  
2-6 months ago = 2  
7-12 months ago = 3  
More than a year ago = 4  
I cannot remember = 5  
I have never received any health education = 6

**F4 How helpful was the health education you received?**

- Key: Most helpful = 1  
Helpful = 2  
Somewhat helpful = 3  
Not very helpful = 4  
Not at all helpful = 5  
I don't know = 6

**F5 Which of the following statements are appropriate to the health education you received?**

- Key: I learned this the first time through the health education = 1  
I gained some knowledge through the health education = 2

The health education did not teach me anything new = 3

F5.1 Malaria is a dangerous disease.

F5.2 How malaria could be prevented.

F5.3 The causes and symptoms of malaria.

F5.4 Children are more at risk of getting malaria.

F5.5 How malaria is transmitted.

F5.6 How malaria is treated.

F5.7 When you should seek medical help in suspected cases.

F5.8 How to know when the patient's condition is improving or deteriorating.

F5.9 How to prevent mosquitoes from breeding.

## SECTION G: PERCEPTION AND EXPERIENCE OF MALARIA

### G1 How serious do you rate the malaria problem?

Key: Very serious problem = 1

Serious problem = 2

Moderate problem = 3

Small problem = 4

Not a problem = 5

### G2 How many people do you know that have died of malaria this year?

### G3 How many people do you know that are currently ill from malaria?

### G4 How many malaria cases occurred for each of the following age groups in your household during the past three months?

G4.1 Children younger than five years

G4.2 Children between the ages of 6 and 10 years

G4.3 Children between the ages of 11 and 15 years

G4.4 Children older than 16 years

G4.5 Pregnant women

G4.6 Adults

**G5 Who should be protected the *most* against malaria?**

|                                              |   |   |
|----------------------------------------------|---|---|
| Key: Children younger than five years        | = | 1 |
| Children between the ages of 6 and 10 years  | = | 2 |
| Children between the ages of 11 and 15 years | = | 3 |
| Children of 16 years and older               | = | 4 |
| Pregnant women                               | = | 5 |
| Adults                                       | = | 6 |

**Please provide a reason for your answer in question G5:**

---

---

**G6 Should a pregnant woman, who contracted malaria, be treated differently than other adults?**

Key: Yes = 1

No = 2

Uncertain = 3

**If your answer to question G6 is “Yes”, please indicate how you think a pregnant woman with malaria should be treated:**

---

---

---

**SECTION H: ADDITIONAL COMMENTS**

**If you have any additional comments, please provide them below**

---

---

---

---

---

# ANNEXURE D

## INTERVIEW SCHEDULE TRANSLATED

Name of respondent

1-2

|  |  |
|--|--|
|  |  |
|--|--|

Payam \_\_\_\_\_ Boma \_\_\_\_\_ Village \_\_\_\_\_

Serial number of H/H \_\_\_\_\_

Name of data collector \_\_\_\_\_

Date \_\_\_\_\_

Checked by \_\_\_\_\_

\_\_\_\_\_

—

### SECTION A

#### DEMOGRAPHICAL DATA

A1 Mima be ndroa miro moda ya (How old are you)?

|      |                       |   |   |
|------|-----------------------|---|---|
| Key: | Ndroa 18 - 22 years   | = | 1 |
|      | Ndroa 23 - 27 years   | = | 2 |
|      | Ndroa 28 - 32 years   | = | 3 |
|      | Ndroa 33 – 37 years   | = | 4 |
|      | Ndroa 38 – 42 years   | = | 5 |
|      | Ndroa 43 – 47 years   | = | 6 |
|      | Ndroa 48 – 52 year    | = | 7 |
|      | Ndroa maro ndra ni 58 | = | 8 |

A3

**A2 'Digi kabe tadri ono ozana 'do e'di yi ya (Sex of respondent)?**

|       |         |   |   |
|-------|---------|---|---|
| Kode: | Manoago | = | 1 |
|       | 'Ditoko | = | 2 |

A4

**A3 Mi Oriazi (toko kode Ago) be ya (What is your marital status)?**

|      |                                                 |   |   |
|------|-------------------------------------------------|---|---|
| Key: | Ma Oriazi be (Toko kode Ago) be (Married)       | = | 1 |
|      | Ma Oriazi ako (ma took kode ago ako (Single     | = | 2 |
|      | Ma ävuzi yi (took/ago ako)( Widow/Widower       | = | 3 |
|      | Malanji ru te (Divorced)                        | = | 4 |
|      | Ma ori voalo ya oriazi maro be(Living together) | = | 5 |
|      | Azakana ka 'd te nyiti (Other)                  | = | 6 |

Nyiti nowa (Please specify): \_\_\_\_\_

**A4 Ledri se cini nyeben vona odrena moda ya (How many people is dependant on your income)?**

Key: Idwo (None) = 1  
1- 3 = 2  
4- 6 = 3  
7 – 9 = 4  
Bute kode Ndra ni bute ri = 5

Toko, ago ndi tokoazii y be (Spouses/partners)

A6

Ngaga se ndroa na sa ko bute alo drina fo nji (Children under the age of 15 years)

A7

Ledri azaka se 'bakala 'do ro be (Other family members)

A8

Ledri azaka na (Other)

