

MEASURES TAKEN BY PARENTS TO PREVENT MALARIA

by

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Summary

A quantitative, explorative, descriptive contextual study was conducted to determine to what extent the malaria control measures proposed by the Tanzanian government had been implemented by parents of children between the ages 0-5 years who lived in Bukumbi village. Structured interviews were conducted with 40 parents of children who had been admitted for malaria treatment during 2007, and the data analysed by computer. Although respondents had a basic knowledge of preventive measures they did not implement actions preventing the anopheles mosquitoes' breeding in this tropical area. The vicious cycle of poverty, malaria episodes and lack of proper malaria health education hampered the implementation of control measures such as the spraying of houses with insecticides. Although the government of Tanzania subsidises insecticide treated bed nets the respondents did not maintain these nets and did not renew the insecticide treatment of these nets. The incidence of malaria is unlikely to decline in the Bukumbi village unless all identified factors are addressed.

KEY TERMS:

Environmental control, insecticide treated mosquito nets, malaria, malaria control, malaria morbidity and mortality rates, spraying of houses with insecticides, Tanzania, under-five-year-old children.

Dedication

*This study is dedicated to all children under
the age of five years, particularly those
with malaria, in Tanzania.*

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ANNEXURE

- A** Requesting and obtaining permission to do research
- B** Informed consent of respondents
- C** Permission received from Ethics Committee of Department of
Health Studies to collect data
- D** Interview schedule
- E** Proof of the services of an editor

LIST OF ABBREVIATIONS

ALu	Artemether-Lumefantrine
CHMTs	Community Health Management Teams
DBL	Duffy Binding-Like
FANC	Focused antenatal care
GDP	Gross domestic product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV/Aids	Human immuno-deficiency virus (HIV) and acquired immune-deficiency syndrome (Aids)
IPT	Intermittent presumptive treatment
ITNs	Insecticide treated nets
MED	Macmillan English Dictionary
MHSW	Ministry of Health and Social Welfare
NATNETS	National Nets Strategy's
NIMR	National Institute of Medical Research
NMCP	National Malaria Control Programme
OAD	Oxford Advanced Dictionary
OPD	Outpatient department
PHC	Primary Health Care
RBCs	Red blood cells
RBM	Roll Back Malaria
RCH	Reproductive and Child Health Clinic
SMARTNET	Social marketing campaign
SPSS	Statistical Package for Social Science data analysis computer program
SSA	Sub-Saharan Africa
TCMD	Taber's Cyclopedic Medical Dictionary
UNISA	University of South Africa UNISA
WHO	World Health Organization
Tshs	Tanzanian shillings

CHAPTER 1

OVERVIEW AND ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Malaria is a disease caused by the plasmodium parasite, and it is transmitted by the bite of an infective female anopheles mosquito (National Malaria Control Programme (NMCP 2006b:3). Approximately 5% of the world's population is infected, and there are globally approximately one million malaria deaths each year (Cook & Zumla 2003:1205). About 90% of these deaths occur in Africa south of the Sahara. The majority of infections in Africa are caused by plasmodium falciparum, the most dangerous of the four human malaria parasites. Other parasites are plasmodium vivax, plasmodium ovale, and plasmodium malariae (Haslett, Chilvers, Boon, Colledge & Hunter 2002:51). Plasmodium falciparum is dangerous because it is the most effective malaria vector. The headache, nausea and vomiting experienced by patients infected with this plasmodium are usually more severe than other malarial infections and there is a greater tendency towards the development of delirium, haemolytic jaundice and anaemia. This type of malaria is the most difficult to control, it causes severe disease and the mortality rate is much greater than in other forms. Almost all deaths are caused by falciparum (Cook & Zumla 2003:1206; Africa Malaria Report 2003).

Malaria continues to be the largest single component of the burden of disease in sub-Saharan Africa (Savigny, Mayombana, Mwageni, Masanja, Minhaja, Mkilindi, Mbuya, Kasale & Reid 2004:2-19). Young children and pregnant women are the population groups at highest risk, because of low immunity. Ninety percent of all malaria deaths in Africa occur in young children (Africa Malaria Report 2003).

It is estimated that 94% of Tanzania's 34.6 million people are at risk of the disease as they live in areas where transmission is possible (Malaria 2002; Government of Tanzania 2003:20). Malaria in Tanzania is believed to be directly or indirectly responsible for about 16 million malaria episodes annually and 100 000 to 125 000 deaths annually, reportedly 70 000-80 000 episodes in the under-five-year-old age group accounted for 64% of all malaria episodes in Tanzania (The Government of Tanzania 2003:19).

Savigny et al (2004:2-19) state that malaria is estimated to consume 3.4% of the gross domestic product (GDP) of Tanzania, at about US\$213 annually per person. Savigny et al (2004:2-19) further say that the problem is greatest in the poorest households and that it is aggravating the poverty cycle. Children are the more common victims of malaria, with mortality rates amongst those aged five years and younger being the highest. The under five-year-old malaria mortality rate in Tanzania during 2004 was 112 per 1 000 live births (Fighting malaria in Tanzania 2004).

In Bukumbi village, 67% of the under five-year-olds were diagnosed with malaria in 2006. Of the total number of malaria-infected children in this village 2.7% died from malaria in 2004 (Tanzania. The state of malaria in Misung District (Mandike commission) 2006:2).

Malaria is a preventable disease. Measures have been planned and implemented to address this problem in Tanzania, such as the *National Strategic Malaria Control Programme*, which consists of four pillars, namely, improved malaria case management, the national scaled-up use of insecticide treated nets (ITNs), the prevention of malaria during pregnancy, and malaria epidemic prevention and control (Savigny et al 2004:2-19; The Government of Tanzania 2003:8). Pillars number two and four are applicable to this research. These preventative measures have been implemented in Bukumbi village by educating parents and other people who attended the hospital for obtaining treatment for their sick children. Despite this educational

programme, the under five-year-old malaria rates are fluctuating although declining slowly. See Table 1.1.

Table 1.1 The prevalence rate of malaria in Bukumbi village

Year	Total population under five-year-olds	Malaria diagnosis under five-year-olds	Deaths due to malaria to under five-year-olds	Prevalence rate
2002	890	720	31	8.1%
2003	913	755	21	8.3%
2004	915	667	20	7.3%
2005	934	426	29	4.6%
2006	942	636	19	6.8%

(Tanzania. The state of malaria in Misung District (Mandike commission) 2002, 2003, 2004, 2005, 2006)

Should the education of parents not be successful, more unnecessary deaths due to malaria amongst children of Bukumbi village could occur.

1.2 BACKGROUND TO THIS RESEARCH

Malaria continues to be the largest single component of disease in sub-Saharan Africa (SSA). Approximately 300 million people worldwide are affected by malaria and 1.5 million people die from malaria every year. Previously extremely widespread, malaria is now mainly confined to Africa, Asia and Latin America (WHO 2004).

Tanzania has the third largest population who are at risk of stable malaria in Africa, after Nigeria and the Democratic Republic of Congo. The United Republic of Tanzania has a population of 34.6 million according to the census of 2002, all of whom are at risk of malaria, as malaria is the most common and dangerous disease in Tanzania (Savigny et al 2004:2-19; Kalugula, Mwinuka, Salim & Mohamed 2005).

According to the government of Tanzania (2003:18), malaria is endemic in almost all parts of Tanzania. Its endemicity varies and is conventionally classified as *unstable seasonal malaria*, *stable malaria with seasonal variations*, and *stable perennial malaria*.

Unstable seasonal malaria occurs with a transmission period of not more than three months a year. In these areas malaria may occur in epidemics with associated increased transmission, morbidity and mortality. The areas where this phenomenon occurs are mountainous, temperatures up to 20°C and mean vapour pressures of 13-15 millibars. In higher altitude areas, there is usually no malaria transmission. In recent years, this has been changed, and the number of epidemics increased, generally with little immunity. People in all age groups are susceptible to severe malaria in these areas.

Stable malaria with seasonal variations occurs where there is seasonal intense transmission for three to six months per year. It occurs in high altitude plains, with temperatures above 15°C, and mean vapour pressures of 10-20 millibars. About 33% of the Tanzanian population live in these areas. These people have weak immunity in all age groups, and are therefore susceptible to severe malaria.

Stable perennial malaria occurs along the Tanzanian coast, extending inland as far as 160-240 km. These areas have annual temperatures of 24-32 C, mean vapour pressures of 26-29 millibars, and are inhabited by about 42% of the population. Most age groups have considerable immunity, which increases with age.

Tanzania is one of the poorest countries in the world with an annual Gross Domestic Product (GDP) of US\$213 per capita in 2000, implying that 36% of the population live below the basic needs poverty line (Savigny et al 2004:2-19). It is, however, very expensive for any country to control malaria. Malaria is estimated to consume 3.4% of the Tanzanian GDP or about US\$240 million annually (Tanzania National Bureau of Statistics, 2003, cited by Savigny et al 2004:2-19). Tanzania spends approximately \$11.37 on the health of one individual according to Ministry of Finance, government of

Tanzania, 2001, cited by Savigny et al 2004:2-19). Of this, US\$2.14¹ is spent on malaria services alone. About 75% of malaria expenditures are borne by the households, with the government contributing 20% and partners such as the Global Fund to Fight Aids, Tuberculosis and malaria, the Japanese International Co-operation Agency and the World Health Organization (WHO) contributing 5% of the household malaria expenditure. Of this figure, about one third is spent on anti-malarial drugs and almost half on mosquito nets for beds, insecticides, mosquito coils and other preventive strategies. The financial burden is therefore greatest on the poorest households, contributing to the continuing poverty cycle (Savigny et al 2004:2-19; The Government of Tanzania 2003:21). The problem of controlling malaria in poor communities is aggravated by inadequate health structures and poor socio-economic conditions (WHO 2004).

Malaria can, however, be controlled with the cooperation of all stakeholders, including members of a community. The new global policy *Health for all in the twenty-first century* also reinforces active client participation in health care delivery as part of the Primary Health Care (PHC) strategy (Stone, McGuire & Eigsti 2002:43). Unfortunately, pervasive morbidity and high mortality of malaria persist because of failed commitment between those at risk of malaria transmission and the available preventive and curative health systems (Savigny et al 2004:2-19).

The Tanzanian Ministry of Health (MoH) has taken steps to address the malaria problem by introducing the *National Malaria Medium-Term Strategic Plan*. This programme is built around four pillars, namely

- improved malaria case management;
- vector control “National scale use of insecticide treated nets (ITNs)”;
- prevention of malaria in pregnancy; and
- malaria epidemic prevention and control, which emphasise parents’ knowledge about prevention and control issues to their under five-year-old children to reduce

¹ 1 American dollar is more or less equal to 10000 Tanzanian shilling in May 2007.

malaria mortality and morbidity rates in this age group (Savigny et al 2004:2-19; The Government of Tanzania 2003:8).

In this research, the success of the implementation of pillars number 2 and number 4 of the *National Malaria Control Programme Strategic Plan* for parents of the under five-year-old target group has been investigated. The reasons for selecting only the second and fourth pillars were that:

- parents are educated about early diagnosis, treatment and the measures that they could take to prevent malaria;
- should parents do what they are taught, this could lower the morbidity and mortality rates of the under five-year-old group; and
- the study of all four pillars would form part of a large project, falling beyond the scope of this study.

The hospital and disabled care dispensary centre of Bukumbi village, where this research was conducted, are located in Idetemya ward, Usagara division, in the Misungwi district of the Mwanza region. The Mwanza region lies between the latitudes 2°S and 3°S, and 31°E and 34°E. It has long periods of rain, which occur from November to May, and short periods of rain (about 1 000-1 200 mm) from September to October. Its altitude ranges from 1 000-2 000 metres above sea level (Kalugula et al 2005:11-34), therefore it falls within the unstable seasonal malaria geographical area.

The Bukumbi hospital serviced a population of 4 290 in 2006. In terms of preventive care, the health care workers provide health education to patients in the outpatient department (OPD) and in the wards. Twelve health-education topics are covered each year with each topic running for one month. According to this schedule, malaria is taught in January only. This type of health education is usually conducted whenever the clients attend to the Reproductive and Child Health Clinic (RCH) or when patients are admitted to the children's ward (Bukumbi Hospital RCH clinic records 1999-2003).

This following map has been included to indicate where Tanzania is within the African

continent.



Figure 1.1: Map of Africa (The African Guide, Sa).

This following map is of Tanzania to indicate where the Mwanza region is. The Bukumbi village where this research was conducted is situated in this region.



Figure 1.2 Map of Tanzania (World Atlas, Sa).

Bukumbi Disabled Care Centre dispensary is situated about 1 km from the hospital, and deals with outpatient services for the villagers and referrals for seriously ill patients to Bukumbi Hospital. The hospital also conducts health education services, including topics on malaria. The patients are taught as they present for medical assistance. Parents are then required to implement the measures that have been explained to them to prevent re-infection of malaria. These measures include the

- implementation of proper environmental sanitation;
- use of protective measures, such as screening their houses' windows and doors with mosquito netting;
- use of mosquito bed nets impregnated with insecticide;

- wearing of protective clothes that cover most of the body, especially the ankles, at dusk; and
- use of sprays/coils to kill mosquitoes.

Despite the health education programme provided to patients (and parents of children) in hospital, the under five-year-old children's morbidity and mortality rates fluctuated, declined slowly and remained higher than those of adults (Tanzania. The state of malaria in Misung District (Mandike commission) 2006:3). According to this commission's report, the under five-year-old children's' population of Bukumbi village were 942 in 2006, of whom 636 (67.5%) contracted malaria. Among 3 348 adults, only 991 (29.6%) got malaria during the whole year.

It was therefore imperative to explore the extent of the effectiveness of the preventive measures implemented by the parents of the under five-year-old population group to enable leaders to take the necessary steps to address the problem of malaria morbidity and mortality rates.

1.3 RATIONALE OF THE RESEARCH PROBLEM

It was on the basis of the following aspects that the research problem was selected.

- Proper preventive measures for malaria help to lower morbidity and mortality rates of the communities, particularly among under five-year-old children.
- Although preventive measures for malaria seem to be practised in different areas in Tanzania, the morbidity and mortality rates of under five-year-old children are still higher than those of adults.
- Parents with under five-year-old children should be competent to apply effective measures concerning malaria prevention to their under five-year-old children.
- Health care providers have been teaching patients about malaria for many years. There is, however, no official way of evaluating the practicality of what is already known.

- The effectiveness of parents regarding the prevention of malaria needs to be investigated.
- No proof could be found of any research previously done in the Bukumbi village, Tanzania, to determine whether the parents of under five-year-old children have indeed implemented the measures they have been taught to prevent malaria.

1.4 STATEMENT OF THE PROBLEM

The morbidity and mortality rates of malaria for the under five-year-old children are higher than those of adults in Bukumbi village, Tanzania. The rates could be lower if parents implement the preventive measures they have been taught. It is therefore important to investigate to what extent these measures are implemented by the parents of Bukumbi village regarding their under five-year-old children. From this problem statement the following research questions were derived.

1.4.1 Research questions of the study

The research questions which directed the research process were the following:

- What do the parents of under five-year-old children in Bukumbi village, Tanzania know about malaria?
- What do the parents of under five-year-old children in Bukumbi village, Tanzania know about the measures that could be implemented to control malaria?
- Where did the parents of under five-year-old children in Bukumbi village, Tanzania get their knowledge?
- Which of the measures to control malaria have the parents of Bukumbi village, Tanzania implemented?
- Which factors prevented the parents of under five-year-old children in Bukumbi village, Tanzania, from implementing malaria control measures?

1.5 AIM OF THE RESEARCH

The aim of the research was to investigate which of the measures that have been taught to the parents of under five-year-old children in Bukumbi village, Tanzania have been implemented to control malaria.

1.6 RESEARCH OBJECTIVES

In view of the aim and problem statement, the objectives of the research were to:

- Explore and describe the knowledge of the parents on malaria in the under five-year-old target group of Bukumbi village, Tanzania;
- explore the knowledge of malaria control of the parents of the under five-year-old target group of Bukumbi village, Tanzania;
- determine where the parents of under five-year-old children of Bukumbi village, Tanzania obtained their knowledge;
- explore and describe which of the suggested measures by the health authorities to control malaria have been implemented by parents of the under five-year-old target group in Bukumbi village, Tanzania.
- identify the factors that prevented parents of the under five-year-old target group of Bukumbi village, Tanzania, to implement malaria control measures.

1.7 SIGNIFICANCE OF THE RESEARCH

It was important to conduct this research as no recorded research could be found on the measure taken by parents with under five-year-old children in Bukumbi village, Tanzania, for the control of malaria.

Findings of the current research could be used to improve malaria control programmes and ultimately to address the problems parents of the under five-year-old target group might experience, which prevent the successful implementation of control measures.

1.8 OPERATIONAL DEFINITIONS

Concepts relevant to this research include the following:

► *Preventive measures*

According to the Chambers English Dictionary (2001:561) and the Oxford Advanced Learner's Dictionary (2002:922), *preventive measures* refers to the ability to hinder or stop someone from doing something, or stopping something bad from happening in the capacity that can be evaluated.

In this research, the term *preventive measure* implies the activities executed by the parents of children under the age of five years in Bukumbi village, Tanzania to prevent malaria infection from occurring among the under five-year-old target group.

► *Parents*

According to the Taber's Cyclopedic Medical Dictionary (2005:1598); Oxford Advanced Learner's Dictionary (2002:847) and Chambers English Dictionary (2001:510), a *parent* is someone's father or mother or the adopter or guardian of a child.

In this research, the term *parents* refers to the under five-year-olds' father, mother, or guardian, who has to implement the malaria control measures as regards that he or she had been taught.

► *Malaria*

Malaria is a parasitic disease caused by the protozoa (plasmodium), transmitted by the bite of an infective female anopheles mosquito that produces recurring bouts of fever, usually in hot countries (Ministry of Health and Social Welfare (MHSW) 2006:3; Taber's Cyclopedic Medical Dictionary 2005:1291; Macmillan English Dictionary 2002:866; Chambers English Dictionary 2001:424).

In this research, the term *malaria* refers to a serious parasitic illness caused by the bite of an infected female anopheles mosquito that produces recurring bouts of fever and

which could be fatal to children under the age of five years in Bukumbi village, Tanzania.

► *Falciparum malaria*

A tropical parasitic disease caused by one of the genus plasmodium and carried by infected anopheles mosquitoes. This parasite uses red blood cells to complete its reproductive cycle. Common symptoms of a malaria attack include fever, chills, sweats and body aches (Biology-online Dictionary 2007). In this research, falciparum malaria is the parasitic disease of the genus plasmodium.

► *Complicated malaria*

This type of malaria is characterised by a severe, rapid downhill course, caused mainly by plasmodium falciparum and rarely by plasmodium vivax, and has a poor prognosis (Crusade against malaria 2007). In this research, it also indicates complicated malaria characterised by severe signs of malaria with poor prognosis, caused by plasmodium falciparum.

► *Stable malaria*

The term is used where the populations are continuously exposed to a fairly constant rate of malarial occurrences (WHO 2006:5).

► *Uncomplicated malaria*

The type of malaria classified by milder infections, caused by plasmodium vivax. The chance of involvement of other organs besides the liver is much less (Crusade against Malaria 2007).

In this research, it refers to malaria that is classified as a milder disease and which does not involve the internal organs of the under five-year-old children of Bukumbi village.

► *Incidence*

The number of new cases or events occurring over any specified period. The term is used to record an intense, short-lived disease.

► *Prevalence rate*

According to Stone et al (2002:352), this comprises –

The number of new cases in a specified period X multiplier

Population at risk during the same period.

In this research prevalence means the number of new under five-year-olds-children in Bukumbi village malaria cases, for the period of one year.

1.9 RESEARCH METHODOLOGY

A quantitative, descriptive, explorative research design was used to investigate the control measures implemented by the parents of under five-year-old children in Bukumbi village.

1.9.1 Quantitative research

Quantitative research is a systemic scientific investigation of quantitative properties and phenomena and their relationships. It is often an interactive process whereby evidence is evaluated, theories and hypothesis are refined and technical advances made. The quantitative research paradigm is normative, measures objective data and is often applied for scientific investigations in nursing (Burns & Grove 2001:26; Polit & Beck 2008:16).

As this research measures how many times parents applied the measures they were taught to prevent malaria among their under five-year-old children, quantitative research was the best method to use in this study.

The quantitative method as applied in this research will be discussed in more detail in Chapter 3.

1.9.2 Exploratory research

According to Polit and Beck (2008:20), exploratory research begins with some phenomenon of interest and explores the full nature of the phenomenon. Since a structured research method has been used to collect data and no research findings could be located where this problem has been researched in the past, this research design could also be considered to be exploratory by nature.

The characteristics of explorative research will be discussed in more detail in Chapter 3.

1.9.3 Descriptive research

Descriptive research provides an accurate portrayal or account of characteristics of a particular individual situation or group (Polit & Beck 2008; 19; Burns & Grove 2001:29). The current research explored the problem that existed in the implementation of the preventative measures the parents of under five-year-old children had been taught and describes the measures these parents implemented, as well as the reasons why some measures were not implemented, to prevent malaria among under five year old children.

1.9.4 Conceptual framework of the research

The value of conceptual frameworks is that it directs attention to the specific phenomena of interest and focuses attention on particular types of relationships (Mugenda & Mugenda 2003:214).

According to the government of Tanzania (2003:52), Community Health Management Teams (CHMTs) will encourage individual and community leaders from the village, faith-

based organisations, community-based organisations and village health committees to take an active role in creating awareness about malaria and the available control interventions in their respective constituencies. Messages should aim to promote positive behaviours towards malaria control among community members and households.

Health education is provided to community leaders, school teachers, estate workers and communities in epidemic prone districts (covering vector control, self-protection and use of insecticide-treated nets [ITNs] as well as recognition of the early signs of fever/malaria and case management). Other measures applied to control epidemics include larviciding and house spraying (Government of Tanzania 2003:22).

This research investigated which measures taught to parents to prevent malaria among their children under the age of five years, had actually been implemented in Bukumbi village, Tanzania.

1.9.5 Research population

In this study, the research population comprised 705 parents whose children in the under five-year-old target group had been treated by the outpatient department and admitted to the Bukumbi Hospital, and parents whose children in the under five-year-old-target group had been treated as outpatients in the Bukumbi Disabled Care Centre on account of malaria over the past five years. Parents had to come from Bukumbi village, and had to be willing to participate in the study.

1.9.6 Sampling method

A purposive sampling method was selected for this research. This technique involves the conscious selection by the researcher of certain subjects or elements to include in the study. It is also sometimes referred to as *judgment sampling*, as the researcher has to use his/her own judgment in selecting the respondents that would be representative of the phenomenon studied (Burns & Grove 2001:376).

This method will be discussed in more detail in Chapter 3.

1.9.6.1 *The sample size*

From a total of 705 parents, of children under the age of five years who had been diagnosed with malaria, and who had been treated in the Bukumbi Hospital and Bukumbi Disabled Care Centre, only 40 respondents were available to take part in the research.

The sample comprised 40 (5.7%) of the 705 parents who met the inclusive criteria.

1.9.7 Data collection approach

The research instrument used to collect data from the parents of under five-year-old patients with uncomplicated malaria was the structured interview schedule. Interviews are methods of data collection where a researcher questions a respondent personally (Brymen 2004:113; Burns & Grove 2001:421). The structured interview was considered the best method to collect data as many of the villagers in Bukumbi are illiterate and would therefore not have been able to complete questionnaires.

The interview schedule consisted of mainly closed-ended questions, but some open-ended questions have been included to allow the respondents to give their honest opinions in their own words on certain aspects (Mugenda & Mugenda. 2003:72).

The research instrument and the way it was compiled, tested and used is discussed in more detail in Chapter 3.

1.9.8 Analysis of data

Data analysis was done electronically, making use of the Statistical Package for Social Science (SPSS) version 14 data analysis computer program. The findings are presented in tables, pie and bar diagrams and graphs in Chapter 4 of this dissertation.

Data analysis procedures will be discussed in more detail in Chapters 3 and 4.

1.10 RELIABILITY AND VALIDITY OF THE RESEARCH INSTRUMENT

Research findings are worthless unless it can be proven that the instrument was reliable and valid.

1.10.1 Reliability

The reliability of a research instrument is concerned with consistency, accuracy, precision, stability, equivalence and homogeneity (Polit & Beck 2008:195).

The research instrument used in the current research (structured interview schedule), was compiled by the researcher after a literature review had been done. Two experts in malaria control were consulted. The instrument was then pre-tested at a hospital, which did not participate in the actual survey, by interviewing five parents who were excluded from the final study.

1.10.2 Validity

A research instrument can be considered to be valid when it accurately measures what it is supposed to measure (Mugenda & Mugenda 2003:102; Polit & Beck 2008: 196).

The interview schedule was properly calibrated by defining *malaria* and identifying the measures the parents of under five-year-old children with uncomplicated malaria were

supposed to implement in order to prevent future occurrences of malaria. The research instrument was tested for face validity by two supervisors at the University of South Africa (UNISA) and during the pre-testing of the instrument, and by two colleagues who are experts in malaria control.

Reliability and validity will be discussed in more detail in Chapter 3.

1.11 AN OVERVIEW OF ETHICAL CONSIDERATIONS

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

- district medical officer, Misungwi district, where the village is situated. (See Annexure A);
- village executive officer of Bukumbi village, where the participants lived. (See Annexure A);
- medical officer in charge of the Bukumbi Hospital where the respondents' children had been admitted. (See Annexure A);
- person in charge of the Bukumbi camp dispensary. (See Annexure A);
- respondents themselves. (See Annexure B); and
- the Ethics and Research Committee of the Department of Health Studies, UNISA (See Annexure C).

During the research, special attention was given to the ethical aspects of the research, such as

- the respondents' rights to self-determination; and
- respect and privacy of respondents and institutions.

Informed consent was obtained from each interviewee (see Annexure B).

The ethical principles applied in this research are discussed in more detail in Chapter 3.

1.12 CHAPTER LAYOUT

This research report has been divided into the following chapters:

Chapter 1: Introduction and overview of the study

Chapter 2: Literature review

Chapter 3: Research methodology

Chapter 4: Data analysis and discussion

Chapter 5: Summary, limitations, conclusions and recommendations

1.13 CONCLUSION

To curb malaria nationwide, the Tanzanian Ministry of Health developed the *National Malaria Medium-Term Strategic Plan*. This strategic plan consists of "four pillars". The second and fourth pillars concentrate especially on health education for malaria epidemic prevention and control, but also on the use of ITNs. Educating the parents of children under the age of five years, who were the most at risk of developing malaria, could help to reduce the under five-year-old malaria morbidity and mortality rates.

Although parents with children under the age of five years who have been admitted with malaria at the Bukumbi Hospital have received the above-mentioned health education, the morbidity and mortality rates have been fluctuating and finally gone down slowly. It is therefore imperative to explore and describe what these parents were taught, what they knew about the preventative measures were and whether recipients implemented what they had been taught.

In this chapter, the background of the research, the rationale, objectives and research questions, as well as the conceptual framework of the research were briefly outlined. An overview was also given of the design and methodology used to collect data and of the reliability and validity of the research instrument. Ethical aspects pertaining to the research were also considered.

In the next chapter, a literature review relevant to the prevention and control of malaria will be presented.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In the previous chapter, an outline was given of the study that was undertaken, the background of the problem, as well as the rationale for the study and the objectives and research questions guiding this research.

Malaria is still the most common dangerous disease. An estimated 100 000 malaria deaths per year underline the need for improved malaria control in Tanzania. Hence, a preventive rather than curative approach is appealing and would reduce the impact of poor access to curative services. Falciparum malaria is a major cause of mortality in children younger than five years in Africa (Searching for solutions to the malaria crisis 2004).

To reduce mortality of the under five-year-old children, greater emphasis on the responsibility of the parents to recognise danger signs at home, enhanced care-seeking behaviours, improved quality of care at health facilities and better adherence to treatment are required (Savigny, Mayombana, Mwageni, Minhaj. Mkilindi, Mbuya, Kasale & Reid 2004:3-27). The parents have been educated about these aspects but do not seem to implement these effectively at home because the prevalence rates of malaria in this area are fluctuating.

This chapter provides a literature review of malaria, which includes malaria as a disease, treatment of malaria, as well as the prevention and control of malaria.

2.2 THE GLOBAL PICTURE OF MALARIA AS A HEALTH PROBLEM

In the nineteenth century, malaria was reported in northern Europe, North America and Russia and malaria in southern Europe was common. Since then it has been eradicated from those areas, and the number of cases in the Middle East, China,

and the Indian subcontinent has declined, but elsewhere in the tropics there has been a resurgence of the disease. This has been associated with increasing resistance of the anopheline vector to insecticides and of the parasite to the anti-malarial drugs. Approximately 270 million people worldwide suffer from malaria and there are between 1 and 2.5 million deaths each year. Most of the deaths occur among Africa's children. The mortality rate is raising (Cook & Zumla 2003:1205-1206).

About 90% of all malaria deaths in the world occur in Africa south of the Sahara and 90% of all malaria deaths in Africa occur among young children (Africa Malaria Report Sa).

The impressive body of work published by the World Health Organization (WHO) on the global burdens of disease consistently single out the African continent as a region deserving particular attention for future health investment (Snow, Korenromp & Gouws 2004:16-24). Some of the important factors that might have contributed to the increasing malaria burden in these Africa settings include; drug resistance, more frequent exposure of non-immune populations, emergence of HIV/Aids, climate and environment changes, and breakdowns of control programmes (Africa Malaria Report 2003). According to Monasch, Reinisch, Steketee, Korenromp, Alnwick and Bergevin (2004:232-238), African heads of state participated in the Abuja summit in April 2000 on Roll Back Malaria (RBM) and agreed to aim for coverage of Sub-Saharan Africa whereby 60% of children younger than five years of age with fever should receive prompt and effective anti-malarial treatment, 60% of household members, especially children younger than five years of age, should sleep under ITNs. Some African countries have started or accelerated the implementation of these interventions in 2000 and 2001, and many others have followed in 2002.

According to the government of Tanzania (2003:35), at least 60% of the children under five years of age and 60% of pregnant women will be sleeping under ITN's by 2007. The strategy to deliver these measures, relies on three interdependent components:

- the ITN cell of the *National Malaria Control Programme* (NMCP), which will provide the overall coordination and monitoring for the National Nets Strategy's (NATNETS) ITN activities in Tanzania;
- a contracted social marketing campaign (SMARTNET), which will also manage the delivery of insecticide treatment kits for ITNs; and
- an ITN voucher scheme, funded through the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) to reduce the amount that pregnant women will have to pay for an ITN in the market place, and to provide free insecticide re-treatment kits for infants who complete their DPT3 and measles vaccination.

Recent surveys show that there is already widespread use of mosquito nets especially in urban areas of Tanzania. In the Mwanza urban area, 82% of households have at least one net. However, on average only 12% of households have at least one ITN. About 11% of children under five years old and 8% of pregnant women sleep under ITNs. The availability and use of mosquito nets in the country varies according to location (rural/urban), the malaria transmission pattern and the presence of an ITN project in the area (Bukumbi Hospital Reproductive and Child Health Clinic Records 2005:2).

In Bukumbi village, an ITN voucher scheme for pregnant mothers was started in October 2005. From 2005 to April 2007, a total of 465 pregnant women in the village received this service. During the first visit, pregnant women receive the voucher amounts 2 750/-Tshs. The vouchers can be used to buy nets at special shops identified by the community. The voucher scheme, for under five-year-old children, started in March/2007 and amounts to 3 250/- Tshs. A total of 22 children received the service between March 2007 and mid-April 2007 (Bukumbi Hospital Reproductive and Child Health Clinic Records 2005:2).

2.3 MALARIA AS A DISEASE

The word *malaria* is derived from the Italian term mal aria means bad air, as previously it was thought that the foul air emanating from swamps caused fever (Munthali 2005:127-146). The nature of the clinical disease depends on the pattern

and intensity of malaria transmission in the area of residence. Malaria occurs throughout the tropics and subtropics (Haslett et al 2003:51).

2.3.1 Causes of malaria and the life cycle of the malaria parasite

Malaria is caused by the protozoan parasite of the genus plasmodium and is transmitted to humans through the bite of the female anopheles mosquito (Ministry of Health 2006:3; Haslett et al 2002:51). Four species of plasmodium can produce the disease in its various forms:

- plasmodium falciparum
- plasmodium vivax
- plasmodium ovale
- plasmodium malaria

Plasmodium falciparum is the most widespread and dangerous of the four because the most effective malaria vector – the mosquito *Anopheles gambiae* – is the most widespread in Africa and the most difficult to control (Haslett et al 2002:51).

According to Cook and Zumla (2003:1206-1207), malaria is transmitted by some species of anopheline mosquitoes. Malaria transmission does not occur at temperatures below 16 C or above 33 C, and at altitudes more than 2 000m above sea level, because development in the mosquito (sporogony) cannot take place at these altitudes and temperatures. The optimum conditions for transmission are high humidity and an ambient temperature between 20 and 30 C. Although rainfall provides breeding sites for mosquitoes, excessive rainfall may wash away mosquito larvae and pupae (Cook & Zumla 2003:1205). The behaviour of man also plays an important role in the epidemiology of malaria. There should be a human reservoir of viable gametocytes to transmit the infection. In areas of high transmission rates, infants and young children are more susceptible to malaria than the more immune older children and adults (Cook & Zumla 2003:1206). Hence, the importance of reducing the number of cases with malaria in any area cannot be overemphasised. The more malaria sufferers there are in any area, the greater the likelihood of mosquitoes spreading malaria to other persons in the area.

In Bukumbi village, the average temperature is 30 °C (Kalugula et al 2005:46). This is the ideal temperature for transmission of malaria. The altitude of Mwanza region where Bukumbi village is situated, is 1 000-2 000 meters above sea level (Kalugula et al 2005:11). The village has two raining seasons per year, and the rain amounts to 1 000-1 200 millimetres per year. The rain is not excessive, thus allowing the larva and pupae to grow without being washed away. The area is also situated near Lake Victoria where the mosquitoes breed easily because of the moist warm environment and the availability of water.

Malaria transmission to man depends on several interrelated factors. The most important of these pertain to the anopheline mosquito vector and, in particular, its longevity. As sporogony (development of the sporozoite¹ parasites in the vector) takes over a week (depending on ambient temperatures), the mosquito must survive for longer than this after feeding on a gametocyte-carrying human, if malaria is to be transmitted (Cook and Zumla 2003:1206). MacDonald (in Cook & Zumla 2003:1206-1207) provides the following formula for the likelihood of infection based on the sporozoite rates, namely the proportion of anopheline mosquitoes with sporozoites in their salivary glands:

$$S = \frac{p^n a x}{Ax - \log_e p}$$

where p = the probability of mosquito survival through one day; n = duration in days, of the extrinsic cycle of the parasite in the mosquito; a = average number of blood meals on man per day, and x = the proportion of bites infective to man. The probability of a mosquito surviving (n) days is given by:

$$\frac{p^n}{-\log_e p}$$

The inoculation rate, or the mean daily number of bites (h) received by sporozoite-bearing mosquitoes is represented by:

$$h = m a b s$$

where m = anopheline density in relation to man, and b the proportion of bites that are infectious. The reproductive rate of the infection (r) or the number of secondary cases resulting from a primary case is then represented by:

¹ Greek: sporos, seed + zoon, animal = cells that infect new hosts – develop in the mosquito's salivary glands

$$r = \frac{ma^2bp^n}{-z \log_e p} (1 - ax)$$

where z is the recovery rate, or the reciprocal of the duration of human infectivity. This is usually estimated at 80 days for plasmodium falciparum in a non-immune subject, $z = 0.0125$. The term:

$$\frac{1 - ax}{ax - \log_e p}$$

refers to the proportion of anopheline mosquitoes "not yet infected". When transmission is very low (x approaches 0), then the basic reproductive rate (r_0) reduces to:

$$r_0 = \frac{ma^2bp^n}{-z \log_e p}$$

thus, as a general approximation, malaria transmission is directly proportional to the density of the vector, the square of the number of times each day that the mosquito bites a human and the tenth power of the probability of the mosquito surviving for one day. The importance of vector longevity in determining transmission is important and focuses control measures on the adult mosquito. At very high levels of transmission, there are considerable reserves in the system and large reductions in transmission reduce malaria by a negligible amount (implying that a reduction in transmission of 90% from 300 infectious bites per year to 30 bites per year will make very little difference to the prevalence of malaria) – but as r_0 approaches the value of 1 (below which the disease dies out), small reductions in r_0 have very large effects on the prevalence of malaria. Control programmes can be very effective in these circumstances, and can eradicate malaria, as indeed they did in Europe where r_0 was very low in many areas, and the vector rested inside houses and could be attacked with residual insecticides. Vectors differ considerably in their natural abundance (particularly in terms of the season of the year), feeding and resting behaviours, breeding sites, flight ranges, choice of blood source (many anopheline vectors also feed on animals) and vulnerability to environmental conditions and insecticides. Thus, there is also considerable variation in their ability to transmit malaria (the vectorial capacity). Of the nearly 400 species of anopheline mosquitoes (many of which are species complexes), approximately 80 can transmit malaria, 66 are considered natural vectors, and about 45 are considered important vectors.

Each vector has its own behaviour patterns (Cook & Zumla 2003:1206-1207). The WHO (2004:2-3) said, like all other mosquitoes, the anophelines breed in water, each species having its preferred breeding grounds, feeding patterns and resting places. Their sensitivity to insecticides is also highly variable. Plasmodium develops in the gut of the mosquito and is passed on in the saliva of an infected insect each time it takes a new blood meal. This happens because the mosquito injects some saliva into its victim to prevent clotting of the blood before it sucks blood from the victim. In this way, the infected mosquito actually injects plasmodium into its victim prior to sucking his/her blood (TDR of WHO 1997).

According to Cook and Zumla (2003:1209), in most cases, relatively few sporozoites are injected (approximately 8-15), but up to 100 may be introduced in some instances. Most sporozoites come from the larger salivary ducts and represent only a small fraction of the total number in the salivary gland. After injection, they enter the circulation, either direct or via lymph channels, and rapidly target the hepatic parenchymal cells. Within 45 minutes of the bite all sporozoites have entered the hepatocyte and there begins a phase of asexual reproduction. This stage lasts on average between 5.5 (plasmodium falciparum) and 15 days (plasmodium malariae) before the hepatic schizont ruptures to release merozoites² into the blood stream. In some instances, the primary incubation period can be much longer (Cook & Zumla 2003:1209). In plasmodium vivax and plasmodium ovale infections, a proportion of the intrahepatic parasites do not develop, but instead rest inert as sleeping forms or hypnozoites, to awaken weeks or months later, and cause the relapses which characterise infections with these two species. During the pre-erythrocytic or hepatic phase of development, considerable asexual multiplication takes place and many merozoites are released from each ruptured infected hepatocyte (Cook & Zumla 2003:1209). However, as only a few liver cells are infected, this phase is asymptomatic for the human host. The merozoites liberated into the bloodstream closely resemble sporozoites. They are motile ovoid forms, which rapidly invade red blood cells. The process of invasion involves attachment to the erythrocyte surface, orientation so that the apical complex (which protrudes slightly from one end of the

²Greek: meros, part [of a series], +zoon, animal) is a daughter cell of a protozoan parasite.

merozoite and contains the rhoptries³, the micronemes⁴, and dense granules) abuts the red cell, and then interiorisation takes place by a vigorous wriggling or boring motion inside a vacuole composed of the invaginated erythrocyte membrane (Cook & Zumla 2003:1209). Once inside the erythrocyte, the parasite lies within the erythrocyte cytosol enveloped by its own plasma membrane, and a surrounding parasitophorous vacuolar⁵ membrane. It has been suggested that the parasite may be connected directly to the surrounding plasma by a parasitophorous duct, but this is widely disputed. The attachment of the merozoite to the red cell is mediated by the attachment of one or more of a family of the merozoite apical complex to a specific erythrocyte receptor (Cook & Zumla 2003:1209). For *Plasmodium falciparum*, much attention was focused on the merozoite protein, a member of the Duffy Binding-Like (DBL) super family of genes encoding ligands for host-cell receptors. This binds to sialic acid and the peptide backbone of the red cell membrane sialoglycoprotein glycophorin⁶ A. But other, sialic acid dependent and independent pathways of invasion also occur, indicating considerable reserves in the invasion system (Cook and Zumla 2003:1209). During the early phase of blood stage development (< 12 hours) the small ring forms of the four parasite species often appear similar under light microscopy. The young developing parasite looks like a signet ring or, in the case of *Plasmodium falciparum*, like a pair of stereo headphones, with darkly staining chromatin in the nucleus, a circular rim of cytoplasm, and a pale central food vacuole. Parasites are freely motile within the erythrocyte. As they grow, they increase in size logarithmically and consume the erythrocyte's contents (most of which is haemoglobin) (Cook & Zumla 2003:1209). Proteolysis of haemoglobin within the digestive vacuole releases amino acids, which are taken up and utilised by the growing parasite for protein synthesis, but the liberated haem poses a problem. When haem is freed from its protein scaffold, it oxidises to the toxic ferric form (Cook & Zumla 2003:1209). Toxicity is avoided by spontaneous dimerisation (using histidine-rich protein 2 as a scaffold) to an inert crystalline substance, haemozoin. Non-polymerised haem is found in the food vacuole and is degraded by glutathione. The digested products, mainly the brown or

³ Acidic compartments.

⁴ Small rod-like structures, with rounded ends.

⁵ A vacuole (vesicle) formed by layers of endoplasmic reticulum around an intracellular parasite which may serve to isolate the parasite and enclose it for lysozymal attack.

⁶ Glycophorin is the major sialoglycoprotein of the human erythrocyte membrane.

black insoluble refractile pigment haemozoin, can be seen within the digestive vacuole of the growing parasite (Cook & Zumla 2003:1209). To obtain amino acids and other nutrients and to control the electrolytic milieu in the infected erythrocyte, the parasite inserts specific transporters and chemicals into the red cell membrane. These and other disruptions make the red cell more permeable. The infected erythrocyte becomes progressively less elastic and deformable and more spherical as the parasite grows (Cook & Zumla 2003:1209). At approximately 12-14 hours of development, plasmodium falciparum parasites begin to exhibit a high molecular weight strain-specific variant antigen, plasmodium falciparum erythrocyte membrane protein 1, on the surface of the infected red cell, which mediates attachment to vascular endothelium. This is associated with the formation of knob-like projections from the erythrocyte membrane. Expression increases towards the middle of the cycle (24 hours) (Cook & Zumla 2003:1209). These red cells then progressively disappear from the circulation by attachment or cyto-adherence to the walls of venules and capillaries in the vital organs. This process is called 'sequestration'. High parasitaemias (over 2%) are usually caused by plasmodium falciparum. Approximately 36 hours after merozoite invasion, repeated nuclear division takes place to form a segmenter or schizont (Cook and Zumla 2003:1209). Eventually the growing parasite occupies the entire red cell, which then becomes spherical, rigid, depleted in haemoglobin and full of merozoites. This then ruptures and between six and 36 merozoites are released, destroying the remnants of the red cell. These rapidly reinvade other red blood cells and start a new asexual cycle. Rupture of the schizont releases more merozoites into the blood (Cook & Zumla 2003:1209).

Progressively breaking down the red cells induces bouts of fever and anaemia (Haslett et al 2002:52). Thus the infection expands logarithmically at around tenfold per cycle. The asexual life span is approximately 48 hours for plasmodium falciparum (Cook & Zumla 2003:1210).