A9

Nyiti nowa (please specify) \_\_\_\_\_

**A5 Mizi ta le engoroya (What is your level of education)?**

Key: Mazi ta ko (No formal education) = 1  
Mazi primary school fere (Some primary school education) = 2

Mande primary school (Completed primary school = 3

Mazi Secondary School ndi fere (Some Secondary School = 4

Mande secondary school (Completed secondary school = 5

Mazi University ndi fere (Some University education) = 6

Azakana ze mizi be to ni iyi ri (nyiti nowa) Other Courses (specify)-----

-----

= 7

A10

**A6 Nya losi oye e'di ro ya (What is your occupation)?**

Key: Maye losi ko (Not employed) = 1

Ma losi oye andivo maro ri (Self employed ) = 2

Ma losi oye amvu di aza ro ya (Small scale peasant) = 3

Losi amvuru (Farmer) = 4

Ma Pastor yi (Pastor) = 5

Ma losi ngalagye ro oyena (Own business) = 6

Ma losi kitali ro oyena (Health worker) = 7

Ma miembe 'ba yi (Teacher) = 8

Azaka na(nyiti nowa (Other(Specify).....

A11

**A7 Liti miro atu usu ro ni e'di ya (What is your main source of income)?**

Key: Ngayi mabe lofona 'do ogyena (Selling of produce) = 1

Ma atu losi ro uruna (Salary) = 2

|                                                    |   |   |
|----------------------------------------------------|---|---|
| Ma Indri/Ti/Timile/tau ogye (livestock)            | = | 3 |
| Ma kayi/tiza/ce ogye (Selling grass/firewood)      | = | 4 |
| Ma ti'bi ogye (fish)                               | = | 5 |
| Ma epe ogye (Honey)                                | = | 6 |
| Azaka na (nyiti nowa) (Other (specify please)_____ |   |   |

**A8 Mima be nyusu na atu ndi oso moda ronye emba alo ya ya (What is you estimated income per month)?**

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## **SECTION B**

### **RESPONDENTS' KNOWLEDGE ON MALARIA**

**B1) Malaria e'di yi ya ( What is malaria)?**

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**B2) Nya malaria uzi e'di kala amiro si ya (What is malaria called in your language)?**

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**B3) E'di kani malaria ozo ya (What causes malaria)?**

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**B4) Tadri oza koyi engoni ni tangye yi ta usu malaria rota ya (Which of the following is/are the correct way(s) in which malaria is transmitted)?**

Key: Yes = 1

No = 2

B4.1 Usuna malaria ondro kado nyinyi toko gi malaria be to kosi di te au (You get malaria from the bite of an infected female anopheles mosquito)

B11

B4.2 Usuna ondro ka'do ledri ritu kodo lomveo iyiro te au (It is transmitted directly, through contact between two people)

B12

B4.3 Usuna ondro kado ado ngaonya de undiro 'do te au (It is transmitted through the handling of contaminated food)

B13

B4.4 Nyusu na malaria ondro ka'do mivu gyi undiro te au (You can contract malaria by drinking contaminated water)

B14

B4.5 Nyusu malaria taoye 'ditoko ro manago be 'do si (You can contract malaria through sexual intercourse)

B15

**B5) Ledri se malaria kuru te, e'di ndaro kani oye ya (What are the symptoms of malaria with which a patient will present)?**

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**B6) Magagana ama engonye ni malaria ri ya (How can malaria be prevented)?**

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**B7) Ayena e'di kagaga nyinyi ro ni uti voya loto ti zo (What can be done to stop mosquito breeding around the house)?**

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**8) Ayena e'di kagaga amaro be ni nyinyi ri osivoya ya (What can be done to prevent mosquito bites on individuals)?**

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## SECTION C

### TREATMENT OF MALARIA

**C1) Miye ediyi tuse nya'do be kode 'dise alo aza se ka ori mibe 'do a'do be malaria be ya (What did you do when you or a member of your household contracted malaria)?**

Key: Yes = 1

No = 2

C1.1 Oyi kitali gi loto ti 'do ya (Went to the nearest health facility)

C3

C1.2 Agye dawa ni dokani ya si (Bought drugs from the local shop)

C4

C1.3 Aye nga aza alona ko (Did not do anything)

C6

C1.4 Ye nga aza (Took other steps)

C7

Nyiti (specify) \_\_\_\_\_

**C2) Inye'do nyoyi kati ledri gi ka azi ede 'badradri 'do ondre teinye oyi ako ledri kitali ro re ya (Did you consult a traditional healer *before* seeking medical help)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

C8

**C3 Imba gi kälävu be njidrialo 'do ya nyoyi perena moda ledri gi ka azi ede 'badradri 'do ondre ne ya (How many times have you consulted a traditional healer in the past six months for malaria)?**

C9

**C4) Ledri gi kabe ledri azi ede 'badri-adri do yeyi edi go miri ta malaria rot a ya (What type of care did the traditional healer give you for malaria)?**

\_\_\_\_\_

\_\_\_\_\_

**C5) Ka'do be miri ngaopa kode dawa gi ledri gi kabe ledri azi opa badriadri to otini a'do ta oyena voro, mitina engoa ro ya (How would you rate the effectiveness of the treatment provided by the traditional healer)?**