After a series of asexual cycles in plasmodium falciparum, a subpopulation of parasites develops into sexual forms (gametocytes), which are long-lived and motile. This process (gametocytogony) takes about 7-10 days. The male to female gametocyte sex ratio is approximately 1.4. Following ingestion in the blood meal of a biting female anopheline mosquito, the male and female gametocytes become

activated. The male gametocytes undergo rapid nuclear division and each of the eight nuclei formed associates with a flagellum (20-25 µm long). The motile male microgametes then separate and seek the female macrogametes. Fusion and meiosis then takes place to form a zygote (Cook & Zumla 2003:1207). For a brief period, the malaria parasite is diploid. Within 24 hours, the enlarging zygote becomes motile and this form (the ookinete) penetrates the wall of the mosquito mid-gut (stomach) where it encysts (as an oocyst) (Cook & Zumla 2003:1208). This spherical bag of parasites expands by asexual division to reach a diameter of approximately 500 µm when it becomes visible to the naked eye. During the early stage of oocyst development, there is a characteristic pigment pattern and colour that allow speciation, but these patterns become obscured by the time the oocyst has matured to contain thousands of fusiform motile sporozoites. The oocyst finally bursts to liberate myriads of sporozoites into the coelomic (body) cavity of the mosquito. The sporozoites then migrate to the salivary glands to await inoculation into the next human host during feeding. The development of the parasite in the mosquito is termed *sporogony*, and this process takes between 8 and 35 days, depending on the ambient temperature and species of parasite and mosquito (Cook & Zumla 2003:1209).

2.3.2 The distribution of malaria

According to Cook and Zumla (2003:1206) as well as the WHO (2004:2-3), malaria is found throughout the tropics. In Africa, *Plasmodium falciparum* predominates, as it does in Papua New Guinea and Haiti, whereas *Plasmodium vivax* is more common in Central America and parts of South America, North Africa, the Middle East and the Indian subcontinent. The prevalence of both species is approximately equal in other parts of South America, East Asia and Oceania. *Plasmodium vivax* is rare in Sub-Saharan Africa, whereas *Plasmodium ovale* is relatively uncommon outside West Africa. *Plasmodium malariae* is found in most areas, but is less common outside Africa. Malaria was once endemic in Europe and Northern Asia, and was introduced to North America, but it has since been eradicated from those areas. Malaria occurs throughout the tropics and subtropics (Haslett et al 2002:51). Tanzania is situated in the tropics, and Bukumbi village is also situated in this region providing an ideal climate (moisture and heat) for mosquitoes to breed.

2.3.3 Signs, symptoms and diagnosis of malaria

According to the WHO (2006:5-41) and NGMD (2006:12), the first symptoms of malaria are non-specific and similar to the symptoms of minor systemic viral illnesses. These comprise headache, lassitude, fatigue, abdominal discomfort: The patient is termed as having diarrhoea if there is an increased frequency of bowel movements (more than 3 times per day, increased amount of stool (more than 200g per day) and altered consistency of stool (Smeltzer & Bare 2004:1030), and muscle and joint aches, followed by fever. According to Behrman, Kliegman & Jenson (2000:1049). Fever occurs when erythrocytes rupture and release merozoites into circulation. The participants (69 out of 97) mentioned excessive body hotness were the symptoms of severe malaria to their under-five children (Kaona & Tuba:2005: 28). In Nigeria, Ebonyi state, the research findings showed that fever and chills were the most common symptoms recognised by 72% (Agu & Nwojiji:2005: 45-50), chills, perspiration, loss of appetite, vomiting and worsening malaise. This is the typical picture of uncomplicated malaria. The presence of one or more of the following clinical and/or laboratory features classifies the patient as suffering from severe malaria. Cold fever is the condition of perspiring. In the mechanism of heat loss, most of the heat loss from the body occurs through the skin, in this process evaporation take place where by the body is cooled when heat is used to convert the water in sweat to water vapour. WHO (2006:5-41); and NGMD (2006a:12) describe that the presence of one or more of the following clinical and/or laboratory features classifies the patient as suffering from severe malaria. The clinical signs and symptoms include:

- progression from minor symptoms to severe illness within a few hours;
- total exhaustion;
- impaired consciousness;
- respiratory distress (acidotic breathing). Can occur due to lactic acidosis and/or pulmonary oedema, restlessness, blood stained frothy sputum (NMCP 2006a:28) Also pulmonary oedema occurs after therapy associated with excessive intravenous fluid therapy (Behrman, Kliegman, & Jenson: 2000:1052);
- multiple convulsions. According to Munthali (2005: 127-146) convulsions develop as a result of clumping of the parasitised blood cells in the capillaries of the brain.

- circulatory collapse. Shock is a clinical syndrome marked by inadequate perfusion and oxygenation of cells, tissues, and organs. Circulatory collapse characterised by low systolic blood pressure (BP) < 50 mmHg and fast pulse rate \geq 50/minute and cold extremities (NMCP 2006a:53). Shock was present in 17 (4%) of under-five-year-old children with malaria in Gondar hospital (Desta 2002:53-59).
- pulmonary oedema (radiological), haemolysis, sequestration of erythrocytes in organs leads to immuno-suppression, which may be responsible for pathologic feature. Cyto-adherence of infected erythrocytes to vascular endothelium may lead to obstruction of blood flow and capillary damage with resultant vascular leakage of protein and fluid, causing oedema and tissue anoxia in the lungs, resulting in congested lungs (pulmonary oedema). The patient will then also complain of chest pain (Behrman et al:2000:1049);
- abnormal bleeding. Blood coagulation factors such as prothrombin, fibrinogen, Ac globulin, proconvertin, thromboplastin and Stuart power factor, are synthesised in the liver. Due to haemolysis and liver problems, the amounts of the factors needed to maintain coagulation and haemostasis diminishes and results in spontaneous/ easy/ prolonged bleeding (Smeltzer & Bare 2004:915 ; Waugh & Grant 2001:68). Haemolysis result in the reduction of platelets, which carry important factors responsible for blood clotting, which can lead to spontaneous bleeding. According to Desta (2002:53-59), 3 (0.7%) of the children in their study in Gondar hospital Ethiopia had bleeding tendencies.
- jaundice. This is when the bilirubin concentration in the blood is abnormally elevated, all the tissues, including the sclera and skin become yellow tinged or greenish-yellow, serum bilirubin level exceeds 2.5 mg/dL(Haslett et al .2002:56). During haemolysis red blood cells are removed from the blood by reticulo-endothelial cells, in the spleen and liver. Some haemoglobin breaks down to form bilirubin and is secreted as bile. Impairment of hepatic uptake causes jaundice (Smeltzer & Bare. 2004:1081). In children the liver may be considered enlarged when its lower boarder reaches more than 3 cm below the costal margin in the mid-clavicular line (Africa Medical and research Foundation: 2001:352);
- haemoglobinuria; and

- diarrhoea are among the clinical features of uncomplicated malaria NMCP (2006a:18).

Laboratory tests, which could indicate the presence of severe malaria, include tests for –

- Anaemia. Anaemia is a condition in which the haemoglobin concentration is lower than normal, as a result, the amount of oxygen delivered to body tissues is also diminished (Smeltzer & Bare. 2004:877). During the course of malaria infection, red blood cells (RBCs) are destroyed, due to either inadequate treatment, parasite resistance or no treatment at all. Haemolysis of parasites, non-parasite RBCs, enhanced splenic uptake of RBCs, impaired RBC production, and unexplained massive intravascular haemolysis may complicate some of infections (NMCP (2006a: 40). Anaemia is the complication which is indicated by the paleness of the skin and mucous membrane. This might cause other serious complications such as restlessness, listlessness and chest problem. According to Schellenberg, Schellenberg, Armstrong, Mushi, Savigny, Mgalula, Mbuya and Victoria (2003:581-590) their research which, was conducted in the south-eastern parts of the United Republic of Tanzania, found that 85% of under-five year old children had a Hb < 11g/dl, 42% had a Hb < 8g/dl, and 6% had Hb < 5g/dl mostly caused by malaria and hookworms.

In Tanzania anaemia is not often recognised, and where recognised is not necessarily associated with malaria (Savigny at el. 2004:2-19);

- hypoglycaemia. Low blood sugar is when the blood glucose is below 2.5mmol/L (NMCP 2006a:28). Vomiting due to malaria, may cause a state of “starvation” where the liver is depleted of glycogen which is associated with hypoglycaemia, resulting from a failure of hepatic gluconeogenesis and an increase in the consumption of glucose by both the host and to a lesser extent the malaria parasites (Kasper, Fauci, Longo, Braunwald, Hauser & Jameson.2005: 1222);
- acidosis;
- renal impairment. Renal failure occurs due to the deposition of HB in renal tubules, decreased renal blood flow, and acute tubular necrosis (black water fever), and results in severe hemolysis and hemoglobinuria (Behrman et

al2000:1052). In renal failure the urinary output is below 0.3 ml/kg/hr in children (NMCP 2006a:18), there is also a rise in the serum creatinine level of 25% or more. Renal failure occurs due to vomiting (hypovolemic shock) and diarrhoea.

- hyperlactacaemia; and
- hyperparasitaemia.

In cerebral malaria, the infected red cells obstruct the blood vessels in the brain. The symptoms include fever, shivering, pain in the joints and headache. Other vital organs may also be damaged, often leading to the death of the patient (WHO 2004). The principal ways which malaria can contribute to death in young children are:

- seizures or coma (cerebral malaria);
- severe anaemia;
- increased susceptibility to other common childhood illnesses, such as diarrhoea and respiratory infections, substantially increasing the risk of death; and
- low birth weights in neonates (and neonatal deaths due to prematurity and stillbirths) the major risk of death within the first month of life (Africa Malaria report 2003; Ministry of Health 2004:76). Low birth-weight babies have a higher chance of dying than babies who are born with a good weight. Prematurity and stillbirths also occur more frequently where the pregnant women suffer from malaria.

Malaria is diagnosed by the clinical symptoms and microscopic examination of the blood (WHO 2004). The thick and thin blood films should be taken whenever malaria is suspected. In the thick film, erythrocytes are lysed, releasing all blood stages of the parasite. A thin film is essential to confirm the diagnosis, to identify the species of parasite, and in plasmodium falciparum infections, to quantify the parasite load by counting the percentage of infected erythrocytes in a specific blood sample (Haslett et al 2002:54). The best time to take blood samples for malaria testing is when the patient has a high temperature, or when the temperature is rising, because this could indicate the body's reaction to the plasmodium (foreign protein) in the blood (Africa Malaria report 2003).

The WHO (2006:11) explains that the diagnosis of malaria is based on clinical criteria (clinical diagnosis), supplemented by the detection of parasites in the blood (parasitological or confirmatory diagnosis). The clinical diagnosis of uncomplicated malaria, in a setting where the risk of malaria is low, should be based on the degree of exposure to malaria and a history of fever in the previous three days with no sign of other serious diseases. In areas of high stable malaria transmission, the probability of fever in a child being caused by malaria is high. Children under five years of age should therefore be treated on the basis of a clinical diagnosis of malaria. In all suspected cases of severe malaria, a parasitological confirmation of the diagnosis of malaria is recommended. In the absence of or a delay in obtaining parasitological diagnosis, patients should be treated for severe malaria on clinical grounds.

2.3.4 Complications of malaria

The complications of malaria are coma, hyperpyrexia, convulsions, hypoglycaemia, severe anaemia, acute pulmonary oedema, acute renal failure, spontaneous bleeding and coagulopathy, metabolic acidosis and shock (WHO 2006:52).

2.3.5 Management of the disease

The goal of appropriate management of malaria is to reduce morbidity, mortality and socio-economic losses. The management aims to provide rapid long-lasting clinical and parasitological care and to reduce morbidity including malaria-related anaemia.

2.3.5.1 *Management of uncomplicated malaria*

Fighting malaria is one of the priorities of the Tanzanian Ministry of Health (MOH). In June 2000, the MOH officially announced a change in the national malaria treatment protocol to be implemented in 2001. With resistance to chloroquine ranging from 28% to 72% in specific regions, the Tanzanian government decided to switch to Fansidar (sulphadoxine-pyrimethamine SP) as first-line treatment. However, in some parts of the country, known parasite resistance to Fansidar is already

estimated to be 15%. Resistance to Fansidar increases rapidly when it is administered on its own (as monotherapy) (Malaria 2002).

According to the WHO (2006:14-16), the national anti-malarial treatment policies should aim at anti-malarial drugs that are highly effective. Assessment of in vivo therapeutic efficacy involves the assessment of clinical and parasitological outcomes of treatment over a certain period following the start of the treatment to check for reappearance of parasites in the blood. Reappearance indicates reduced parasite sensitivity to the drug. The treatment of uncomplicated malaria with combinations of antimalaria drugs is recommended by the WHO for the treatment of falciparum malaria. The rationale for combining different modes of action is twofold: the combination is often more effective, and in events where mutant parasites might be resistant to one of the drugs, the parasite could be killed by the other drug.

Artemisinin and its derivatives (artsunate, artemether, artemotil, dihydroartemisinin) produce rapid clearance of parasitaemia and rapid resolution of symptoms, comprising Artemisinin-based combination therapy (ACT).

According to the NMCP (2006a:21), *combination therapy* refers to the use of two or more anti-malarial drugs with independent modes of action and different biochemical targets in the parasite, which are synergistic or additive, or complementary in their effect. Combination therapy can be either fixed combination therapy, where all components are co-formulated in a single tablet or capsule like Artemether-Lumefantrine (ALu), or co-administered therapy, where the components are simultaneously administered in separate tablets or capsules. The aim of combination therapy is to improve treatment efficacy and also to delay the development of drug resistance.

a) The treatment of uncomplicated malaria with a first-line drug: Artemether-Lumefantrine (ALu)

ALu is an oral fixed combination tablet of 20 mg Artemether, a derive of artemisinin, and 120 mg Lumefantrine. Artemether is effective against all human malaria parasites species. It has a rapid schizonticidal action against plasmodium falciparum. Lumefantrine is an aryl-amino alcohol. It has a longer elimination half-

life of up to 10 days and is associated with a low recrudescence rate, but has a slower onset of action. ALu therefore combines the benefits of the fast onset of action of Artemether with the long duration of action and high cure rate of Lumefantrine in a single oral formulation. It is highly efficacious even against multi-drug-resistant malaria parasites with clearance of the parasites from the blood within two days.

Indications: The drug is indicated for first-line treatment of uncomplicated malaria

Contra-indications include cases of hypersensitivity to either Artemether or Lumefantrine; children below 5 kg body weight; first trimester of pregnancy and lactating mothers with children below 5 kg of body weight.

Adverse effects of ALu are few with the most common adverse effects reported being sleep disorders, headache, dizziness, nausea, loss of appetite, abdominal pain, pruritis, rash, cough, palpitation, arthralgia and myalgia.

Table 2.1 Dosage schedule of ALu

Artemether 20 mg and Lumefantrine 120 mg – number of tablets recommended at approximate timing of dosing.

		Day 1		Day 2		Day 3		Colour Code Coartem®
Kg	Dose	1 st	2 nd	3 rd	4 th	5 th	6 th	
	Hours	0 (*)	8	24	36	48	60	
	Age	Tablets	Tablets	Tablets	Tablets	Tablets	Tablets	
5 up to 15	3 months up to 3 years	1	1	1	1	1	1	Yellow
15 up to 25	3 years up to 8 years	2	2	2	2	2	2	Blue

(*) 0 hours means the time of starting medication. (NMCP 2006a:24).

According to the NMCP (2006a:24), non-response to ALu may be due to:

- vomiting of the drug;
- poor quality of the drug;

- inadequate dosage;
- fever and/or symptoms from a cause other than malaria; and
- parasite resistance to the drug (rare).

During the management of non-response to malaria treatment with ALu where a patient returns at between four to 14 days after treatment with ALu complaining of continued symptoms of malaria, non-response should be considered and the following recommendations followed after a full history and examination:

- Where laboratory facilities are not available and malaria is still suspected, treatment with quinine should be started immediately with strict follow up.
- A blood smear should be examined. If parasites are found, treatment with quinine should be started and treatment failure recorded. If no parasites are found, other causes for symptoms should be sought and treated accordingly.

During the management of fever of 38.5 C and above, patients should be given an anti-pyretic drug (paracetamol). Children below 12 years of age should not be given aspirin because of the risk of developing Reye's syndrome.

Table 2.2 Treatment schedule for paracetamol

(Paracetamol 500 mg tablets, dosage for children: 10 mg/kg bw)

Age (years)	Weight (Kg)	Dose
2 months up to 3 years	4 up to 14	¼ tablet
3 years up to 5 years	14 up to 19	½ tablet

(NMCP 2006a:25).

b) Treatment of uncomplicated malaria second line: quinine

According to the NMCP (2006a:25), second-line treatment is indicated in the following situations:

- treatment of uncomplicated malaria where ALu is contra-indicated;
- treatment of uncomplicated malaria where ALu has failed;
- drug of choice for treatment of uncomplicated malaria in children below 5 kg and in lactating mothers with children below 5 kg, and in the first trimester of pregnancy; and

- drug of choice for treatment of severe malaria.

Contra-indications include cases of hypersensitivity to quinine, optic neuritis and myasthenia gravis.

Adverse effects of quinine are cinchonism (tinnitus, muffled hearing, sometimes vertigo or dizziness), hypotension, hypoglycaemia and injection (non-sterile) abscess.

Table 2.3 Dosage schedule for malaria treatment using oral quinine for children

Age	Weight (kg)	Number of tablets
Up to 11 months	5 up to 11	¼
1year up to 5 years	19 up to 25	½

(NMCP 2006a:25).

As regards health education for uncomplicated malaria to caretakers, the following should be noted:

- importance of compliance;
- doses and dose schedule;
- when to return immediately (worsening conditions especially when fever remains high or excessive vomiting occurs);
- continue with feeding and fluid intake;
- when to return for follow up to health facility (to ensure good progress);
- personal protection measures especially use of insecticide-treated nets; and
- environmental sanitation.

2.3.5.2 Management of complicated malaria

Haslett et al (2002:55-56) explain that management of complicated plasmodium falciparum malaria should include appropriate anti-malarial chemotherapy, active treatment of complications, correction of fluid, electrolyte and acid-base balance, and

avoidance of harmful ancillary treatments. According to the NMCP (2006a:31), the appropriate treatment is intra-venous quinine.

Table 2.4 Dilution schedule for intra-muscular quinine administration

(Dose = 10 mg/kg of body weight)

Age	Weight (kg)	Volume of undiluted quinine (300 mg/ml)	Volume of diluent (to add to each dose)	Total volume of diluted quinine (60 mg/ml)
2 to 4 months	4 to 6	0.2 ml	0.8 ml	1.0 ml
4 to 9 months	6 to 8	0.3 ml	1.2 ml	1.5 ml
9 to 12 months	8 to 10	0.4 ml	1.6 ml	2.0 ml
12 months to 3 years	10 to 14	0.5 ml	2.0 ml	2.5 ml
3 to 5 years	15 to 19	0.6 ml	2.4 ml	3.0 ml

(Haslett et al 2002:55-56).

According to Haslett et al (2002:55-56), treatment should be started with a loading dose infusion of 20 mg/kg quinine salt. Up to a maximum of 1.4 g quinine can be given over 4 hours, then after 8-12 hours a maintenance dosage of 10 mg/kg quinine salt up to a maximum of 700 mg can be given. The dose should be repeated at intervals of 8-12 hours until the patient can take drugs orally. Quinine may be given intramuscularly instead but could cause muscle necrosis (Downie, Mackenzie & Williams 2001:506). Downie et al (2001:506-507) describe the measures to prevent muscle necrosis as follows. After the syringe is filled, the needle is changed so that the substance is contained in the syringe only and is less likely to drip from the tip of the needle as it penetrates the skin. To reduce pain as well as the risk of staining, the injection is given into the buttock. The injection is given slowly and steadily. Ten seconds should be allowed to elapse before withdrawing the needle, so that the muscle mass can accommodate the volume of the injection. The site is not massaged otherwise the medication may be forced into the subcutaneous tissue, causing irritation (Downie et al 2001:507).

Artemisinin derivatives may also be used as anti-malarial chemotherapy. Artesunate should be given as a loading dose of 2.4 mg/kg then 1.2 mg/kg intravenously 12-hourly to a total dose of 600 mg. In children, this can be given

intramuscularly. Artemether is given as a loading dose 3.2 mg/kg intramuscularly then 1.6 mg/kg daily to a total of 640 mg. Change to an oral formulation as soon as possible. Mefloquine should not be used for severe malaria since no parenteral form is available (Haslett et al 2002:55-56).

Table 2.5 Dosage for initial (pre-referral) treatment in children
(Age 2-15 years) and weighing at least 5 kg.

Weight (kg)	Age	Artesunate dose(mg)	Regimen (single dose)
5 to 8.9	0 to 12 months	50	One 50-mg suppository
9 to 19	13 to 42months	100	One 100-mg suppository
20 to 29	43 to 60 months	200	Two 100-mg suppositories

(WHO 2006:51)

According to the Ministry of Health (2006:3), the anti-malarial drug of choice recommended in Tanzania as second line, where (ALu) has failed or is contra-indicated, is quinine. Quinine is therefore the drug of choice for severe malaria. Mueller, Razum, Traore and Kouyate (2004:36) emphasise the need for better education of parents about the correct dosages of first-line malaria drugs, particularly in the treatment of very young children.

Agu and Nwojiji (2005:49) state that the low level of awareness of mothers of the cause of malaria, the poor treatment-seeking behaviour shown by the low level of the use of the health facilities as a place where treatment is first sought, and the delay in seeking treatment for childhood malaria, suggest a need for intensified health education intervention programmes. Measures to relieve poverty and reduce the cost of allopathic care (a system of treating disease by inducing a pathological reaction that is antagonistic to the disease being treated) should also be put into place. The researcher wanted to investigate the knowledge of the Bukumbi village parents of children under five years of age with malaria to determine whether parents know the preventive measures, lacked this knowledge, or failed to implement actions based on their knowledge.

2.3.5.3 Management of malaria with local herbs

In a personal interview Kulebelwa admitted openly (Kulebelwa 2006) that the treatment of malaria to children under five years of age differs according to the age of the baby. The treatment of malaria of children below two years of age, is superficially (to the skin) by bathing with mwoshafedha tree leaves only. Oral medication is prohibited because it can damage the liver, because the liver is not well matured by that age.

For children 2-5 years old, a combined therapy is used: milage tree leaves, pilipili kichaa, pilipili manga and tangawizi boiled together. The dose is three tablespoons three times per day for seven days. Alternatively, a mixture of the following leaves: njuguji, lonzwe and mwatya are ground together, mixed with water, boiled and sieved. The dose is half of a small glass three times per day for seven days. Mboera, Kamugisha, Barongo, Rumisha, Msageni, Molteni and Kitua (2004:40) stated that traditional healers were most frequently consulted for cases of convulsions in Mpwapwa district, Tanzania.

According to Savigny et al (2004:2), traditional care is no longer a significant delaying factor in seeking modern medical care in Tanzania. Whether or not this remains an important factor in the Bukumbi village, was investigated by this research project.

2.3.6 Population groups most at risk

There are areas and groups of people who are the most at risk of contracting malaria such as:

- those who live in areas of relatively stable malaria transmission;
- young children and pregnant women because of low immunity; and
- poor people (child mortality rates are known to be high in poorer households).

In a demographic surveillance system in rural areas of the Tanzania, under-5 mortality following acute fever, "much of which would be due to malaria", was 39%

higher in the poorest socioeconomic group than in the richest (Africa Malaria report: 2003).

In the Bukumbi village, malaria is the problem, which persists throughout the year. According to statistics, the children below five years of age are mostly affected. In relation to the population, 97% of under five-year-old children population contracted uncomplicated malaria, while in the age group above five years; only 11% were affected by the year 2004. Due to the climatic changes, there was not enough rain for the past three years. This causes reduction of food production. Therefore, from the villagers who depend on farming, about 75% of the adult population were affected, which resulted in the reduction of hospital attendance, because of lack of money to pay for treatment, for buying nets and insecticides for their nets. This could possibly lead to an increase in morbidity and mortality rates regardless of their knowledge regarding malaria.

2.4 PREVENTION AND CONTROL OF MALARIA

The problems of controlling malaria in Africa, Asia and Latin America are aggravated by inadequate health structures and poor socioeconomic conditions. The situation became even more complex over the last few years with the increase in resistance to the drugs normally used to combat the parasite that causes the disease (WHO 2004).

2.4.1 Avoiding mosquito breeding

Mosquito breeding should be avoided by killing larvae with larvicide and by environmental sanitation. In preventing breeding by larvicides, oil works by spreading it over the water surface as a continuous film and thus preventing the larva from breathing. Oil can therefore only be used in open water. When there is vegetation, emulsions or pellets must be used. The ability of oil to spread is enhanced by dilution with thinner oil such as vegetable oils or kerosene (Carter, King, Nduba, Nordberg, Some, AMREF & Aluvaala 2004:87). Stomach poisons, such as Paris Green, are effective only against larvae, which feed on the water surface. Temephos (Abate) granules can be applied on water once monthly and are

relatively non-toxic to humans, animals and fish (Carter et al 2004:87). This control method is not used in the Bukumbi village because it is expensive and money is needed to buy oil and chemicals, while the economy is still a problem because there was little rain, which made villagers concentrate on buying food.

The division of control of tropical diseases (2004) explained the systematic control of malaria, which was started after the discovery of the malaria parasite by Laveran in 1889 (for which the latter received the Nobel Prize for Medicine in 1907), and the demonstration by Ross in 1897 that the mosquito was the vector of malaria. These discoveries quickly led to control strategies and with the invention of DDT (dichlorodiphenyltrichloroethane) during World War II, the notion of global eradication of the disease (WHO 2004).

Widespread spraying with a pesticide called dichlorodiphenyltrichloroethane, commonly known as DDT, was banned because of serious side-effects for humans and the environment but it could be effective in reducing transmission of malaria. An international anti-pesticide treaty allows for an exception to the ban in malarial areas. So far, Tanzania has resisted using DDT (Searching for solutions to the malaria crisis 2004). According to Munthali (2005:127-146) the use of DDT led to the eradication of malaria in Europe and North America, but its use was discontinued mainly because of its non-biodegradability and its lethal effects on other forms of life. Other countries already reintroduced it in 2000 after experiencing a very high prevalence of malaria. For this reason it was decided that the early diagnosis of malaria and timely seeking of appropriate treatment should rather be encouraged than the spraying with DDT in Tanzania.

According to Carter et al (2004:88), environmental sanitation is an effective and cheap form of control. It is used to prevent breeding at village level by self-help projects such as:

- draining water holes, ditches and any accumulation of water around the village;
- clearing bush and grass along water banks;
- collecting and disposing of all containers likely to hold water;

- emptying water containers once a week;
- covering water containers with lids or larvicide such as a few drops of oil; and
- clearing the bush and replacing it with cultivation.

2.4.2 Avoiding mosquito bites

The mosquito bite can be avoided by wearing long sleeves and trousers outside the house, especially at night when the anopheline mosquitoes bite. Repellent creams and sprays can also be used. Screened windows, the use of mosquito nets and burning repellent coils or tablets also reduce the risk. Impregnation of bed nets with permethrin also reduces mosquito biting. Haslett et al (2002:56) describe the protection against mosquito bites as the first line of defence. The anopheles mosquito tends to bite between dusk and dawn. By using a combination of the following measures, villagers can reduce the probability of being bitten:

- Wear protective clothing (long-sleeved shirts, long trousers, long skirts, high socks).
- Use an effective mosquito repellent containing diethylmetatoluamide (“deet”) as an active ingredient, which should be effective for about four hours.
- Use repellents containing permethrin on clothing, shoes, bed nets and other gear such as back packs. Permethrin is highly effective as an insecticide and repellent. Clothing treated with permethrin will continue to repel after washing.
- Use insect sprays containing pyrethroid in living and sleeping areas during evening and night hours.
- Use mosquito netting over the bed. The netting should be tucked under the mattress and may be sprayed with repellent. Treated nets can reduce mosquito bites by more than 80% and kill more than 50% of all mosquitoes that enter houses.

Medical experts say the use of bed nets would cut the number of children killed by the disease by 27%. Tanzanians need to start using bed nets, but many Tanzanians say they are not used to sleeping under mosquito nets: “I feel I can’t breathe when I am under a mosquito net,” said Asha Munisi, 37 years, who lives in Tanzania’s coast

region, one of the hardest-hit malaria zones, and who admits suffering from recurrent bouts of malaria. "And I don't trust those chemicals," she added, referring to the insecticide used to treat the nets (Searching for solutions to the malaria crisis 2004).

Tanzania's National Institute of Medical Research (NIMR) has approved the insecticide as safe for humans. Yet less than 1% of Tanzanians used bed nets prior to 2002, according to the Ministry of Health Officials. In 2002, government abolished taxes on mosquito nets and anti-malaria chemicals. However, a NIMR study found that even after the waiver not even 2% of Tanzanians slept under nets. To reduce further cost to pregnant women and women with children below five years, government launched a pilot system in 2003. Women are given vouchers to buy bed nets from designated shops that cost them between 500 Tsh (50 US cents) and 700 Tsh (70 US cents) depending on size. The target is to have 60% of pregnant women and children below five years of age using insecticide-treated nets by 2007.

World Vision Tanzania has prioritised fighting this preventable disease as one of its most important health interventions. Focused antenatal care (2004:78) discussed preventing malaria in the following ways:

- Always sleep under ITNs. Insecticide-treated nets are much more effective than untreated nets. Mosquitoes that transmit malaria mostly bite people indoors between 22:00 and 06:00.
- Materials treated with insecticides reduce the number of mosquitoes in the house and also kill other insects such as ticks, lice, bedbugs and cockroaches.
- Other protective measures include repellents (sprays, creams and mosquito coils), but they are not substitutes for ITNs.

A study was done by Mboera, Kamugisha, Barongo, Rumisha, Msageni, Molten and Kitua (2004:37-41) on community knowledge, attitudes and perceptions regarding malaria and its management. This study was conducted in the Mpwapwa district of central Tanzania. Six villages were selected for the study. These villages lie between 975 and 1 859 m above sea level. The finding was that only 2.1% of the children in the district were sleeping under mosquito nets. The use of mosquito nets was more common among individuals living in the villages with health facilities than

among those without health facilities. The objective of a study done by Korum, Bennet, Adiamah and Greenwood (2005:146-150) in Gambia, was to identify the socio-economic risk factors for malaria in a peri-urban area of Gambia. The researchers undertook the study among over 350 Gambian children with malaria, resident in a peri-urban area with seasonal transmission, using the case control approach. They identified that malaria was associated with poor quality housing and overcrowding and with travelling to rural areas, where the level of malaria transmission is higher than in urban centres. The study found that the knowledge of malaria among mothers was less than that of controls, suggesting that further education of the study community on the causation of malaria and on ways of preventing it could be of value.

2.4.3 Chemoprophylaxis

A study done by Kidane and Morrow (2000:550-555) in Trigary, Ethiopia, aimed to compare the effect of teaching mothers about under-five mortality by promptly providing anti-malarials to their sick children at home, with the present community health worker approach. The sample included 37 tabias (cluster of villagers) in two districts that are hyperendemic to holoendemic. After the study, the interpretations were that a major reduction in under-five mortality can be achieved in holoendemic malaria areas through training local mother coordinators to teach mothers to give under-five children anti-malarial drugs. Emphasis on malaria control programmes uses focused antenatal care (FANC), a comprehensive care approach for pregnant women that provides intermittent presumptive treatment (IPT) service in early detection and management of diseases such as malaria. The new guidelines include the practice of using anti-malarial drugs that prevent and control the effects of malaria on mothers and their unborn children (Combating Malaria in Tanzania 2005).

According to Haslett et al. (2002:56), clinical attacks of malaria may be preventable by drugs such as proguanil, which attack the pre-erythrocytic form, and also by drugs such as atovaquone 250 mg plus proguanil 100 mg (Malarone), doxycycline, chloroquine or mefloquine after the parasite has entered the erythrocyte. See Table 2.6 for malaria chemoprophylaxis.

Table 2.6 Chemoprophylaxis of malaria

Area	Anti-malarial tablets	Adult prophylactic dose	Regimen
Chloroquine resistance high	Mefloquine ² or Doxycycline or Malarone	250 mg 100 mg 1 tablet from 1 to 2 days before travelling to 1 week after return	One tablet weekly Daily Daily
Chloroquine resistance moderate	Chloroquine ³ plus proguanil	150 mg base 100 mg	Two tablets weekly <u>Two tablets daily</u>
Chloroquine resistance absent	Chloroquine or proguanil	150 mg base 100 mg	Two tablets weekly One or two tablets daily

¹ Choice of regimen is determined by area to be visited, length of stay, level of malaria transmission, level of drug resistance, presence of underlying disease in the traveller and concomitant medication taken.

² Contra-indicated in the first trimester of pregnancy, lactation, cardiac conduction disorders, epilepsy, psychiatric disorders; may cause neuropsychiatric disorders.

³ British preparation of chloroquine usually contain 150 mg base; French preparation 100 mg base and American preparations 300 mg base.

(Haslett et al 2002:56)

The above table also gives the recommended doses for protection of the non-immune. It is important to determine the degree of risk of malaria in the area to be visited and the degree of chloroquine resistance. The following are important stipulations in the prophylaxis of malaria:

- chloroquine should not be taken continuously as prophylaxis for more than five years without regular ophthalmic examination, as it may cause irreversible retinopathy;
- pregnant and lactating women may take proguanil or chloroquine safely;
- Mefloquine is contra-indicated in the first trimester of pregnancy;
- Fansidar should not be used for chemoprophylaxis, as deaths have occurred from agranulocytosis or Stevens-Johnston syndrome;
- Mefloquine is useful in areas of multiple drug resistance, such as East and Central Africa and Papua New Guinea.

2.4.4 Use of local herbs

Some individuals prefer to use local herbs for preventing mosquito bites. According to Kulebelwa (2006), preventive measures are provided by folk healers in Bukumbi village. They make use of a combination of leaves of certain trees, namely saliungu, mwihunge and mabingobingo trees. The leaves of these trees are taken in equal amounts, dried and then mixed with water. The child is then bathed three times weekly in this mixture and it is also taken orally, one teaspoon three times weekly.

He explained another type of prevention by using the leaves of the bukumambu, mahimba or mikaratusi trees, by keeping pieces of the leave of any of the above-mentioned trees in the room or burning it, which usually produces a certain smell, disliked by mosquitoes.

2.4.5 Health education

Health education is the part of health care that is concerned with creating awareness and promoting appropriate health behaviour that promote health, prevent illness, cure disease and facilitate rehabilitation. It brings desired changes in human behaviour, especially early diagnosis and treatment and prevention of diseases to children under the age of five years (NMCP 2006b:74).

According to Africa Medical and Research Foundation (2001:154-156), the primary goal of health education is to improve people's health by promoting better health practices. The goals for effective health education are to facilitate changes in knowledge, attitude and practice. Health is a concern of everyone, and every member of the community should pass knowledge on to his neighbour, friend, parent, child, husband, wife, colleague or flock about health.

Local government leaders, teachers, pastors and other influencers can also be encouraged to take an active part in health education programmes. Every health worker is a health educator. Health education is frequently done when a mother has a sick child and is looking for help -- unless the patient is very sick and treatment and

rest is more important or when mothers attend a Reproductive Health Clinic (RHC). Health education is often most effective when provided formally but given informally on the spot when the opportunity arises.

The Africa Medical and Research Foundation (2001:157) describe the major causes for the lack of success when offering health education at health services, as follows:

- Anxiety and stress

As the sick child causes immediate anxieties and parents' concentration is affected.

- Time factor

Nobody seems to have time to sit and talk about the issues relating to the needs of the mother and child. Even the mother may be anxious to get home after spending 2 or 3 hours in the health service.

- Relevance

At health facilities mothers and children enter an environment which is very different to that of their homes. In health facilities resources are different, events are frightening and people are strange. They cannot relate to what is said to them as it is quite different from their daily life.

The Africa Medical and Research Foundation (2001:158) say that health education is provided most effectively beyond the dispensary. The closer to home, the more effectively the answers to clients' questions are understood, accepted and demonstrated in practice. The more the family and community take responsibility for their own health, the more community-based health becomes, and the more sustained any achievement will be. Individual contact is more effective, but also group health education can be done. To be effective, the groups should be kept small – about 15-20 people per group. The topic must be of interest to the listeners and best selected by them. It is important that everyone is seated comfortably so all can hear and see well.

In Bukumbi village, health education is provided by the health care providers to patients in the Out Patient Department (OPD) and in the wards.

Twelve health education topics are covered each year with each topic running for one month. According to the schedule, malaria is taught during January only. This type of health education is usually conducted whenever the clients attend to the RHC or are admitted to the children's ward (Bukumbi Hospital RCH records 1999-2003).

2.5 CONCLUSION

Malaria is a dangerous disease in children, and it is epidemiologically complex. Babies infrequently develop severe malaria and the mortality rate is high. Acutely ill children require careful clinical monitoring as they may deteriorate rapidly. Referral to a health centre or hospital is indicated for young children who cannot swallow anti-malarial drugs. Due to parasite resistance, combination therapy is used to improve treatment efficacy. As prevention is better than cure, parents need to put more emphasis on preventive measures against malaria, to prevent the unnecessary death of their babies.

In this chapter malaria as disease as well as the applicable treatment have been discussed. Much attention was given to the preventive measures that have been taught to the parents of under five-year-old children according to the *National Malaria Control Programme Strategic Plan*. These measures are simple measures that could be applied by parents and which would have a big impact on the morbidity and mortality rates of malaria in Bukumbi village. In the next chapter, the research methodology used to collect and analyse data will be discussed.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In the previous chapter, available information and previous research on malaria was discussed.

The aim of this chapter is to discuss the key concepts and variables that formed part of the study, as well as the instrument used to collect data. The sample design, the sampling techniques employed and the criteria used in the choice of sample size will also be covered. This chapter gives full details of the data collection process followed in this research.

At the end of this chapter, the reliability and validity of the research instrument as well as ethical aspects that had to be considered during the research process will be discussed.

3.2 AIM OF THE RESEARCH

The aim of the research was to investigate which of the measures that have been taught to the parents of under five-year-old children in Bukumbi village, Tanzania have been implemented to control malaria.

3.2.1 Objectives of the research

The objectives of the research were to:

- explore and describe the knowledge parents with children under the age of five in Bukumbi village, Tanzania have on malaria;
- explore the knowledge parents with children under the age of five years in Bukumbi village, Tanzania have of the control of malaria;

- determine where the parents of under five-year-old children of Bukumbi village, Tanzania obtained their knowledge;
- explore and described the measures suggested by the health authorities to control malaria have been implemented by parents of the under five-year-old target group in Bukumbi village, Tanzania;
- identify the factors that prevented parents of the under five-year-old target group of Bukumbi village, Tanzania, to implement the malaria control measures;
- make recommendations to improve the malaria control programme by parents of children aged five and younger in Bukumbi village, Tanzania; and
- make recommendation for future research on this topic.

3.3 SUMMARY OF THE MODUS OPERANDI THAT WAS FOLLOWED

The following steps were followed in order to collect data for this research project:

- A preparatory literature study was undertaken to provide background information necessary to proceed with the required research.
- A suitable methodology was chosen, as well as the sample and sampling method.
- Key concepts were defined and explained.
- An interview schedule was used for data collection.
- The interview schedule was submitted for approval to experts in the field, a statistician at UNISA, a system analyst who had to analyse the data as well as to the supervisors of the dissertation (Annexure D).
- The researcher applied for permission to conduct the research project (Annexure B).
- Permission to conduct the research project was obtained from the district medical officer (Misungwi District), the medical officer in charge of the Bukumbi Hospital and the Bukumbi Disabled care dispensary as well as the Research and Ethics Committee of the Department of Health, University of South Africa (Annexure A).

- The research instrument was tested by interviewing five parents with children under the age of five years who had been admitted to the Bukumbi Hospital with malaria but who were not part of the final study.
- Informed consent was obtained from the parents of children under the age of five years who had been admitted to the Bukumbi Hospital with malaria and who were selected to take part in the testing of the research instrument.
- The necessary adjustments were made to the research instrument and the final copy was produced and photocopied.
- The purposive sampling technique was used to select participants who fitted the selection criteria.
- Informed consent was obtained from the parents of children under the age of five years with malaria, who had been treated at and/or admitted to the Bukumbi Hospital and the Bukumbi Disabled care dispensary outpatient department, and who were selected to take part in the final study (Annexure B).
- Appointments were made with the respondents to conduct the interviews.
- The interviews were conducted on the stipulated dates.
- A computer and the Statistical Package for Social Science (SPSS) version 14 computer program were used, and data were analysed under the guidance of the supervisors, a system analyst and a statistician.

The analysed data will be presented in tables and graphs and discussed in Chapters 4 and 5.

3.4 RESEARCH METHODOLOGY

Burns and Grove (2001:223) define a research design as a guide in planning and implementing the study in a way that is most likely to achieve the intended goal.

A quantitative, descriptive and exploratory research design was used in this study to investigate the measures taken by parents to control malaria in their children in the under five-year-old target group.

This design was evaluated and it was decided that the design would:

- focus on the end product (the kind of results aimed at); and
- focus on the logic of the research, and address the research questions (Mouton 2001:56).

The concepts related to the research design have been described in Sections 3.4.1 to 3.4.3 in this dissertation.

3.4.1 Quantitative research

Quantitative research is a formal, objective, systematic process in which numerical data are utilised to obtain information about the world. The focus of the quantitative research approach is concise, objective and reductionistic. It enhances logistic and deductive reasoning, and determines cause and effect interactions between variables (Burns & Grove 2001:27).

The research approach used in this study was *quantitative* by nature as the researcher decided to make use of a pre-planned and prepared interview schedule for the interviewing of parents with children under the age of five years, who had contracted malaria. The interview schedule contained numerical values applicable to a set of outcomes (preventive measures), which was believed the parents should have attained (Burns & Grove 2001:26-27) to prevent malaria among their children.

Burns and Grove (2001:30) explain that there is limited involvement of the researcher in quantitative research and the research relationship is distant. During the current study, the researcher used not more than 30 minutes to interview each parent, therefore the focus of the knowledge investigated was narrow and the relationship for such a period was not sufficiently close to get adequate knowledge of the parents.

The quantitative research design was selected because of its narrow focus and product orientation as the researcher needed to know why children under the age of five years are still affected with malaria despite the parents' education on preventive malaria measures in Bukumbi village.

3.4.2 Exploratory research design

According to Polit and Beck 2008 (1999:20), an exploratory research begins with some phenomenon of interest and explores the full nature of the phenomenon. An advantage of exploratory design is that it could be applied to discover new ideas and insights when little is known about a phenomenon (Wood & Haber 2002:223; Burns & Grove 2001:30). It has, however, the disadvantage that those findings may change over time (Kothari 2004:36).

This design is typically used in qualitative research, but since a structured interview schedule has been used to collect data in this research and no findings could be located where the problem has been researched, the research design could also be considered to be exploratory by nature (Kothari 2004:35).

3.4.3 Descriptive research design

The research design was also descriptive by nature as it allowed for an accurate portrayal or account of characteristics of a particular situation or group (Polit & Beck 2008:274; Burns & Grove 2001:29). The design also allowed for the description of the frequency with which something occurred (Burns & Grove 2001:30).

The researcher selected the descriptive research design for the following reasons:

- it is designed to gain more information about characteristics within this field of study,
- it enhanced the identification of possible problems in the current practice of educating parents with children with malaria on preventive measures or justification of the current practice;
- it helped the process of making of judgments based on the current practices (Burns & Grove 2001:248; Polit & Beck 2008: 274); and
- it helped the researcher to see the malaria situation accurately by assessing the current condition and practices and suggesting plans for improving health care practices to the children under the age of five years in the village.