- |                                               |   |   |
|-----------------------------------------------|---|---|
| Key: Kado para (Very effective)               | = | 1 |
| Kado (Effective)                              | = | 2 |
| Ye nga opa ndi fere (Did help to some extent) | = | 3 |
| Ngaopa na toto fere                           | = | 4 |
| Ye nga opako cu alona (Did not help at all)   | = | 5 |

C10

**C6) Dawa engoni fondrana (badriadri kode kitali ro) nyama oyeyena ayani ondro kado nyado te malaria be ya (Which medicines (both modern and traditional) do you commonly use for treating malaria)?**

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## **D MEASURES TAKEN TO CONTROL MALARIA**

**D1) Miye ediyi zo miro lomvosi se gagana nyinyi ni utivoya ti zo miro lomvo ya (What actions have you taken around the house to inhibit mosquito breeding around the house)?**

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**D2) Perena moda se aza miye ta koi te kagaga nyinyi ro be ni utivoya ti zo lomvo (How often have you taken the following actions to inhibit mosquito breeding around the house)?**

|                                                 |   |   |
|-------------------------------------------------|---|---|
| Key: Ondo alo (Every day)                       | = | 1 |
| Oso pere alo gyima alo ya (At least once a week | = | 2 |
| Pere na 1-3 imba alo ya (1-3 times a month)     | = | 3 |
| Tototu azaka si (Very seldom)                   | = | 4 |
| Maye ko cu alona (Have never done it)           | = | 5 |

D2.1 Liti upi gyi gi kabe edre zo lomvo 'do ri (Drain any accumulation of water around the house).

D1

D2.2 Kayi gi kabe edre gyi lomvo si do o'bina (Clear bushes along water banks).

D2

D2.3 Kayi gi kabe edre zo lomvo to olona si (Cut grass short along houses).

D3

D2.4 Ngase cini kunina ndi gyi edreni 'do onana (Dispose of all containers likely to hold water)

D4

D2.5 Dri lakaza yi ro takona (Keep water containers covered).

D5

**D3) Nga gi koi nya oyena perena moda nyinyi gaga za ya (How often do you take the following measures to control mosquitoes)?**

|                           |   |   |
|---------------------------|---|---|
| Key: Ondo alo (Every day) | = | 1 |
|---------------------------|---|---|

|                                            |   |   |
|--------------------------------------------|---|---|
| Perena alo gyima ya (At least once a week) | = | 2 |
| Perena oso 1-3 ronye (1-3 times a month)   | = | 3 |
| Toto tu azaka si (Very seldom)             | = | 4 |
| Maye ko cu alona (Have never do it)        | = | 5 |

D3.1 Dawa obosi zo losi desi si kufu nyinyi ro (Spray the outside of the house to kill mosquitoes)

D6

D3.2 Dawa gi omboro ro opaopa ro 'do ozana (Use mosquito coils)

D7

D3.3 Ma kyibi ago ce oye [Make use of traditional medicine (Leaves of certain plants)]

D8

D3.4 Ma bongo gi kuni na ndi pa ndi dri ngaga ro takoni cini 'do osona ngaga lomvo (Dress the child with clothes that covers his/her arms and legs)

D9

D3.5 Ma dawa nyinyiro gi ka be nyinyi onjaonja 'do opina lomvo ngaga ro ya (Apply mosquito repellent on the skin of your child)

D10

D3.6 Dawa o'bo zo ya kufu nyinyi ro be (Spray the inside of the house to kill mosquitoes)

D11

D3.7 Katuka o'ba ngakyi si zo ya konja nyinyi ro be (Make smoky fires at dusk to keep mosquitoes away)

D13

D14) Nyiti nga azaka se nyabe oyena to ni kuru iyiri malaria gaga zana (Please describe any other measures you take to control mosquito numbers)

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**D4) Inye'do vo ogbo zo miro ya do a'ba adidi gi kayikayi ro do ndi kigye nyinyi gaga za na (Are the openings in your house covered with mosquito gauze)?**

Key: Owa vona cini (Yes, all of them) = 1

Alona aye ko (None of them) = 2

Azaka na ayete (Some of them) = 3

D14

**D5.1) Inye'do Käläsi zo miro ro aba adidi gi kayikayi ro do ndi kigye ya (Are the doors of your house covered with mosquito gauze)?**

Key: Owa, vona cini (Yes, all of them): = 1

Alona a'ba ko (None of them): = 2

Azaka na a'ba ndi (Some of them):= 3

D15

**D5.2) Ondro kado aba te inye do kayikayi na do lewe ko ya (If yes, are the mosquito gauze screens intact)? (Not torn or broken)**

Key: Owa, vona cini (Yes, all of them): = 1

Alona idwo kadu (None of them): = 2

Azaka na kadu (Some of them): = 3

D16

**D6.1) Minda lomosia be ngaga ri ya (Do you have mosquito nets for your children)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

D17

**D6.2) Nya'do te akona, nyiti tana e'di mi nomosia ako ngaga riya (If your answer to D6.1 is "no", explain why you do not have mosquito nets for your children)**

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**D7) Inye 'do ozo nomosia 'do (iyi) miri awi ogye ako ya (Did you receive the mosquito nets free of charge)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

D18

**D8) Mile tadri ndi ta koyi be ta u'du miro lomosia ya ro ya (Please consider the following as a reason for using a mosquito-net):**