3.5 THE RESEARCH POPULATION

The population used for the study, comprised parents of Bukumbi village who have children in the under five-year-old target group and who have attended Bukumbi Hospital and Bukumbi disabled care dispensary for treatment of malaria in their children during 2006. The number of children, who contracted malaria in the Bukumbi village over the past five years, is shown in the table below.

Table 3.1 Number of malaria cases in children under the age of five years

YEAR	Number of cases
2002	1 043
2003	755
2004	667
2005	426
2006	636
TOTAL	3 527

A total of 3527 children in the under five-year-old target group in the village therefore contracted the disease over a five-year period (Mandike 2006:3). The researcher used this number as guide for calculating the research population and planning the sample process.

The researcher could not trace those parents whose children contracted malaria to include them in the sample as the houses are scattered over a wide area in this village and the houses are not numbered. It was therefore impossible to find these people.

3.5.1 Sample and sampling technique

The researcher selected a purposive sample for this research. According to Polit and Beck (2008:339), this technique involves the conscious selection by the researcher of certain subjects or elements to include in the study. It is sometimes

referred to as *judgment sampling* as the researcher has to use her/his judgment and knowledge of the research problem and sample to decide whom to select (Kothari 2004:59). Mugenda and Mugenda (2003:50) confirm this and add that the purposive sampling technique allows a researcher to select individuals deliberately as he or she has the required information with respect to the objectives of his or her study.

The researcher should, however, take steps to prevent bias in the selection of the sample (Bryman 2004:333; Kothari 2004:59). To prevent bias, a researcher who proposes to use purposive sampling should specify the criteria for choosing the particular cases, such as age range, religious affiliation, or educational level (Mugenda & Mugenda 2003:50).

3.5.2 Sampling criteria and selection process

Sampling criteria are the characteristics essential for inclusion in the sample. The researcher therefore decides which attributes members of the sample should have to be considered for inclusion in the sample (Burns & Grove 2001:226). The criteria used during the current research, were developed from the research problem, the purpose, the objectives, operational definitions and design (Burns & Grove 2001:366; Polit & Beck 2008: 338).

In this research, the sampling criteria were that the respondents (parents) should have the following characteristics:

- Their children had to be under the age of five years.
- Their children had to be diagnosed with malaria during 2007.
- Their children should have been treated for malaria at the Bukumbi Hospital or Bukumbi Disabled care dispensary.
- They had to be living in Bukumbi village.
- They had to be willing to be interviewed and give informed consent.
- They had to be able to communicate in Swahili, because the interviewer could communicate in this language.

Respondents who fitted the above criteria were selected from the records of the participating health care institutions. The researcher contacted the respondents and introduced herself to the parents visiting their children who were being treated for malaria at the Bukumbi Hospital or Bukumbi Disabled care dispensary. Following that, the respondents were briefed about the objectives of the research, funding of the research, and the role of the researcher in this process. The reason for their selection and their rights in the research process, such as confidentiality, were explained in detail. This is discussed in more detail under point 3.9 in this chapter. Their cooperation was requested as it was believed that this might prolong their visit to the health service (in the case of the outpatients department). All the parents who were approached to participate in the research consented to do so. The method, which was to be followed on the day of data collection as well as participants' ethical rights were spelled out in a pamphlet allowing them to read it at a later stage or to find someone who could read it to them, should they be illiterate (see Annexure B). The respondents were then asked to sign a consent form. A suitable date and time for each respondent and the researcher had to be found. The respondents agreed that the health facilities at the Bukumbi Hospital or the Bukumbi disabled care dispensary were the best venues to conduct the interviews.

3.5.3 Sample size

To determine the sample size from the children under the age of five years in Bukumbi village who had malaria, the number of children who contracted malaria over the previous five years, 2002 (1043); 2003 (755); 2004 (667); 2005 (426) and 2006 (636) were taken into account. The average number of children under the age of five years who had contracted malaria over the previous five years were 705 per year, which was then used as research population. The total populations of the under five-year-old group for these years were 890 (2002); 913 (2003); 915 (2004); 934 (2005) and 942 (2006).

The following calculation was made to determine the sample size for this research:

N = sample size needed

z = standard variant for 95% confidence is 1.96 (as per table of area under normal curve (Kothari 2004:164)

\bar{x} = sample mean: The sum of five years' number of children under the age of five for sample years who contracted malaria = $3\,525 \div 5 \text{ years} = 705$

μ = population mean: The sum of five years' population of children under the age of five years in the village = $4\,594 \div 5 \text{ years} = 919$

p = sample proportion (probability of children under the age of five years infected with malaria) in the village $\div \mu = 0.76$ Approximately = 0.8

q = probability of non-infected children under the age of five years with malaria
 $= (\mu - \bar{x}) \div \mu = (919 - 705) \div 919 = 0.2$

e = acceptable error = 0.097 (Since the estimate should be within 9.7% of the true value.

Formula

$$N = \frac{z^2 \cdot p \cdot q}{e^2}$$

$$N = \frac{(1.96)^2 \times 0.8 \times 0.2}{(0.097)^2} = \frac{3.8416 \times 0.16}{0.009409} = \frac{0.614656}{0.009409} = 65.33$$

N = should therefore be approximately 65 parents with children under the age of five years who were treated for malaria, during 2007. However only 40 parents were available during the five weeks in which data were collected.

How to determine sample size, Determining sample size.[sa]

3.6 DATA COLLECTION

The researcher planned for data collection and clarified the data to be collected by preparing and pre-testing the interview schedule and conducting the interview.

3.6.1 The interview

The interview was chosen as the data collection approach. The advantages of the interview method of data collection for this research were that:

- Some of the members of the sample were illiterate and would not have been able to read a questionnaire. The researcher therefore had to read the questions to these respondents during the interview.
- The interview schedule had to be compiled in English for the purpose of the dissertation, but the researcher translated the interview schedule into Swahili and could answer the questions the respondents had in Swahili (Kothari 2004:98; Wood & Haber 2002:303-304).

Data were collected by interviewing 40 parents with children under the age of five years who were treated for malaria during 2007. The interview schedule was translated into Swahili by the researcher. A Swahili editor certified that the English and Swahili items' meaning correspond (See Annexure F). Conducting interviews enhanced the response rate, which was ultimately 100% (Wood & Haber 2002:303; Burns & Grove 2001:421-422; Polit & Beck 2008:414).

The structured interview method also has some disadvantages, which had implications for the research, such as that bias remained a problem. Kothari (2004:99) as well as Burns and Grove (2001:423) say that no research is ever without some degree of bias. To overcome this problem, the researcher concentrated on the questions in the interview schedule. The researcher took special care not to influence any respondent to choose a certain response. The same questions were asked from every interviewee in the same order.

The presence of the interviewer during data collection might have encouraged the respondents (Kothari 2004:99; Wood & Haber 2002:303), to give imaginary information just to make the interview interesting or to impress the interviewer. The respondents were however, asked before the interview to give their honest opinions to the best of their ability, and the researcher could only trust that this is what had happened during the interview. The researcher also conducted the interviews herself and made use of the prepared instrument in the pre-testing of the instrument as well as the final study (Kothari 2004:99; Burns & Grove 2001:422).

3.6.1.1 Methodology followed during each interview

- Early in the morning of the set date for the interview session, the researcher visited the health institution where the particular parents waited to be interviewed. The researcher used a room designated for this purpose in the outpatient department of Bukumbi Disabled care dispensary, outpatient department or the children's ward of Bukumbi Hospital (refer to Table 3.2).
- The rooms used for the interviews were in quiet sections of the buildings. Disturbances during the interviews were therefore eliminated as far as possible. The researcher placed the chairs in such a position that it would allow the researcher and respondents to face each other, and the researcher did not sit behind a desk that could be seen as a barrier between the two parties. The researcher made sure that there was cold water and glasses available for the respondents.
- The respondents were welcomed and thanked for their willingness to take part in the research. They were again briefed about the objectives of the research, their role in this process and their rights.
- Their cooperation was again requested, and they were re-assured that they could terminate the interview at any stage without incurring any penalty whatsoever.
- Signing of consent form.

The respondents were asked whether they had any questions before the interview started.

- During the interview the researcher marked the choices made by the respondents to the closed-ended questions in the relevant spaces on the interview schedule. The researcher also wrote down the respondents' answers to the open questions verbatim on copies of the interview schedule.
- Three interviews were conducted per day. The following table indicates the dates on which the interviews were conducted at the participating health facilities concerned.

Table 3.2 Dates of interviews at participating facilities

DATES	04/6/07- 08/6/07	11/6/07- 15/6/07	18/6/07- 22/6/07	02/7/07- 06/7/07	09/7/07- 10/7/07
HEALTH FACILITY	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL
	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL
	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL	BUKUMBI DISABLED CARE DISPENSARY	BUKUMBI HOSPITAL
TOTAL NUMBER. OF PARTICIPANTS	10	10	10	5	5

3.6.2 The interview schedule

An interview schedule is a list of prepared questions used by researchers during interviews. The construction of a new instrument requires an extensive review of the literature and the tests and measurements that deal with related constructs.

The instrument used in this research, the interview schedule, consisted of closed and open-ended questions. In the closed-ended questions, respondents were asked to respond to questions with fixed alternatives (Kothari 2004:96; Polit & Beck 2008:414). Open-ended questions allowed respondents to provide answers in their own words and to give their own opinions.

Both open and closed-ended questions have strengths and weaknesses. Closed-ended questions are usually difficult to construct but easy to analyse. The closed-ended questions in this research were analysed by means of a computer. The open-ended questions were categorised by the researcher by finding commonalities. This process took considerable time and skill. Enough space was allowed for the researcher to write the exact words of the participant when answering open-ended questions.

Experts, such as experts in the field; a statistician; and the supervisors of the study evaluated the interview schedule. After it had been approved by the above-mentioned individuals the interview schedule was translated into Swahili by the researcher, edited by the language expert and tested in a pre-test to ensure that the items measured what they were intended to measure (Wood & Haber 2002:305; Polit & Beck 2008: 380). After correcting the instrument after the pre-test, it was used to collect data of the selected sample.

After the completion of the process, the parents' verbatim responses had to be translated into English. Again, the language expert edited these translations. The completed interview schedules were then analysed by the statistician using the SPSS version 14-computer program.

The interview schedule was kept as short as possible. However, it had to include all aspects necessary for the prevention of malaria in the under five-year-old target group.

The interview schedule's items, addressed the research objectives and research questions (see annexure D).

3.6.2.1 *Format of the interview schedule*

The interview schedule consisted of the following main aspects:

Section A

Section A requested demographical information from the respondents.

Section B

This section comprised questions to determine what health education the parents had received on malaria.

Section C

This section attempted to determine the parents' level of knowledge concerning malaria.

Section D

The section identified the preventive measures implemented by parents.

Section E

This section dealt with the factors preventing the implementation of preventive measures of malaria by the parents.

Section F

The section contained control questions for the parents' knowledge of malaria

Section G

The section had questions, which described the clinical picture of the child with malaria.

The use of the interview schedule was demanding, as it required the interviewer's constant concentration, as the recording task was tedious.

3.6.2.2 *Pre-testing of the interview schedule*

Pre-testing involves determining the feasibility of using a given instrument in a formal study. Pre-testing provides an opportunity to try out the technique or instructions that will be used during data collection, especially if the research instrument has never been used with a specific population. According to Burns and Grove

(2001:421), pre-testing of the interview schedule would identify problems in the design of questions, sequencing of questions or procedures for recording responses, as well as help to establish the reliability and validity of an instrument.

In this research, pre-testing of the interview schedule was done by conducting five interviews with parents who were not part of the main study. This was done to

- identify any weakness 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 (Polit & Beck 2008: 380).

The following corrections were made:

- items were numbered correctly;
- duplicate questions were deleted
- typing errors were corrected; and
- the coding of the closed-ended questions was improved.

3.6.3 Analysis of the data

The items in the interview schedule were coded to facilitate coding of the data into the computer. The SPSS version 14 statistical computer program was used. After all the interviews were conducted the data from each completed interview schedule were entered into the computer.

3.7 RELIABILITY AND VALIDITY OF THE RESEARCH

It is important for quantitative data to be as precise and objective as possible. For this reason, numerical values are assigned to specific attributes. It is then possible to establish how much of an attribute is present by measuring it. This process removes guesswork when gathering information.

Reliability of the research instrument is defined as the extent to which the instrument yields the same results on repeated measures. Reliability testing focuses on stability, equivalence and homogeneity (Wood & Haber 2002:319; Polit & Beck 2008:445). As time could affect the stability of a measure when data is collected from people on separate occasions, the researcher took the following steps to guard against this possibility:

- Interviews were conducted over a short period. The parents with their sick children, under the age of five years, were known to the researcher only. The interviews were conducted in the outpatient department of the Bukumbi disabled care dispensary and the outpatient department or children's ward of the Bukumbi Hospital. Data were collected on the dates as indicated in Table 3.2 and three parents were interviewed per day.
- The respondents were also asked not to inform any of the other respondents about the interview process and what they had been asked.
- To ensure *internal consistency*, the researcher made use of an instrument, which had been prepared by the researcher, based on the literature review conducted on the subject, made sure that the wording of the interview schedule was clear by consulting experts in malaria, and by pre-testing the research instrument. Questions were clearly formulated and discussed with experts in the field and the supervisors to ensure that it would be interpreted correctly.
- The respondents were interviewed using the structured interview schedule. The responses of the participants to open-ended questions were noted verbatim and were ticked off in the case of closed-ended questions.

Validity refers to whether an instrument accurately measures what it is supposed to measure (Mugenda & Mugenda 2003:102; Wood & Haber 2002:314). Like reliability, validity comprises a number of aspects and assessment approaches, such as face validity, content validity, criterion-related validity and construct validity (Polit & Beck 2008:457).

Face validity is a rudimentary type of validity that basically verifies that the instrument gives the appearance of measuring the concept. It is an intuitive type of validity in which experts in the field and the supervisors were asked to read the

instrument and evaluate the content in terms of whether it appears to reflect the concept the researcher intended to study (Wood & Haber 2002:315; Polit & Beck 2008:458). The researcher, experts in the field as well as the supervisors accepted the research instrument's face validity.

Content validity represents the universe of content, or the domain of a given construct. The research instrument (the interview schedule) was also judged for content validity (Wood & Haber 2002:314; Polit & Beck 2008:458). The instrument was pre-tested and items were corrected where necessary.

3.8 ETHICAL CONSIDERATIONS

Certain steps were taken to ensure that the research was conducted in an ethical manner.

3.8.1 Permission to collect data

Permission to conduct the research was asked from and granted by the following individuals of Misungwi District:

- district medical officer;
- village executive officer from where the participants came and where the hospital is situated;
- the medical officer in charge of Bukumbi Hospital, where the interviews were conducted; and
- the medical assistant in charge of Bukumbi disabled care dispensary where the interviews were conducted (see Annexure A).

3.8.2 The right to self-determination

The right to self-determination is based on the principle of respect for persons, and indicates that humans are capable of controlling their own destiny (Burns & Grove 2001:158).

In this research, the respondents (parents) were treated as “autonomous agents” who had a freedom to conduct their lives as they chose without external controls. This was made possible by –

- informing participants about the research;
- allowing parents to choose whether or not to participate in this study;
- allowing respondents to withdraw from the study without fear of any penalty or prejudicial treatment;
- avoiding coercion or deception during the research, as all respondents were fully informed; and
- giving information to respondents in Swahili.

All the parent who were approached participated.

3.8.3 Right to privacy

Privacy is the freedom an individual has to determine the time extent and general circumstances under which private information will be shared with or withheld from others (Burns & Grove 2001:162). The right to privacy applied in this research was observed through the following rules:

- the right to refuse to be interviewed;
- the right to refuse to answer any question; and
- not be interviewed for long periods (Mouton 2001:243).

The respondents' privacy was protected in that the parents were interviewed in the side room in the presence of only the one interviewer. The parents were informed that data gathered would only be shared with those involved in the research.

3.8.4 The right to confidentiality and anonymity

Anonymity refers to the principle that the identity of an individual is kept secret. The confidentiality of information provided by respondents must be treated as private by researchers. Researchers should keep information confidential even when this information enjoys no legal protection or privilege and even when no legal force is applied (Mouton 2001:243-244).

In this research, anonymity of the subjects was maintained by the fact that the names of respondents did not appear on the interview schedule and names of parents were not written on any of the reports compiled by the researcher. The information provided by respondents could in no way be traced to any particular individual respondent and was only used for the purposes of this study. All data gathered were kept confidential. Subsequent to the acceptance of the research report, the completed interview schedules would be destroyed by the researcher. In the research report, statistics have been used and no individuals' names have been mentioned (Polit & Beck 2008:180).

3.8.5 The right to protection from discomfort and harm

The process of conducting research must not expose the subjects to any substantial risk of personal harm (Mouton 2001:245). This right is based on the ethical principle of beneficence, which states that one should do good and above all do no harm (Burns & Grove 2001:166).

The researcher took special precautions to ensure that the participants did not come to any physical, emotional, spiritual, economical, social or legal harm or that no treatment was withheld from them to ensure the smooth running of the research process.

3.8.6 Informed consent

According to Burns and Grove (2001:168), informed consent is the prospective respondent's agreement to participate in the study as a subject. Informing comprises the transmission of essential ideas and content from the researcher to the prospective participants.

In this research, every prospective respondent was given the opportunity to choose whether to participate in the research or not. The following information was given to the respondents:

- the purpose of the research;

- the objectives of the research;
- the duration of the study;
- the type of participation expected from the respondents;
- the way in which results would be published;
- the way confidentiality, anonymity and privacy would be ensured; and
- the identity and qualifications of the researcher (see Annexure D) (Mouton 2001:244; Polit & Beck176).

3.8.7 Research benefits

According to Mouton (2001:44), human subjects who take part in research should be informed about the benefits of the research and who will benefit.

The respondents in this research were informed that they would receive no monetary benefits from the study. The findings would, however, benefit them either directly or indirectly when identified problems are addressed. Suggestions deduced from the findings of this research would be conveyed to the district medical officer who will take the necessary steps to improve the situation.

3.8.8 Scientific honesty

Each researcher is responsible for monitoring the integrity of his or her research protocols, results and publications (Burns & Grove 2001:218). The researcher discussed all findings honestly and correctly and kept all the original interview schedules and documents to be monitored by anyone at any time.

3.9 CONCLUSION

This chapter began with a short overview of the modus operandi followed during this research. This chapter also highlighted the methodology that was adopted to complete this research. A quantitative, exploratory, descriptive research design was chosen as it was regarded as the most appropriate paradigm for the research problem.

The research population, sampling method and the criteria for obtaining the sample were also discussed. The reasons for choosing an interview schedule to collect data were discussed, as well as the way this research instrument was compiled and pre-tested for validity and reliability. The process of collecting data during the interviews with the parents of under five-year-old children with malaria was explained. As any research in nursing might elicit ethical problems, the steps taken to ensure the correct and ethical management of all involved were also outlined in this chapter.

An analysis of data collected from the interview schedules will be presented and discussed in Chapter 4.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

The previous chapter highlighted the methodology that was adopted to conduct this research. The quantitative, exploratory, descriptive, contextual research design used in this study was discussed as well as the research instrument used, namely a structured interview schedule.

The main purpose of this chapter is to discuss and interpret the findings of this research. This chapter presents the data obtained from 40 analysed interview schedules from parents of children under the age of five years, diagnosed with malaria, who lived in Bukumbi village, who had visited the outpatient department of Bukumbi Hospital, who had been admitted for malaria at Bukumbi Hospital or who had been treated for malaria at Bukumbi disabled care dispensary. The response rate was 100% as the respondents were interviewed at the health institutions by the researcher. The data from the interview schedules were presented in seven sections.

4.2 RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

As mentioned in Chapters 1 and 3, the aim of the research was to investigate which of the measures, that had been taught to the parents of under five-year-old children by health personnel and other avenues in Bukumbi village, Tanzania, had indeed been implemented to control malaria.

The following objectives were also formulated:

- Explore and describe the malaria knowledge of parents with children under the age of five in Bukumbi village, Tanzania.
- Explore the knowledge parents with children under the age of five years of Bukumbi village, Tanzania, have about the control of malaria.
- Determine where the parents, of children under the age of five years of Bukumbi village, Tanzania, obtained their knowledge about malaria.
- Identify which of the measures suggested by the health authorities to control malaria, have indeed been implemented by parents of the under five-year-old target group in Bukumbi village, Tanzania.
- Make recommendations to improve the malaria control programme by parents of the children under the age of five years in Bukumbi village, Tanzania.
- Make recommendations for future research on this topic.

4.3 DISCUSSION OF THE FINDINGS OF THE INTERVIEW SCHEDULE

The research instrument comprised of seven sections. The discussion of the findings has also been divided into the following main sections:

Section A

This section dealt with the biographical data of the respondents.

Section B

This section consisted of items, which covered the health education the respondents received about malaria.

Section C

This section consisted mostly of open-ended questions to test the respondents' knowledge about malaria.

Section D

This section consisted of items covering the preventive measures implemented by parents.

Section E

Section E covered the factors that might have prevented the respondents from implementing preventive measures.

Section F

This section consisted of control questions to test parents' knowledge about malaria.

Section G

Section G consisted of questions on the symptoms with which the children presented.

4.3.1 Biographical data

This section covered personal data of the respondents such as the age distribution of the children, ages of the parents, levels of education of the parents, employment status and monthly income of the families.

4.3.1.1 *Age distribution of the children (N=40)*

The age distribution of the children ranged from younger than 6 months (10.0%, n=4) to 5 years (5.0%, n=2). The majority of children (47.5%, n=10) who were treated for malaria and were therefore included in the sample, were aged 7-12 months as indicated in Table 4.1.