Key: Owa (Yes) = 1

Kwa (No) = 2

D8.1 Kaga ama ro be mi nyinyi ri osivoya (Prevent mosquitoes from biting)

D19

D8.2 Kada'do amaro be ni ondre vo ya (For privacy)

D20

D8.3 Kagaga ama ro beni kacici azaka na ri osi voya (To prevent bites from other insects)

D21

D8.4 Azakana (Others reasons)

D22

Nyiti azakana 'do (Please If other reasons, specify)

**D9) Mile miro lomosia beti engone aya ya (Which type of mosquito-net would you prefer)?**

Key: Demuria gi dawa be nja 'do (Treated demuria) = 1

Demuria gi dawa ako 'do (Untreated demuria) = 2

Nomsia gi ranga ranga dawa be 'do (Treated mesh) = 3

Nomosia gi ranga ranga dawa ako (Untreated mesh) = 4

Tho'bo gi dawa be nja 'do (Treated thob) = 5

Tho'bo gi dawa ako 'do (Untreated thob) = 6

D23

**Ta kacina e'di mile beti do aya ni ya (Give reason(s) for your choice):**

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**D10) Nomosia gi ro baru iyi gi kaduro ya (Are the mosquito nets in your home in a good condition)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

D24

**Ondro ka'do kote kado, nyiti takacina (If you answer to question D10 is "no" explain why your nets are not in a good condition).**

---

---

**D11 Ondro ka'do ezo lomosia go ogyeni ogye, mile na tadri ndi ogyeni ya (If you are provided the mosquito-net on sale, would you be willing to buy)?**

Key: Yes = 1

No = 2

**Ondro tadri oza ta eji gi D11 ya 'do ka'do te Kwa, nyiti takacina (If your answer to question D11 is "No", please explain why:**

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**D11) Nomosia gi miro 'do aye dawa te kigye ya (Are the nets treated with insecticide)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

**Ondro kado tadri oza ta eji gi D12 ya do kado te "Kwa", nyiti takacina (If your answer to question D12 is "No", please explain why):**

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**Ondro kado tadri oza ta eji gi D12 ya do kado te "Owa" Dawa beti ingoni ya (If your answer to question D12 is "Yes", please specify what kind of insecticide you use to treat the mosquito-net).**

---

**D13) Nyama dawa oye nomosia miro ya tu engoni si ya (How often do you treat the mosquito net with insecticide)?**

|                                       |   |   |
|---------------------------------------|---|---|
| Key: Imba 2-4 vosi (Every 2-4 months) | = | 1 |
| Emba 5-7) vosi (Every 5-7 months)     | = | 2 |
| Emba 8-12 vosi (Every 8-12 months)    | = | 3 |
| Perena alo droa ya (Once annually)    | = | 4 |
| Maye ko cu alona (Never)              | = | 5 |

**D14) Liti to aza kana nyate oyena nyinyi gaga zana, nyiti (Please describe any other measures you take to control mosquito numbers).**

---

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## **SECTION E**

### **FACTORS PREVENTING THE IMPLEMENTATION OF PREVENTIVE MEASURES**

**E1) Miza dri ta koyi ro oso egyibe 'do vo ro (Please indicate to which extent you agree or disagree with the following statements).**

|                                                      |   |   |
|------------------------------------------------------|---|---|
| Key: Male tadri endaro ta 'do be (I strongly agree)  | = | 1 |
| Male tadri ta 'do be (I agree)                       | = | 2 |
| Ma tadri oza ako                                     | = | 3 |
| Male tadri ko ta 'do be (I disagree)                 | = | 4 |
| Male tadri ko endaro ta 'do be (I strongly disagree) | = | 5 |

E1.1 Ma orivoya parata be amba ogyeni nga nyinyi o'ba ro dri (I do have enough money to spend on spraying equipment).

E1

E1.2 Ma orivoya saa be se aza mani na ndi dawa nyinyiro o'bani tu cini si 'baru marigä (I have the time to consistently spray the home).

E2

E1.3 Ma orivoya mbara be amba dawa nyinyi ro o'bazani tu cini si baru (I have the energy to spray the home so often).

E3

E1.4 Ma oriviya lakaza nyinyi o'boro be (I do have the equipment to spray the home).

E4

E1.5 Ma orivoya parata be adidi gi kayikayi ro 'do ogyezana o'bani vo onbo gi kayikai nail lewe te 'ba maro ya 'do ya (I do have the money to replace broken gauze screens for all the openings of my home).

E6

E1.6 Mani na ndi gyi gi kabe edre 'ba maro lomvo 'do lit upine rigye tu cini si (I can treat/drain any accumulation of water around the house).

E7

E1.7 Lakaza gi dawa nyinyi o'boro 'do orivoya tu cine bakala maro ya (The equipment to spray homes is always available in my village).

E10

E1.8 Dawa nyinyi onja ro do orivoya amba bakala amaro ya (Mosquito repellent is always available in my village).

E11

E1.9 Mandre maro be, ta gi malaria gaga ro 'do saa enji tana ayena nga aza ca, malaria ka ero gi ledri uru (I feel it is a waste of time to attempt to combat malaria; people get it in any case).