Table 4.1: Age distribution of the children (N=40)

AGE	Frequency	
	N	%
Younger than 6 months	4	10.0%
7 to 12 months	19	47.5%
13 months to 2 years	11	27.5%
25 months to 3 years	2	5.0%
37 months to 4 years	2	5.0%
49 months to 5 years	2	5.0%
Total	40	100.0%

According to Mandike (2006:6), the Bukumbi village reported 942 636 malaria cases in the under five-year-old target group, whilst of the 3 348 children in the older than five target group only 991 contracted malaria in 1996.

4.3.1.2 Ages of the children's fathers (N=40)

The age distribution of the fathers ranged from 21 to 30 years (32.5%, n=12) and 41 to 50 years (27.5%, n=11). Most of the fathers (40.0%, n=17) of children who were treated for malaria were between the ages 31 to 40. As indicated in Figure 4.1.

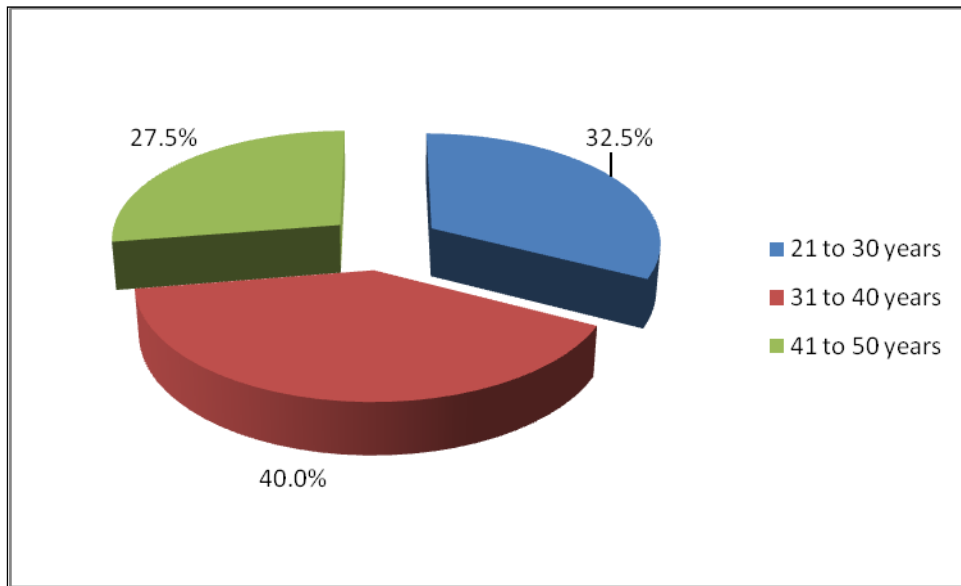


Figure 4.1: Ages of the children's fathers (N=40)

4.3.1.3 Age of the children's mothers (N=40)

The age distribution of the mothers ranged from 11-20 (15.0%, n=6) to 41-50 (7.5%, n=3). Most of the mothers 47.5% (n=19) whose children were treated for malaria were between the ages 21-30, as indicated in Figure 4.2.

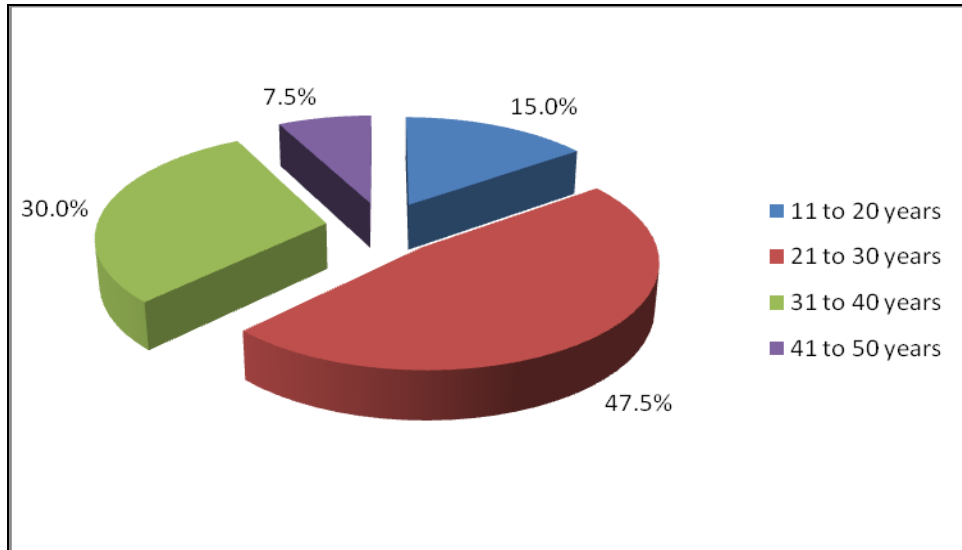


Figure 4.2: Ages of the children's mothers (N=40)

4.3.1.4 Marital status of the mothers (N=40)

The majority, namely 95.0% (n=38) of the mothers of the children who were treated for malaria were married, and only 5.0% (n=2) were single.

4.3.1.5 The level of education of the mothers (N=40)

Of the mothers 60.0% (n=24) had primary education, while 37.5% (n=15) had no formal education and only 2.5% (n=1) had post-primary education, as indicated in the pie diagram in Figure 4.3.

4.3.1.6 The level of education of the fathers (N=40)

Most 62.5% (n=25) of fathers of children in the study had primary education, while 20.0% (n=8) had post-primary education, and 17.5% (n=7) had no formal education. See Figure 4.3.

4.3.1.7 *The occupation of the mothers (N=40)*

The majority, namely 80.0% (n=32) of mothers, were small-scale peasant farmers, while 2.5% (n=1) were employed and 17.5% (n=7) had their own businesses. Therefore, all the mothers had some form of income. See figure 4.4.

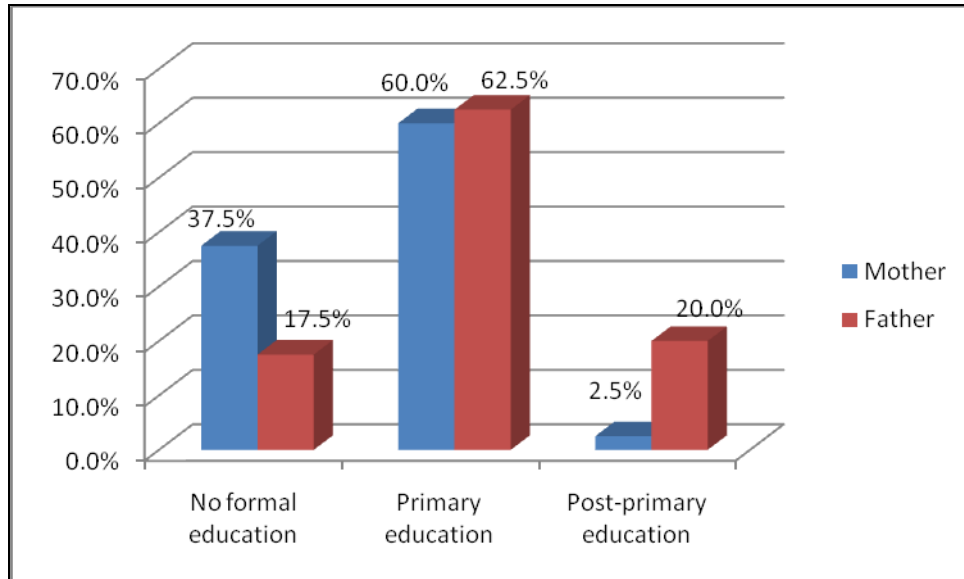


Figure 4.3: Level of education of the mothers and fathers of children with malaria (N=40)

4.3.1.8 *The occupation of the fathers (N=40)*

Many of the fathers, namely 65.0% (n=26) were small-scale peasant farmers, while 20.0% (n=8) were employed, 12.5% (n=5) had their own businesses and one (2.5%, n=1) was un-employed. Only one (2.5%, n=1) father therefore did not receive any income, but his wife earned an income for the family. See figure 4.4.

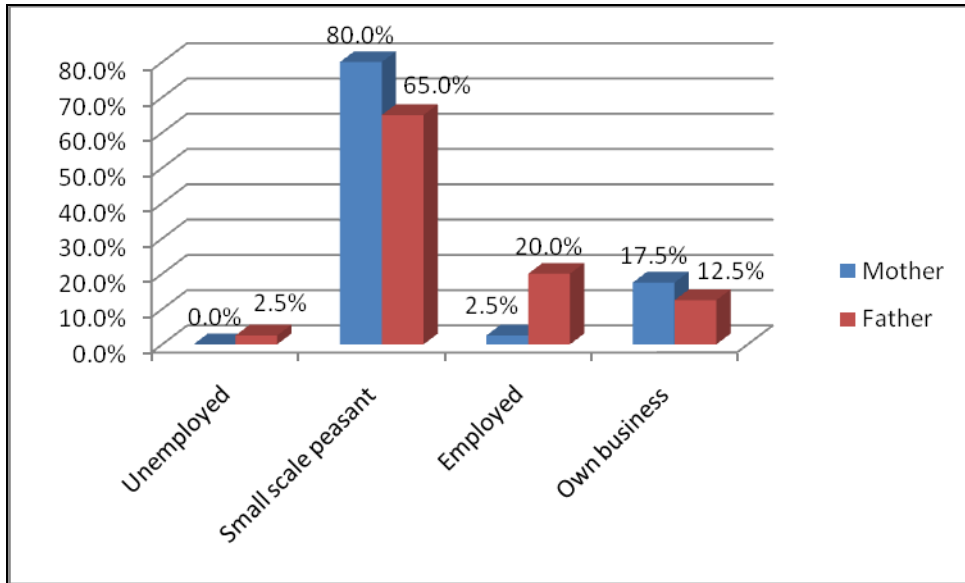


Figure 4.4: Occupations of mothers and fathers of children with malaria (N=40)

4.3.1.9 Number of children born to the family (N=40)

Many of the families, namely 30.0% (n=12) indicated that they had 1 to 2 children, 35.0% (n=14) had 3 to 4 children, while 17.5% (n=7) had 5 to 6 children and 17.5% (n=7) had seven or more children. See figure 4.5.

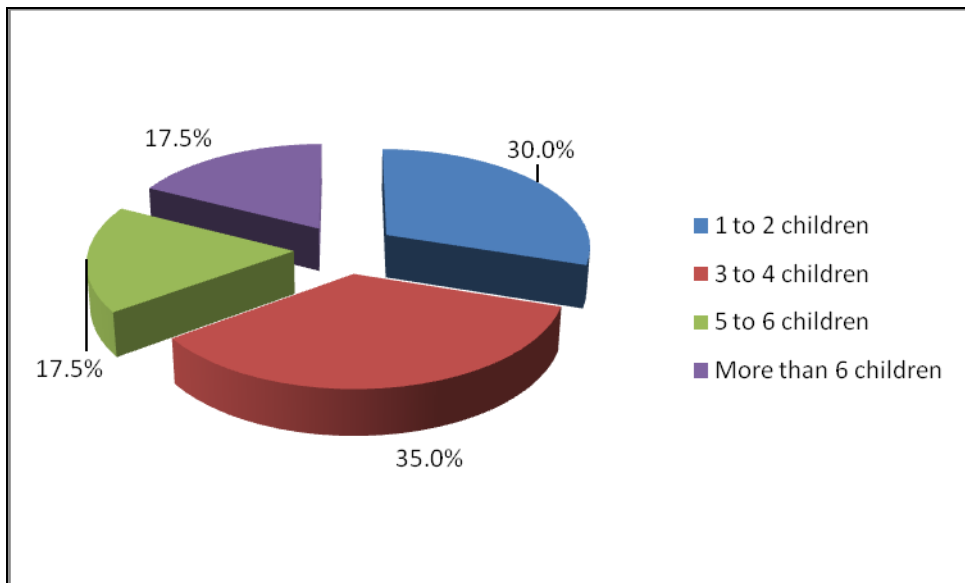


Figure 4.5: Number of children born to the family (N=40)

4.3.1.10 Number of malaria episodes children in this sample have previously contracted (N=40)

According to the respondents, most of the children, namely 70.0% (n=28) did not have previous episodes of malaria. The parents indicated that previously 27.5% (n=11) had contracted malaria once and 2.5% (n=1) had contracted malaria four times. See figure 4.6.

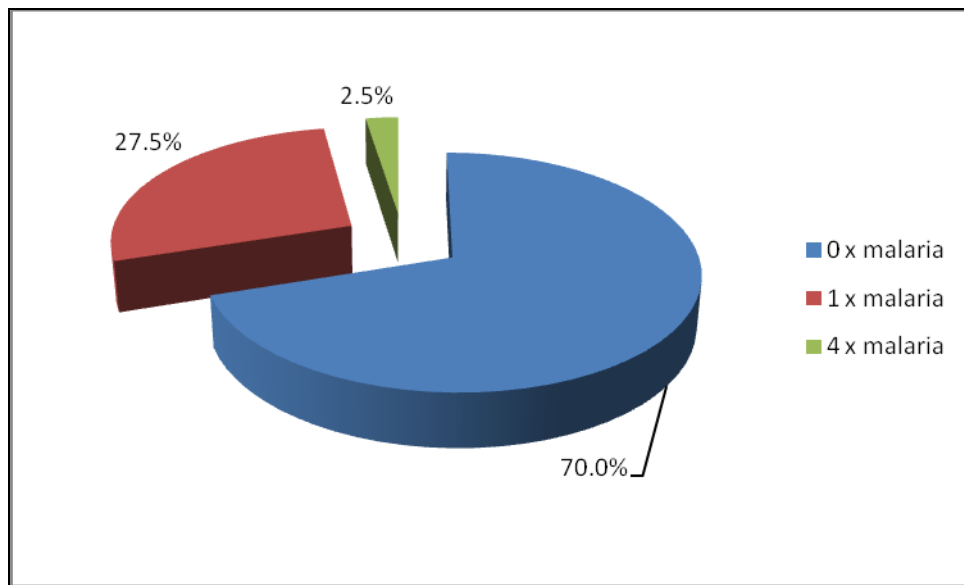


Figure 4.6: Children's number of previous malaria episodes (N=40)

4.3.1.11 Total number of children in each family who had died of malaria (N=40)

Most of the respondents, namely 65.0% (n=26) reported no death of any child in the under five-year-old age group due to malaria, while 32.5% (N=13) had one child who had died due to malaria, and one family (2.5%, n=1) reported that four (4) of their children had died due to malaria.

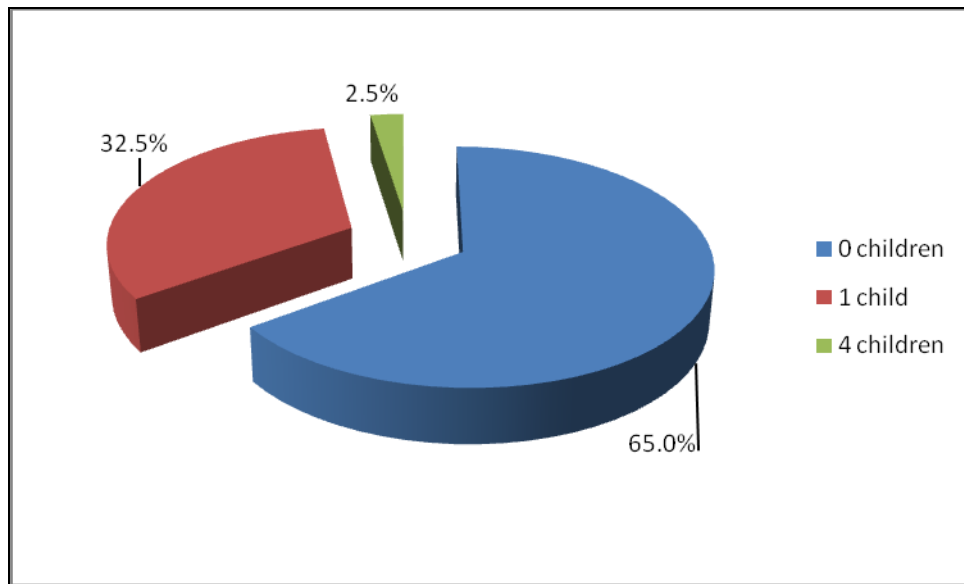


Figure 4.7: Number of children (under the age of 5 years) who have died of malaria in families (N=40)

According to Mandike (2006:2), seventeen children under the age of five years had died of malaria in Bukumbi village in 2004, whereas 112 children per 1000 live births died of malaria in the same year in Tanzania (Fighting Malaria: Malaria in Tanzania 2004).

4.3.1.12: Combined income of the family (N=40)

The highest combined income in the families of the respondents were Tsh 260 000 per year, while the lowest income was reportedly less than Tsh 16 000 per year (22.5% of the respondents).

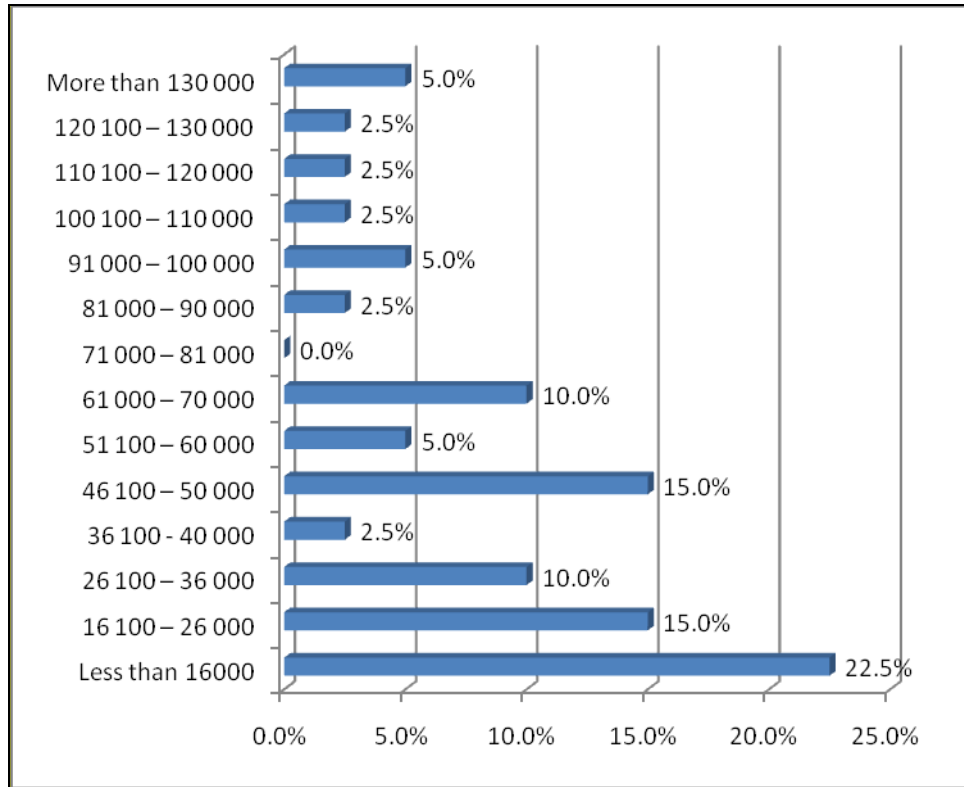


Figure 4.8: Combined income of the family in Tanzanian shilling (N=40)

The gross domestic product (GDP) per capita in Tanzania was US\$213¹ in 2000. About 27.0% of population could therefore be considered poor, spending less than US\$0.50 per day (Government of Tanzania 2003:12). All the families of the respondents were therefore from the poorest households. Malaria in turn aggravates the poverty cycle.

¹ 1 US dollar was less than 1000 Tanzanian shillings during May 2007.

4.3.2 Health education received about malaria

Health education is important as it empowers communities. Community members should then take ownership of the process and make it a priority to safeguard their children against malaria. Community participation should however be coupled to the availability of commodities (Brieger 2007b).

4.3.2.1 *Number of times respondents had received health education about malaria from any of the health services in Bukumbi village (N=40)*

According to Bukumbi Hospital RCH records (1999-2003), 12 health education topics are covered each year with each topic running for one month. According to this schedule, malaria is taught in January only. This type of health education is usually conducted whenever clients attend the Reproductive Child Health clinic (RCH) or are admitted to the hospital.

Many of the respondents, namely 75.0% (n=30) indicated that they did not receive any health education on the prevention of malaria from the health personnel. These parents therefore did not attend a health institution where health education had been provided. They could therefore not protect their children from contracting malaria. The findings in Item 4.3.1.10 indicated that 12 (30.0%) parents indicated that their children had contracted malaria one to four times during the preceding 12 months.

One respondent (2.5%) received health education five to nine times and two (5.0%) had received health education at least ten times from health personnel.

Three respondents therefore attended more health education sessions at the health institutions than the number of malaria episodes, their children had contracted. It could be that these parents attended health education sessions for their other children or for contraceptive health services in January. It is clear from these

findings that, although some parents had received health education they did not take the necessary precautions to prevent their children from getting malaria. It is therefore also necessary to provide health education in the community to adults and couples before they have families. Health personnel should also see to it that their control measures are properly implemented.

Item 4.3.1.10 showed that 70.0% (n=28) of the respondents reported that their children had contracted malaria for the first time. The same number of parents indicated that they only had one or two children (Item 4.3.1.9). If these parents did not attend the antenatal clinic during January when malaria was addressed they would not have obtained information from the health personnel on protecting their children against malaria. If these parents had received health education before their children contracted malaria, they might have taken the necessary steps to protect their children against malaria.