---

## SECTION F

### HEALTH EDUCATION RECEIVED ON MALARIA

**F1) Imba gi kalavu natu do ya, nyusu nga emba perena moda ta malaria gaga ro ta ni kitai gi amiro now ono yasi ya. (How many times over the past three months have you received health education on the prevention of malaria from any of the health services in your village)?**

**F2) Nyusu lazo ta malaria gaga rota 'do ni engoa ro ya (From which of the following sources have you received information on malaria)?**

Key: Owo = 1

Kwa = 2

**F2.1 Ta ayo radio ro ya (Radio broadcasts)**

**F2.2 Waraga gi egyibe makana si 'do ya (Printed media)**

**F2.3 Ledri nboko ro resi (From the member of the community)**

**F2.4 Losi 'ba kitali ro resi (From health personnel)**

**F2.5 Liti azaka ya si (Other sources)**

**Kado te azaka na yi nyiti (Please specify these sources)**

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**F3) Nyusu ngaembe ta malaria rota aduna itube ya (When was the last time you received health education on malaria)?**

Key: Imba na kalavu te alo (During the past one month) = 1

Imba na lavute 2-6 (2-6 months ago) = 2

Imba na lavute 7-12 (7-12 months ago) = 3

Ndra ni ndroa alo (More than a year ago) = 4

Mani kote unine (I cannot remember) = 5

Musu ro ko cu alona (I have never received any health education)

= 6

**F4) Nga emba gi nyusu be 'do nga opana mu'du engonye ya (How helpful was the health education you received)?**

Key: Nga opa be amba (Most helpful) = 1

Nga opa be (Helpful) = 2

Nga opa be fere = 3

Nga opa ako amba (Not very helpful) = 4

Nga opa ako alona (Not at all helpful) = 5

Maniko = 6

**F5) Ta koi 'be drini nga emba gi nyusu be ta malaria rota do ya (Which of the following statements are appropriate to the health education you received)?**

Key: Musu on kati na le nga emba ado jiniri ro ono ya (I learned this the

first time through the health education) = 1

Maru tauni azaka nga emba on ya (I gained some knowledge through the health education) = 2

Nga emba on cu emba nga aza ko mari (The health education did

not teach me anything new) = 3

**F5.1 Ekye malaria adravo riti be yi (That malaria is a dangerous disease).**

**F5.2 Ekye anina ndi malaria gaga ni (That malaria could be prevented).**

**F5.3 Ngase kabe malaria ozo (The cause and symptom of malaria).**

**F5.4 Ekye riti ako malaria usu ni ngaga ri (That children are more at risk of getting malaria).**

**F5.5 Malaria ka oyi engonye ni 'di alo dri le 'di aza dri (How malaria is transmitted).**

**F5.6 Ekye anina ndi malaria ufuni dawa si (That malaria could be treated).**

**F5.7 Ekye nyuguna ledri se nyusu ta te mikye malaria be itu nga opa ta kitali ya (When to seek medical help for a patient who you suspect contracted malaria).**

**F5.8 Mini na engonye minye lomvo adravo ro ka ugu ado pari koziro ya (How you would know that the patient's condition is deteriorating).**

**F5.9 Agaga na nyinyi engonye in utivoya (How to prevent the mosquito from breeding).**

**F6) Mindre be losi oye ombo (Hakuma) rot a malaria gaga rota engonye ya (How would you rate the government's malaria control measures)?**

|                               |   |   |
|-------------------------------|---|---|
| Key: Kadupara oye (Excellent) | = | 1 |
| Kadu (Good)                   | = | 2 |
| Fere kadu (Acceptable)        | = | 3 |
| Koziropara                    | = | 4 |
| A'doko kadu (unacceptable)    | = | 5 |

**Nyiti takaci tadri oza miro gi F6 ya 'do (Please explain your answer provided in question F6).**

---

---

**F7) Mindre be losi oye Munazama ta malaria gaga rot a engonye ya (How would you rate the work done by NGO's in terms of malaria control)?**

|                               |   |   |
|-------------------------------|---|---|
| Key: Kadupara oye (Excellent) | = | 1 |
| Kadu (Good)                   | = | 2 |
| Fere kadu (Acceptable)        | = | 3 |
| Koziropara                    | = | 4 |
| A'doko kadu (unacceptable)    | = | 5 |

Nyiti takaci tadri oza miro gi F7 ya 'do (Please explain your answer provided in question F7).

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### SECTION G: PERCEPTION AND EXPERIENCE OF MALARIA

**G1 Ka'do be miri riti malaria ro otini a'do kozi na voro, mitina engoa ro ya ( How serious do you rate the malaria problem)**

|                                               |   |   |
|-----------------------------------------------|---|---|
| Key: Riti kosi para yi (Very serious problem) | = | 1 |
| Riti kozi yi (Serious problem)                | = | 2 |
| Riti fere yi (Moderate problem)               | = | 3 |
| Riti giriwa yi                                | = | 4 |
| A'do ko riti yi (No problem)                  | = | 5 |

**G2 Ledri moda mini be se ndroa ono ya drai ni malaria ri ya (How many people do you know that have died of malaria this year)?**

**G3 Ledri moda se mini be yau ono ndana adravo malaria ro be (How many people do you know that are currently ill from malaria)?**

**G4 Ledri gi ndroa koi (gi kai ori be 'baru miriga 'do) malaria ru ndana perena moda emba gi lavu be natu 'do ya ya (How many malaria cases occurred for each of the following age groups in your household during the past three months)?**

- Toto perena alo (Only once) = 1
- Perena ritu le su (2-4 times) = 2
- Ndra ni nji drisi (More than 5 times) = 3

G4.1 Ngaga gi ndroa na sa ko nji 'do (children younger than five years)

G4.2 ngaga gi ndroa na 6-10 'do (children between the ages 6-10 years)

G4.3 ngaga gi ndroa na 11-15 'do (children between the ages 11-15 years)

G4.4 ngaga gi ndroa na ndra ni 16 'do (children older than 16 years)

G4.5 Kovoro yi (pregnant women)

G4.6 Ledri desi yi (adults)

**G5 Kado be miri dise gagani dra ni malaria ri uru voya si ni a'di ya (Who should be protected the *most* against malaria)?**

Key: Ngaga gi ndroa na sa ko nji do

(Children younger than five years = 1

Ngaga gi ndroa na 6-10

(Children between the ages 6-10 years) = 2

Ngaga gi ndroa na 11-15 years

(Children between the ages 11-15 years) = 3

Ngaga gi ndroa na ndra ni 16

(Children older than 16 years) = 4

'Ditoko gi ngwa be ya ya 'do

(Pregnant women) = 5

Ledri desi (Adults) = 6



**Nyiti takeci ta tadri oza miro gi G5 ya 'do ro (Please provide a reason for your answer in question G5):**

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**G6**

**30a) Inye'do Kovoro ka'do te malaria be adrena vo ndaro kode dawa ndaro a'dona kpa to ni ledri 'desi anjoko 'do ri ya (Should a pregnant woman who contracted malaria be treated differently than other adults)?**

Key: Owa (Yes) = 1

Kwa (No) = 2

Azaya (Uncertain) = 3

**30b) Ondro ka'do tadri oza miro G6 ya 'do ta ka'do te Owa, nyiti liti se dawa ozo ro kovoro ri (If your answer to question G6 is “Yes”, please indicate how you think a pregnant woman with malaria should be treated)**

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**SECTION H: ADDITIONAL COMMENTS**

**Nyado te ta aza be atani nyiti (If you have any additional comments, please provide them below)**

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## ANNEXURE E

| Village      | Number of Households | Proportion of population | Sample size |
|--------------|----------------------|--------------------------|-------------|
| Wandi        | 170                  | 0.106                    | 7           |
| Kedi'ba      | 483                  | 0.300                    | 21          |
| Lui          | 760                  | 0.473                    | 33          |
| Lozoh        | 70                   | 0.044                    | 3           |
| Iye'ba 1     | 45                   | 0.028                    | 2           |
| Minga        | 80                   | 0.050                    | 3           |
| <i>Total</i> | <b>1608</b>          | <b>1</b>                 | <b>70</b>   |

# ANNEXURE F

## Data collectors training programme conducted at Lui Centre

| Venue : LUI Centre (Lozoh payam) |                |                                                                                                                                   |               |
|----------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------|
| Day 1                            |                |                                                                                                                                   |               |
| Date                             | Time           | Topics                                                                                                                            | Method        |
| 18/01/2010                       | 4-6 Pm         | Arrival of the participants                                                                                                       |               |
| 19/01/2010                       | 7-7:15 am      | Tea                                                                                                                               |               |
|                                  | 7:20-7:30 am   | Introduction                                                                                                                      |               |
|                                  | 7:35-8:35 am   | explaining the purposed of the research, procedures to be followed during data collection process and reasons for data collection | Lecture       |
|                                  | 8:35-8:45 am   | Short break                                                                                                                       |               |
|                                  | 8:45-9:30 am   | Reading the questions and clarifying the unclear or difficult terms in the schedule                                               | Participatory |
|                                  | 9:30-9:35 am   | Energiser                                                                                                                         |               |
|                                  | 9:35-10:30 am  | Reading the questions and clarifying the unclear or difficult terms in the schedule                                               | Participatory |
|                                  | 10:30-10:50 am | Tea break                                                                                                                         |               |
|                                  | 10:50-11:40 am | Reading the questions and clarifying the unclear or difficult terms in the schedule                                               | Participatory |
|                                  | 11:40-11:50 am | Short break                                                                                                                       |               |
|                                  | 11;50-12:20    | Continue with reading the question and clarifying the unclear terms in the schedule                                               | Participatory |
|                                  | 12:20-12:25 am | Energiser                                                                                                                         |               |

|              |                  |                                                                                                                                                                 |                           |
|--------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|              | 12:25 am:1:00 pm | Question from the data collectors regarding the topics covered                                                                                                  | Participatory             |
|              | 1:00-2:0 pm      | Lunch                                                                                                                                                           |                           |
|              | 2:0-3:0 pm       | Explaining and demonstration of the method of sample selection                                                                                                  | Lecture and demonstration |
|              | 3:0-3:45pm       | Question and answers about the method of sample selection                                                                                                       | Participatory             |
|              | 3:45 pm          | End of day 1                                                                                                                                                    |                           |
| <b>Day 2</b> |                  |                                                                                                                                                                 |                           |
| 20/01/2010   | 7-7:15 am        | Tea                                                                                                                                                             |                           |
|              | 7:20-7:30 am     | Recap of the day 1 topics                                                                                                                                       | Participatory             |
|              | 7:35-8:35 am     | how to approach the respondents                                                                                                                                 | Lecture and demonstration |
|              | 8:35-8:45 am     | Short break                                                                                                                                                     |                           |
|              | 8:45-9:30 am     | Discussion about inadequate and accurate filling of the interview schedules and how to absorb the research ethic when collecting the data from the respondents. | Participatory             |
|              | 9:30-9:35 am     | Energiser                                                                                                                                                       |                           |
|              | 9:35-10:30 am    | Discussion about inadequate and accurate filling of the interview schedules and how to absorb the research ethic when collecting the data from the respondents. | Participatory             |
|              | 10:30-10:50 am   | Tea break                                                                                                                                                       |                           |