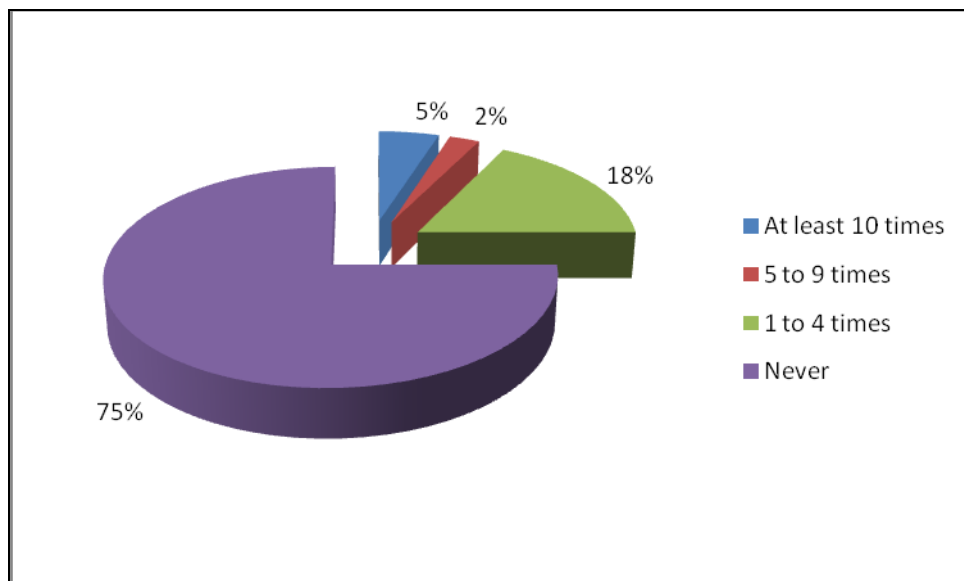


Figure 4.9: Number of times health education about malaria was received from health personnel (N=40)

4.3.2.2 *Other sources from which health education about malaria was received (n=30)*

The respondents (75.0%; n=30) who indicated that they had never received any health education about malaria from the health personnel obtained it from other sources. The respondents obtained their malaria knowledge from radio broadcasts, printed media, other villagers and from health personnel.

- *Received malaria health education from radio broadcasts (n=30)*

Many of the respondents (73.33%, n=22) who indicated in item 4.3.2.1 that they did not receive any health education from health personnel indicated that they had obtained some malaria information from radio broadcasts.

- *Received malaria health education through the printed media (n=30)*

The same number of respondents who indicated that they had obtained malaria knowledge from radio broad casts (rather than from health personnel) (73.3%, n=22) had also received some malaria information through the printed media.

- *Received health education about malaria from the villagers (n=30)*

The majority, namely 96.7% (n=29) of respondents who did not receive any health education from the health personnel, had obtained some malaria information from other villagers. This is understandable as malaria is a very big problem and it affects the majority of families in this village; people therefore talk about it.

- *Received health education from other sources than those listed in interview schedule (n=30)*

Only one respondent (3.3%) indicated that he/she obtained some malaria information from other sources than those listed in the interview schedule, namely from a television programme.

Health education is that part of health care that is concerned with creating awareness and promoting appropriate health behaviour to promote health, prevent illness, cure disease and facilitate rehabilitation. It brings desired changes in human behaviour, especially early diagnosis and treatment for children under the age of five years (NMCP 2006b:74).

In a study by Kidane and Morrow (2000:550-555) done in Trigary, Ethiopia, the effect of the under five-year-old mortality rate revealed that a major reduction in the under five-year-old mortality rate could be achieved in holo-endemic² malaria areas³ through the training of local mother-coordinators, who could teach other mothers how to control the disease by preventing the mosquitoes from breeding. This principle could be very successful, as educated mothers could have healthier families. According to Carter et al (2004:87), simple measures could be applied to control malaria, such as the prevention of mosquito bites by wearing clothes with long sleeve and trousers outside the house. This is especially necessary at night when the anopheline mosquitoes are most active (Haslett et al 2002:56). Chemoprophylaxis could be used in some cases to prevent clinical attacks of malaria

democ at a high level in a population, affecting most of the children but affecting the adults in the same population less often

³ areas where transmission of malaria takes place over the whole year

³ endemic at a high level in a population, affecting most of the children and so affecting the adults in the same population less often

taking place even if the mosquito has already bitten the individual (Haslett et al. 2002:56).

4.3.2.3 *The last time they had received malaria health education received from health personnel (N=10)*

As in the case of Item 4.3.2.2, 75.0% (n=30) respondents indicated that they had never received any malaria education from health personnel.

Of the respondents, 25.5% (n=10) who had received health education from the health personnel, 10% (n=4) had had received it two to six months previously. Seventy-five (n=4) of these respondents received malaria information from health personnel during the previous month, while one respondent 17.5% (n=1) had received it seven to twelve months ago, and one respondent (2.5%, n=1) more than a year ago.

According to government of Tanzania (2003:22), health education was provided to communities in epidemic-prone districts such as Bukumbi village, covering vector control, self-protection and the use of ITNs as well as the recognition of early signs of fever/malaria and case management.

According to Bukumbi Hospital RCH records (1999-2003), health education about malaria is provided during January only. It is provided whenever the clients attend the RCH clinic or are admitted to the children's ward.

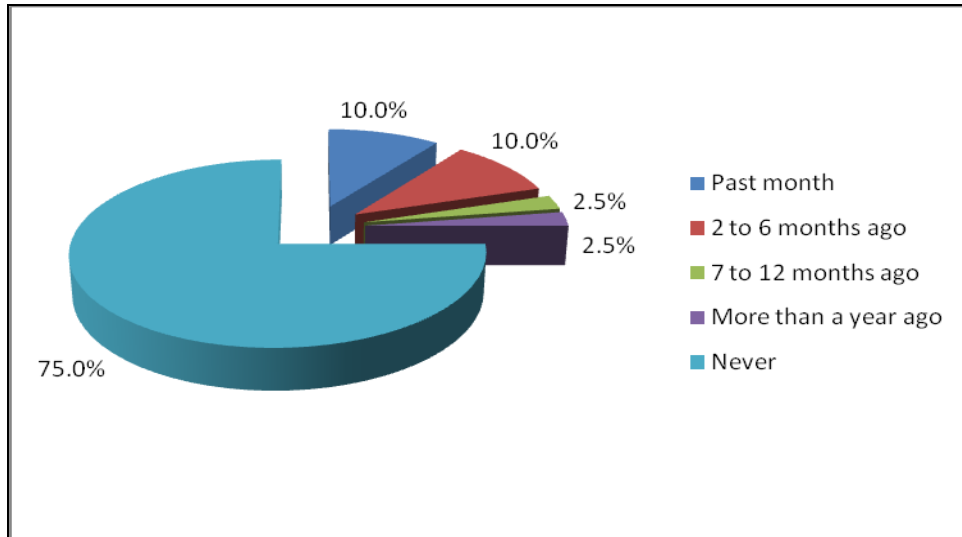


Figure 4.10: When last malaria health education had been received from health personnel (n=10)

4.3.2.4 *Helpfulness of the health education received from the health personnel (n=10)*

A large number of respondents (75.0%, n=30) did not make use of health personnel and therefore could not give any opinion as to whether or not malaria health education was helpful. Thirty percent of the respondents (n=3) who had received health education from the health personnel found the health education to be most helpful, 50% of the respondents (n=5) indicated that the information was helpful, and 20.0% (n=2) felt that it was not very helpful. Health education before the children contracted malaria might have been helpful to some parents in preventing malaria occurrences.

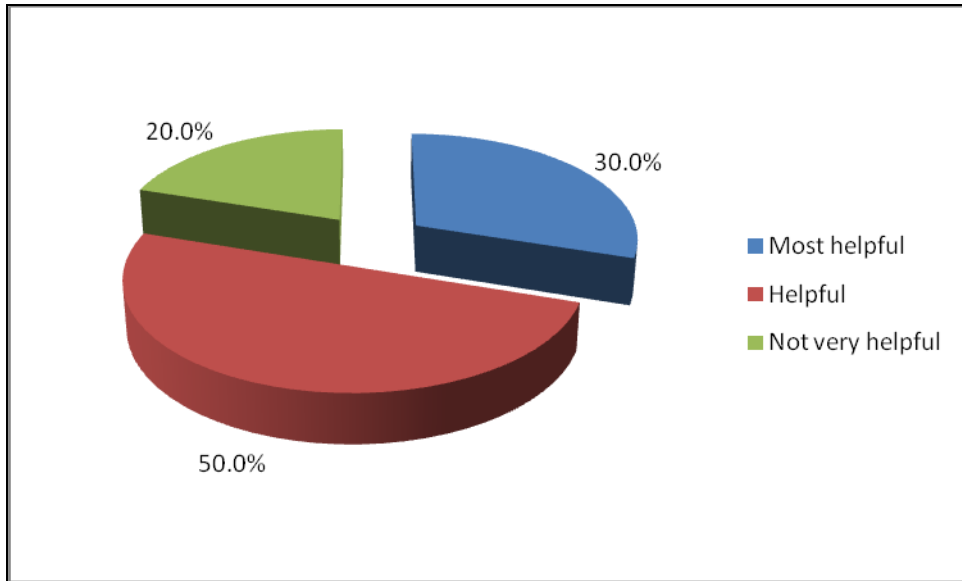


Figure 4.11 Helpfulness of malaria health education received from health personnel (N=10)

4.3.2.5 Knowledge obtained through health education provided by health personnel (N=10)

In this section, the respondents had to indicate whether they had gained their knowledge from the health personnel.

- *Learnt that malaria is a dangerous disease from health personnel (n=10)*

Sixty percent (n=6) of the respondents who had received health education from health personnel indicated that they had heard that malaria is a dangerous disease for the first time from the health personnel. Thirty percent (n=3) of the respondents indicated that they already knew this to be the case but learnt more about it through these health education sessions, and 10.0% (n=1) indicated that he/she already knew this and gained no new knowledge for the health personnel. See figure 4.12.

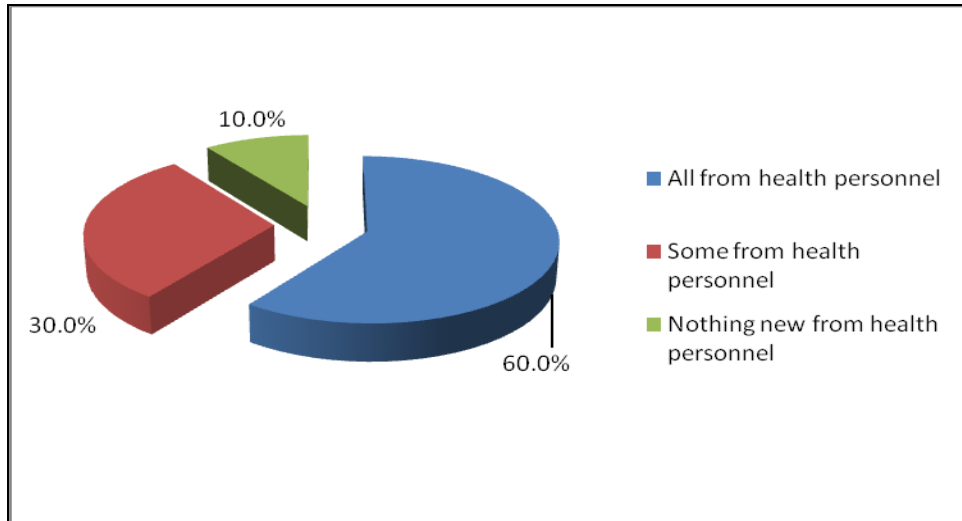


Figure 4.12: Learnt that malaria is a dangerous disease from health personnel (n=10)

- *Learnt that malaria could be prevented from health personnel (N=10)*

Only 5 (50.0%) respondents indicated that they had heard that malaria could be prevented for the first time from health personnel, and 4 respondents (40.0%) gained some knowledge on this topic through the health education sessions offered by health personnel on the prevention of malaria. One respondent (10.0%) indicated that he/she had learned nothing new the health personnel. See figure 4.13.

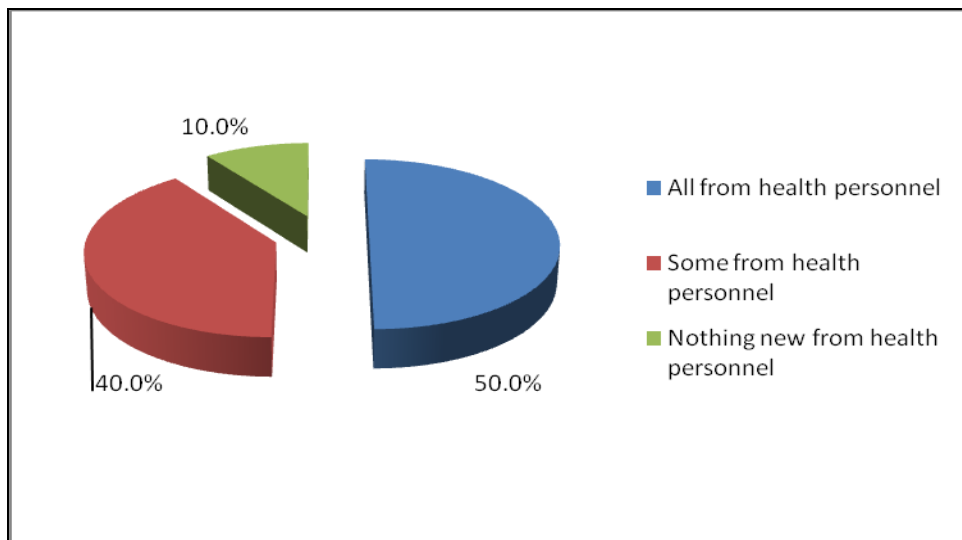


Figure 4.13: Learnt that malaria can be prevented from health personnel (n=10)

- Gained information from health personnel (n=10)

Of the same respondents who had received health education from health personnel 5 (50%) indicated that they had received all their knowledge from them concerning

- the causes of malaria;
- that children are more at risk of getting malaria;
- what could be done to prevent their children from getting malaria;
- how malaria is transmitted;
- that malaria can be treated and how it is treated;
- which symptoms to look-out for in their young children.

Four respondents (40.0%) indicated that they had learnt more about these topics through these health education sessions offered by health personnel. One respondent (10.0%) indicated that he/she had learned nothing new.

Four (40.0%) respondents said that they had gained all their knowledge about:

- when to seek medical help for their sick children;
- the child's condition's deterioration;
- the prevention of mosquitoes from breeding.

Five respondents (50.0%) gained more knowledge through these sessions, whereas the same respondent (10.0%, n=1) indicated that he/she learned nothing new about.

4.3.3 Knowledge of malaria

This section consisted of open-ended questions asking what the respondents actually knew about malaria and about its prevention and control. Similar questions were asked in the other sections but there possible answers were provided from which respondents had to choose an alternative. As the respondents could provide more than one answer to the questions in this section, the numbers do not necessarily add up to 40 in all cases.

4.3.3.1 Cause of malaria (N=40)

The majority of respondents, namely 82.5% (n=33), mentioned that malaria was caused by a mosquito. None of the respondents indicated that it was a protozoan parasite, transmitted through the bite of an infected female anopheles mosquito, which caused the disease (Ministry of Health 2004:3; Haslett et al 2002:51).

Other responses were drinking dirty water (n=2), a dirty environment with stagnant water (n=1), a virus (n=1), HIV (n=1), ticks (n=1) poor hygiene (n=1), and “child kept in cold climate” (n=1). One respondent (n=1) indicated that he did not know what caused malaria.

4.3.3.2 Transmission of malaria (N=40)

In response to the question “*How does the transmission of malaria take place?*” the majority, namely (75.0%; n=30), indicated that malaria was transmitted through the bite of an infected mosquito. Only one of these respondents was more specific and mentioned that it was the anopheles mosquito that causes malaria. Four (10.0%, n=4) of the respondents indicated that they did not know how malaria was transmitted. The following responses were also obtained:

- “*By drinking dirty water*” (n=2; 5.0%);
- “*If you sleep outside the net*” (n=2, 5.0%);
- “*Sexual intercourse*” (n=1, 2.5%); and
- “*By inhaling dirty air*” (n=1, 2.5%).

No respondent indicated that malaria is transmitted through the bite of the infected female anopheles mosquito (Ministry of Health 2004:3; Haslett et al 2002:51).

4.3.3.3 *Symptoms of malaria with which a child will present (N=40)*

Only one respondent (2.5%) could not name any symptom with which a child suspected of having malaria would present.

Symptoms mentioned were fever (47.5%, n=19), vomiting (40.0%, n=16), drowsiness, general body weakness, fatigue (37.5%, n=15), diarrhoea (35.0%, n=14), loss of appetite, inability to eat or suck (17.5%, n=7), pallor, pale eyes (10%, n=4), crying (7.5%, n=3), convulsions (7.5%, n=3), and dehydration (5.0%, n=2). Shivering, rashes, cough, restlessness, swelling of extremities, and “*Becoming very sick*” was mentioned by 2.5% (n=1) of the respondents.

No respondents mentioned the following signs: impaired consciousness, respiratory distress (acidotic breathing), abnormal bleeding, jaundice, haemoglobinuria (NMCP 2006a:12; WHO 2006:5-41).

4.3.3.4 *Symptoms with which their child (0-5 years) presented that made the respondents decide to take their child to hospital/seek medical help (N=40)*

Of the respondents, 16 (40.0%) indicated that their child presented with vomiting (40.0%, n=16) and high temperatures (37.5%; n=15). Eleven respondents (27.5%) cited as the reasons why they took their children to hospital mentioned fatigue, weakness, general body weakness and diarrhoea. Other symptoms included the children’s inability to suck (12.5%; n=5); loss of appetite (7.5%, n=3), and multiple convulsions (5.0%, N=2). One (2.5%) respondent also named the following symptoms: swelling of eyes, crying, neck stiffness, pale eyes, dehydration, increased respiratory rate and sunken eyes.

4.3.3.5 Prevention of malaria (N=40)

Of the respondents 17 (42.5%) indicated that they did not know how malaria could be prevented. One respondent (2.5%) indicated that malaria could be prevented “*By following the instructions of the health personnel*”, and that the health education obtained from the health personnel was “*most helpful*” in response to item 4.3.2.4.

Thirteen respondents (32.5%) mentioned the use of a mosquito net as a way to prevent malaria, but only three respondents (7.5%) mentioned that the net should be treated with insecticide. Other methods to prevent malaria included:

- “*proper environmental hygiene*” (10.0%; n=4);
- “*by using prophylaxis*” (5.0%; n=2);
- “*having blood tests done several times*” (5.0%; n=2);
- “*send baby quickly to hospital*” (2.5%; n=1);
- “*proper body hygiene to the baby*” (2.5%; n=1);
- “*food hygiene*” (2.5%; n=1); and
- “*boil water*” (2.5%; n=1).

None of the respondents mentioned the use of repellent creams and sprays, screened windows, the use of burning repellent coils or tablets (Haslett et al 2002:56). According to Haslett et al (2002) people living in malaria areas should also wear protective clothing (long-sleeved shirts, long trousers, long skirts, high socks and they should also use repellents containing Permetrin on clothing, shoes and other gear. No respondents mentioned these preventive measures.

4.3.3.6 Measures respondents could take to prevent their children of getting malaria (N=40).

Thirteen (32.5%) respondents indicated that they did not know how malaria could be prevented and two (5.0%) indicated that it was difficult.

Twelve respondents (30%) indicated that “*to use a mosquito net*” would help to prevent their children from getting malaria, and five (12.5%) thought that the “*use of an insecticide treated net*” would help.

Other methods that could be used according to the respondents were:

- “*To prevent eating dirty food*” (7.5%, n=3);
- “*To keep the baby inside the house after dark*” (5.0%, n=2);
- “*Give prophylaxis*” (5.0%, n=2);
- “*Proper body hygiene*” (2.5%, n=1);
- “*Nutritious food*” (2.5%, n=1);
- “*Clean net*” (2.5%, n=1);
- “*Prevent dirty water*” (2.5%, n=1); and
- “*Environmental hygiene*” (2.5%, n=1).

4.3.3.7 Signs that the malaria was effective (N=40)

To determine whether parents would know when the child’s condition was improving, they were asked, “*How would you know that the malaria treatment of your child is working?*”

The majority of the responses were rather vague. Sixteen (40.0%) of the respondents indicated that they would know as the child’s condition would improve or return to normal, 22.5% (n=9) indicated that the child would become active and start to play, and “*Stops vomiting, starts to eat, drinks normally, develops appetite*” (20.0%, n=8). Five respondents (12.5%, n=5) indicated that the temperature would go down, that the blood test would indicate that the child is improving (7.5%, n=3), vomiting and diarrhoea would stop (5.0%, n=2), and the doctor would say so or the treatment would be discontinued (2.5%, n=1).

4.3.3.8 Signs that the child's condition was deteriorating (N=40)

Three respondents (7.5%, n=3) indicated that they would not know whether the child's condition was deteriorating. The majority did not mention specific signs but only answered that the child's condition would "*Not improve*", and that "*The condition is unchanged*" or "*Not cured*" (47.5%, n=19).

That the child become "*sleepy*", "*weak*", and that he or she would find it "*difficult to sit*" was mentioned by 12.5% (n=5) of the respondents. Ten percent (n=4) of the respondents mentioned that the "*temperature will persist*", and that the child will be "*unable to suck*" (5.0%, n=2). Vomiting and diarrhoea, fatigue, drowsiness, and inability to eat that persists would be signs of deteriorating according to 2.5% (n=1) of the respondents.

4.3.3.9 Drug treatments administered to the patient (N=40)

Three respondents (7.5%) indicated that they did not know what drug treatment their children were receiving, and nine (22.5%) indicated either "*yellow syrup*", or "*red syrup*". As some of the parents named more than one drug, the numbers and percentages do not correspond with the number of respondents in the sample. Figure 4.12 presents these.