|              |                |                                                                                                                       |                             |
|--------------|----------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------|
|              | 10:50-12:20 am | practical filling of the research schedule using the data collectors as respondents and interviewers at the same time | Demonstration               |
|              | 12:20-12:30 am | Short break                                                                                                           |                             |
|              | 12:30-1:0 pm   | Discussion of the filled forms (schedule)                                                                             | Participatory               |
|              | 1:0-2:0 pm     | Lunch                                                                                                                 |                             |
|              | 2:0-3:30 pm    | practical filling of the research schedule using the data collectors as respondents and interviewers at the same time | Demonstration               |
|              | 3:30-3:50 pm   | Discussion of the filled forms                                                                                        |                             |
|              | 3:50-4:0 pm    | Short break                                                                                                           |                             |
|              | 4:0-4:30 pm    | Thoroughly explanation of the data collection approach at individual households                                       | lecture                     |
|              | 4:30-5:0 pm    | Role play on the data collection approach                                                                             | Role play                   |
|              | 5:5 pm         | End of the day 2                                                                                                      |                             |
| <b>Day 3</b> |                |                                                                                                                       |                             |
| 21/01/2010   | 7-7:15 am      | Tea                                                                                                                   |                             |
|              | 7:20-8:0 am    | Recap of the day 2 topics                                                                                             |                             |
|              | 8-0 am-1:0 pm  | practical field demonstration (filling the research tools as pre-test using community members)                        | Practical (at U'du village) |
|              | 1:0-2:0 pm     | Lunch                                                                                                                 |                             |
|              | 2:0-3:0        | practical field demonstration (filling the research tools as pre-test using community members)                        | Practical (at U'du village) |
|              | 3:0-3:10       | End of the Day 3                                                                                                      |                             |

## Day 4

|            |                  |                                                                                    |               |
|------------|------------------|------------------------------------------------------------------------------------|---------------|
| 22/01/2010 | 8:0-8:20 am      | Tea                                                                                |               |
|            | 8:20-8:50 am     | Presentation of the data collected from the community by the first data collector  | Participatory |
|            | 8:50-9:20 am     | Presentation of the data collected from the community by the second data collector | Participatory |
|            | 9:20-9:30 am     | Short break                                                                        |               |
|            | 9:30-10:0 am     | Presentation of the data collected from the community by the third data collector  | Participatory |
|            | 10:0-10:30 am    | Presentation of the data collected from the community by the first data collector  | Participatory |
|            | 10:30-10:50 am   | Tea break                                                                          |               |
|            | 10:50-12-00 am   | Discussion of the results of the data collected                                    | Participatory |
|            | 12:00-12:10 am   | Short break                                                                        |               |
|            | 12:10 am-1:00 am | Cont. with discussion                                                              | Participatory |
|            | 1:00 pm          | And end of the day 4                                                               |               |

# ANNEXURE G

ANNEXURE 2 a

RESPONDENTS

**TITLE OF RESEARCH: Knowledge of and control practices for malaria in rural areas of Mundri East Southern Sudan**

**RESEARCHER: James Gassim Simon**

**Student Number: 34398848**

**Please mark your answer by encircling the choices provided.**

Do you understand that you have been asked to be in a research study?

Yes                  No

Have you read and received a copy of the attached information sheet?

Yes                  No

Do you understand the benefits and risks involved in taking part in this research?

Yes                  No

Have you had an opportunity to ask questions and discuss the study with the researcher?

Yes                  No

Do you understand that you are free to participate or withdraw from the study at any time?

Yes                  No

Do you understand who will have access to this information?

Yes                      No

This study was explained to me by the researcher

I agree to take part in this study. I agree to be interviewed for the purposes described in the information letter. I understand that my name will not be associated with the collected information and that identifiers will be removed.

.....  
.....

Signature of participant

Date

Printed name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

.....  
.....

Signature of researcher

Date

Printed name

## Respondents

I am Mr James Gassim Simon a student at the University of South Africa

- 1 I need to collect data for my research, and have chosen you to take part.
- 2 The purpose of the research is to study the knowledge of community members of the rural Mundri East County, Southern Sudan have on malaria as disease and the control thereof; what do they do themselves to control malaria; and to identify the major problems encountered by the community that hinder the control of malaria.
- 3 The objectives are to assess the level of knowledge that community members have on malaria as disease and its control practices, and to identify the major problems encountered by the community of Mundri East County, Southern Sudan, in control of malaria at household level.
- 4 Data will be collected by data collectors using interview schedule at individual homes.
- 5 The data collection process should not take more than 1½ hour.
- 6 You are requested to answer the questions as honestly and truthfully as possible without fear.
- 7 The results of the research will be printed in the master's dissertation of the researcher and will be examined by examiners to establish whether the researcher is able to do research on his own. This research is therefore only for the researcher's own development and studies.
- 8 The findings of this research will be confidential as no name will be mentioned and in no way will it be possible to identify the participants.
- 9 Your participation is voluntary and you may withdraw at any stage of the study if you feel threatened.
- 10 No harm will be done to you and no information you share with the researcher will be used to harm you.
- 11 The information collected might however benefit Ministry of health or non-governmental or church related organizations should it be possible to make suggestions to improve the implementation of malaria control programmes.
- 12 Your privacy will be ensured during the interview.
- 13 Should you feel uncomfortable during the interview in any way, please discuss it with the researcher.



I am Mr James Gassim a student at the University of South Africa

- 15 I need to collect data for my research, and have chosen you to take part.
- 16 The purpose of the research is to determine which malaria control measures members of the community rural areas of Mundri East County, Southern Sudan have implemented.
- 17 The data collection process should not take more than 2hours.
- 18 You are requested to answer the questions as honestly and truthfully as possible.
- 19 The results of the research will be printed in the master's dissertation of the researcher and will be examined by examiners to establish whether the researcher is able to do research on her own. This research is therefore only for the researcher's own development and studies.
- 20 The findings of this research will be confidential as no name will be mentioned and in no way will it be possible to identify the participants.
- 21 Your participation is voluntary and you may withdraw at any stage of the study if you feel threatened.
- 22 No harm will be done to you and no information you share with the researcher will be used to harm you.
- 23 The information collected might however benefit the community should the research findings be implemented.
- 24 Your privacy will be ensured during the interview.
- 25 Should you feel uncomfortable during the interview in any way, please discuss it with the researcher.
- 26 Should you have any questions at any time, please direct it to the researcher.

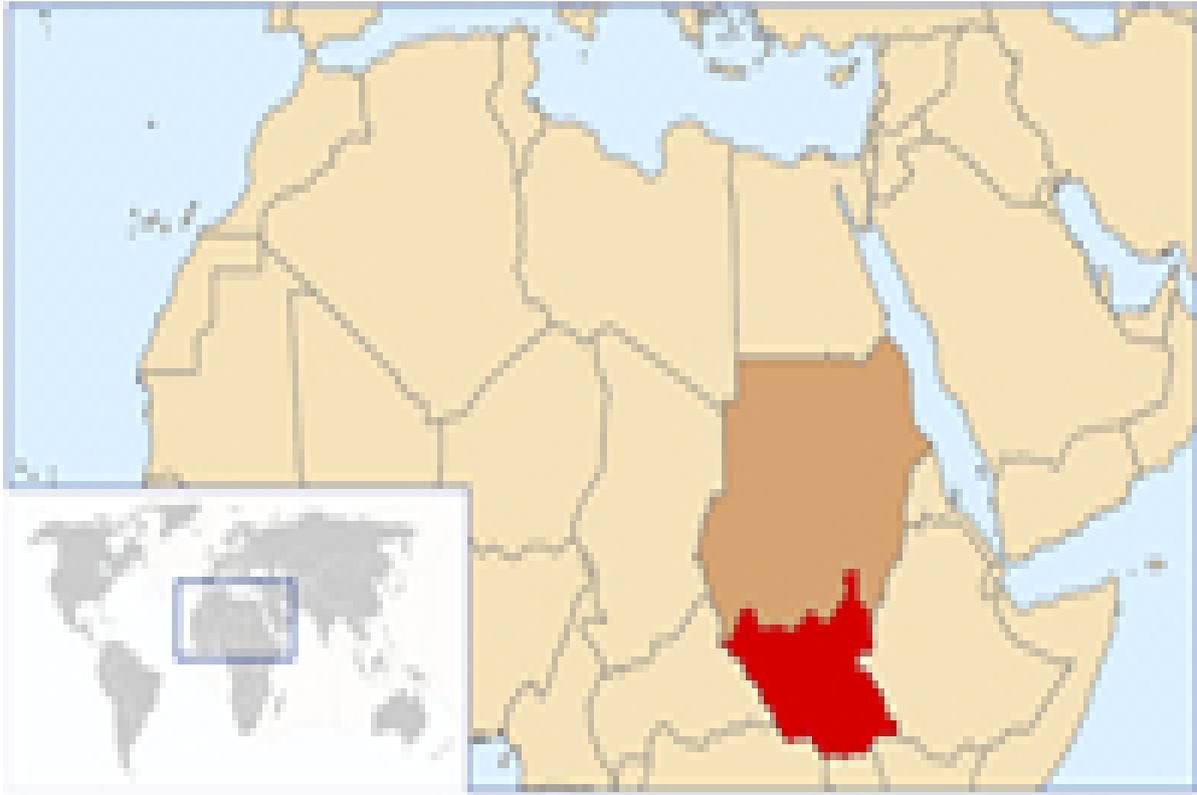
# ANNEXURE H

## Maps

Map 1: Map of Africa indicating where Sudan is located



**Map 2: Map Of Africa showing Southern Sudan (indicated in red Color).**



**Map 3: Map of Southern Sudan indicating where Mundri East County is located.**