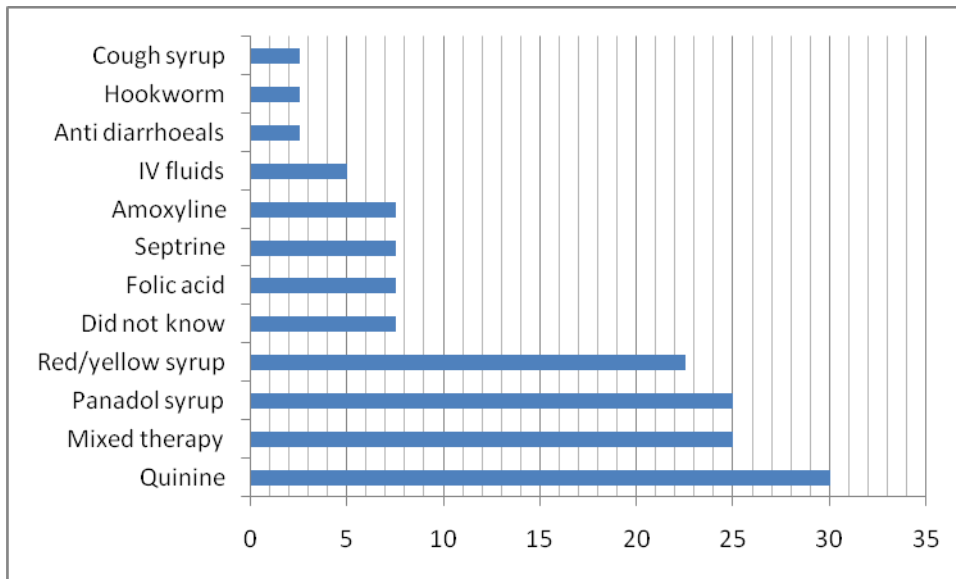


Figure 4.14: Type of drug treatment administered to respondents' children (0-5 years) (N=40)

Mueller et al (2004:36) explained the need for better education of parents about the correct dosages of first-line malaria drugs, particularly in the treatment of very young children, in order to prevent possible complications. The findings revealed that the parents were not well educated and did not know the names of the drugs they administered to their children. As this was not asked during the interview, it cannot be determined whether these children received the correct dosage of the malaria drugs.

4.3.3.10 Complications of malaria in children (N=40)

Of respondents, 32.5% (n=13) considered general body weakness to be a complication of malaria, followed by fever (17.5%, n=7). Nine respondents (22.5%) indicated that they did not know what the complications of malaria were. Other complications mentioned were "crying" (10.0%, n=4), "abdominal pain" (7.5%, n=3), "diarrhoea", "pain over the whole body", "loss of sleep" and "shivering" (5.0%, n=2). One (2.5%) respondent also mentioned inability to suck, tachycardia and vomiting.

None of respondents mentioned the following complications of malaria: coma, convulsions, hypoglycaemia, severe anaemia, acute pulmonary oedema, acute renal failure, spontaneous bleeding and coagulopathy, metabolic acidosis and shock (WHO 2006:52).

4.3.3.11 Measures that could be taken to inhibit mosquito breeding around the house (N=40)

Forty percent (n=16) of the respondents indicated that environmental sanitation and draining of any accumulated water around the house are measures that could be taken to inhibit mosquito breeding. Thirty percent (n=12) of the respondents indicated that cutting grass short around the house could also be useful to reduce mosquito breeding.

None of the respondents mentioned the use of oil on top of water in preventing breeding. Oil works by forming an impenetrable film over the water surface, preventing the larva from breathing. Temephos (Abate) granules can also be applied on water once monthly and are relatively non-toxic to humans, animals and fish (Carter et al 2004:87).

Seven respondents (17.5%) indicated that they did not know what could be done to inhibit the breeding of mosquitoes around the house. Other measures named by the respondents were:

- *“To keep the well far from the house”* (2.5%, n=1);
- *“Burn all the dirt”* (2.5%, n=1); and
- *“Refuse to be disposed of far away from the house”* (2.5%, n=1).

4.3.3.12 Measures that could be taken to prevent mosquito bites on children (0-5 years) (N=40)

Of the respondents, 52.5% (n=21) were of the opinion that “*using a mosquito net*”, “*buying Permetrin*”, and “*the baby should sleep under a net*” would prevent their children from being bitten by mosquitoes.

Eight (20.0%) respondents indicated that they did not know how they could prevent mosquito bites on their children. Two (5.0%) indicated that they would cover their children at night, dress their children well or keep their children in the house during the night. The use of mosquito repellent, and water prevented from accumulating in drains, was mentioned by one (2.5%) of the respondents. One respondent (2.5%) also indicated that it was difficult to protect children against malaria.

None of the respondents mentioned that sprays, or screened windows, can avoid the mosquito bite or that burning repellent coils or tablets can reduce the risk (Haslett et al 2002:56).

4.3.3.13 Reasons why special care should be taken in preventing malaria in children younger than five years (N=40)

Only 10.0% (n=4) of the respondents indicated that these children’s “*...immunity is low*” and “*they get malaria easier than adults*”. Some respondents (37.5%; n=15) indicated that they did not know the reason and 35.0% (n=14) provided irrelevant reasons such as: “*Because they are angels*”, “*Children are the future of the nation*”, and “*They depend on us to be helped*” (35.0%, n=14).

According to the Africa Malaria Report (2003), young children and pregnant women are the population groups at highest risk of getting malaria, because of low immunity. Ninety percent of all malaria deaths in Africa occur among young children (Africa Malaria Report 2003).

4.3.3.14 *Number of malaria episodes for different age groups during the past year (N=40)*

- *Number of episodes for children younger than 5 years (N=40)*

Many of the respondents 55.0% (n=22) mentioned that their children had more than five episodes of malaria during the previous year, 30.0% (n=12) had two to four episodes, while two respondents (5.0%) reported only one episode and in four cases (10.0%) there were no episodes. This finding is quite different from the answer to the question asked under Item 4.3.1.10 where the respondents indicated that 70.0% (n=20) of the under five-year-old children did not have any previous episodes of malaria.

Savigny et al (2004:2-19) said that children are the more common victims of malaria, with mortality rates being the highest amongst those aged five years and younger. During 2004, the under five-year-old malaria mortality rate in Tanzania was 112 per 1 000 live births.

- *Number of episodes for the children between the ages 6-10 years (N=40)*

Fifty percent the respondents, (n=20), mentioned that the children in their families, in this age group, had two to four episodes of malaria during the previous year, 10.0% (n=4) had more than five episodes, five children (12.5%) had only one episode and 27.5% (n=11) had no episode in this period.

- *Number of episodes for children between the ages 11-15 years (N=40)*

Most of the respondents, namely 67.5% (n=27) mentioned that none of their children who are between the ages of 11 to 15 had experienced any episodes during the previous year, 15.0% (n=6) only had one episode, and seven respondents (17.5%)

reported two to four episodes. These figures are still very high although there seems to be a decline in the prevalence rate for malaria among older children.

- *Number of episodes of malaria in children older than 16 years (N=40)*

The majority of respondents, namely 95.0% (n=38), mentioned that there were no episodes of malaria in their children older than 16 during the previous year. Five percent (n=2) of the respondents indicated that their children of this age group only had one episode during this period. The number of episodes is also lower in the age group older than 16 years than the age group 11-15 as discussed in Item 4.3.3.14. See also figure 4.15.

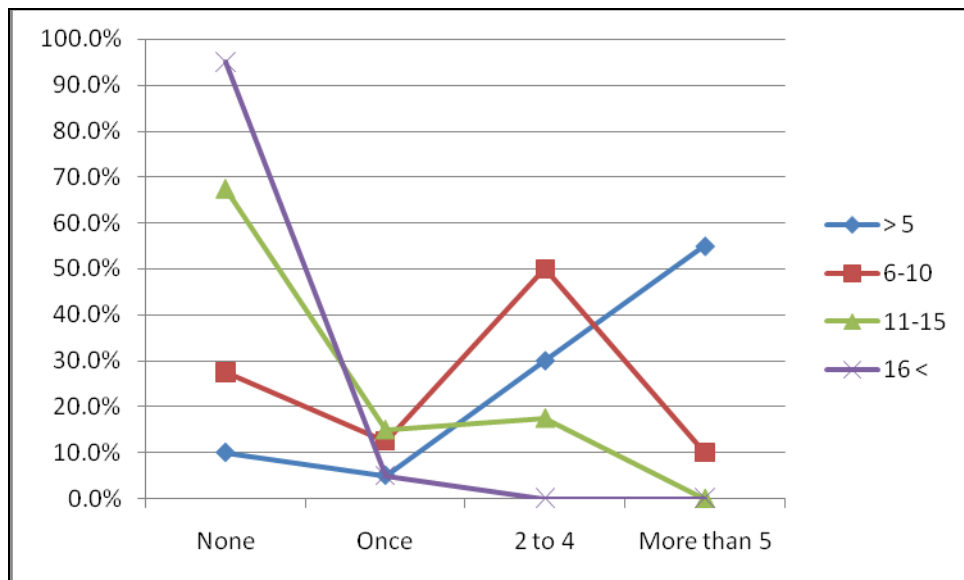


Figure 4.15: Number of episodes of malaria in children (N=40)

There seems to be a steady decline in the number of malaria episodes, as the children become older as discussed in section 4.3.3.14.

- *Number of episodes for the adults (N=40)*

Of the respondents 55.0% (n=22) indicated that the adults in their families had one episode of malaria during the previous year, 44.5% (n=18) reportedly had between two and four episodes.

The findings revealed that there was a decline in the number of episodes as the children became older but that this was not the case in terms of the adults in the family.

4.3.3.15 *Frequency with which the traditional healer was consulted in the past (N=40)*

Many of the respondents, namely 72.5% (n=29), indicated that they never consulted a traditional healer for malaria, whereas 15.0% (n=6) revealed that they had consulted these healers two to four times in the past. Four respondents, (10.0%) indicated that they had visited the healer on at least 5 occasions, and one respondent (2.5%) had visited this healer once in the past. See figure 4.16.

According to Savigny et al (2004:2) traditional care is no longer a significant delaying factor in seeking modern medical care for malaria in Tanzania, and these findings seem to be concordant with this standpoint.

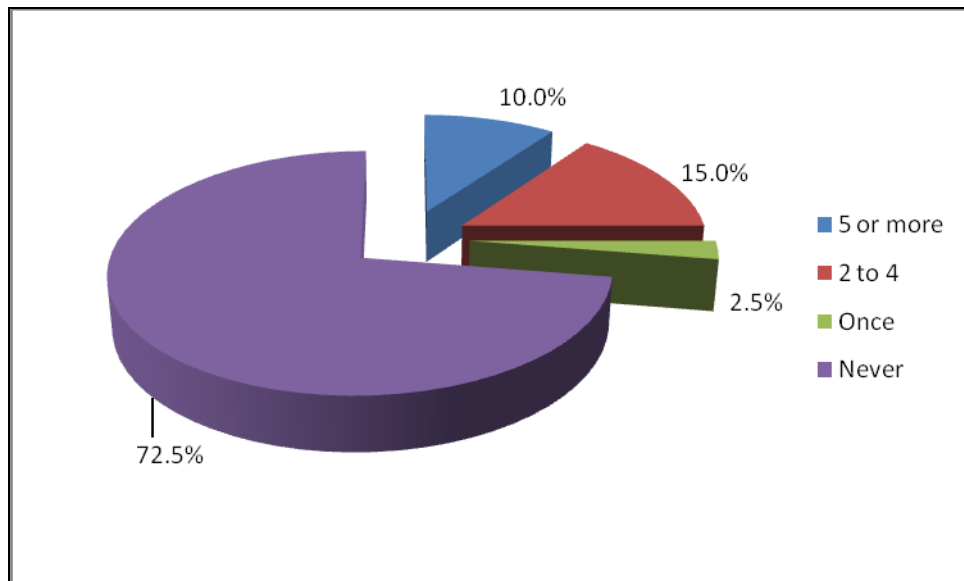


Figure 4.16: Frequency with which the traditional healer had been consulted for malaria (N=40)

Mboera et al (2004:40) stated that traditional healers were most frequently consulted for cases of convulsions in Mpwapwa district, Tanzania.

- *Type of care the traditional healer provided for malaria (n=3)*

Only three respondents (7.5%) provided an answer to this question. They all mentioned a powder that was inserted in the nose of the baby for convulsions.

4.3.4 Preventive measures implemented by parents

In this section, the respondents were asked about the preventive measures they had implemented to control malaria.

4.3.4.1 *Actions taken by parents around the house to inhibit mosquito breeding (N=40)*

An open-ended question was included to determine what actions the parents had taken to inhibit mosquito breeding.

Of respondents, namely 42.5% (n=17), indicated that they had drained water accumulating around the house, or dirty water, kept the grass short (12.5%, n=5) or purchased an insecticide-treated mosquito net (12.5%, n=5). One respondent (2.5%) indicated that their family used Permetrin. Six respondents (15.0%) revealed that they either did not know what to do or had done nothing. One respondent (2.5%) indicated that it is impossible to control mosquitoes. The remaining five parents (12.5%) did not respond to this question.

4.3.4.2 *The frequency with which parents took certain measures to inhibit mosquito breeding around the house (N=40)*

The first measure that was probed was the drainage of accumulated water around the house. According to Carter et al (2004:88), environmental sanitation is an effective and cheap form of mosquito control, which could be done by community members themselves. It entails the following:

- draining stagnant water in water holes or ditches and any accumulation of water around the house;
 - clearing bushes and grass along water banks;
 - collecting and disposing of all containers likely to hold water;
 - emptying water containers once a week;
 - covering water containers with lids or larvicide such as a few drops of oil; and
 - clearing bush and replacing it with cultivation.
- *The frequency with which accumulated water is drained around the house (N=40)*

Of the respondents 67.5% (n=27) had never drained accumulated water around the house, 12.5% (N=5) drained it seldomly, while 7.5% (n=3) drained it at least once per week, and the remaining respondents 12.5% (n=5) indicated that they did so every day.

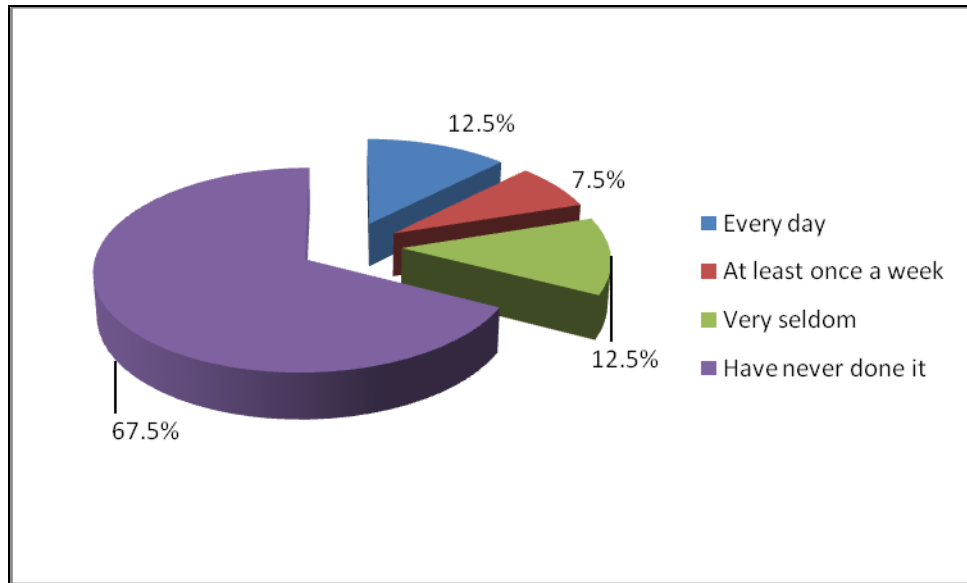


Figure 4.17: Frequency with which accumulated water had been drained (N=40)

- *Frequency with which bushes are cleared along the water banks (N=40).*

Many of the respondents 57.5% (n=23) indicated that they cleared the bushes around the water banks 1-3 times per week, 20.0% (n=8) did so seldomly, while 10.0% (N=4) cleared it at least once a month, and 12.5% (n=5) had never done it. See figure 4.18.

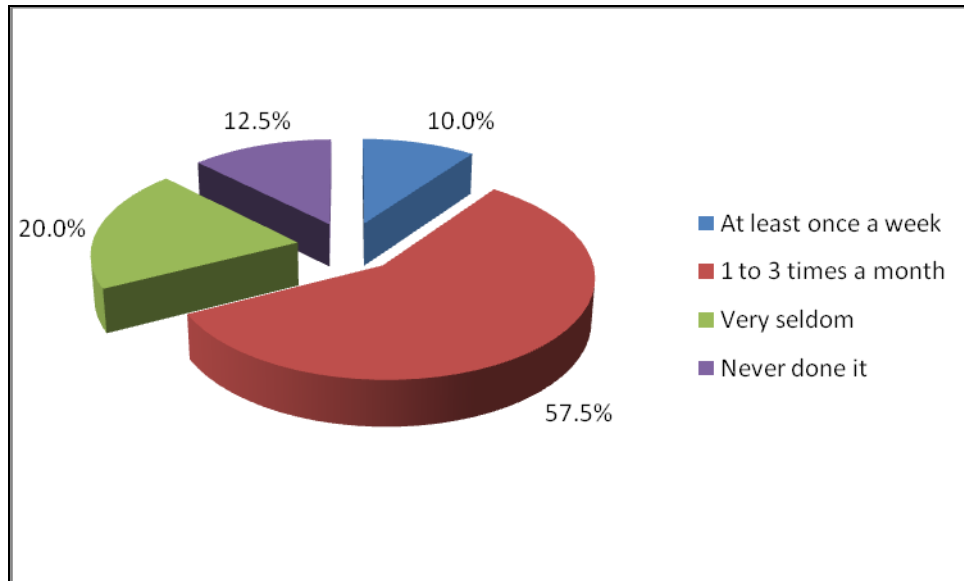


Figure 4.18: Frequency in which bushes were cleared along water banks (N=40)

- *Frequency with which grass was cut short along water banks (N=40)*

Most of the respondent (57.5%, n=23) cut the grass short along the water banks 1-3 times a month, 20.0% (n=8) did it seldomly, 10.0% (n=4) did so at least once a week, and 12.5% (n=5) had never done so.

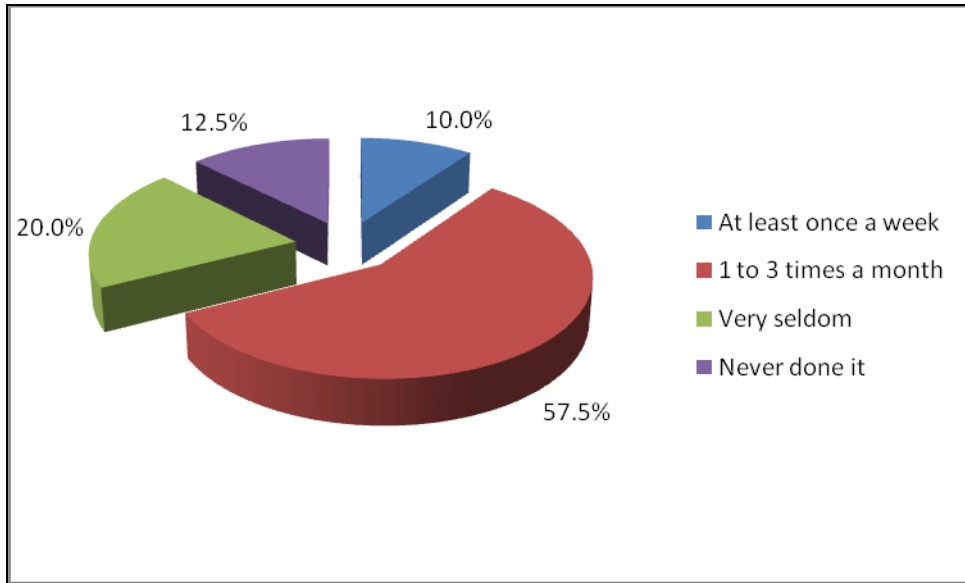


Figure 4.19: Frequency with which grass was cut short along water banks (N=40)

- *Frequency with which containers likely to hold water were discarded (N=40)*

Some respondents, (40.0%; n=16), had never disposed of containers that were likely to hold water, 32.5% (n=13) indicated that they did it very seldom, 15.0% (n=6) did this at least once per week, and 12.5% (n=5) did it every day.

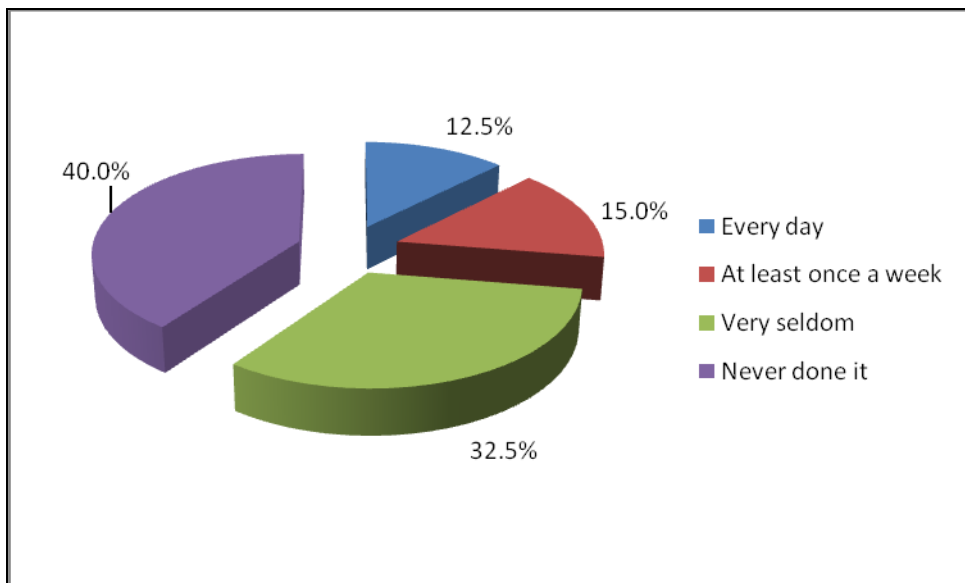


Figure 4.20: Frequency with which containers likely to hold water were discarded (N=40)

- *Frequency with which water containers were covered (N=40)*

Some respondents (60.0% (n=24) indicated that they covered water containers every day, while 40.0% (n=16) have never done so.

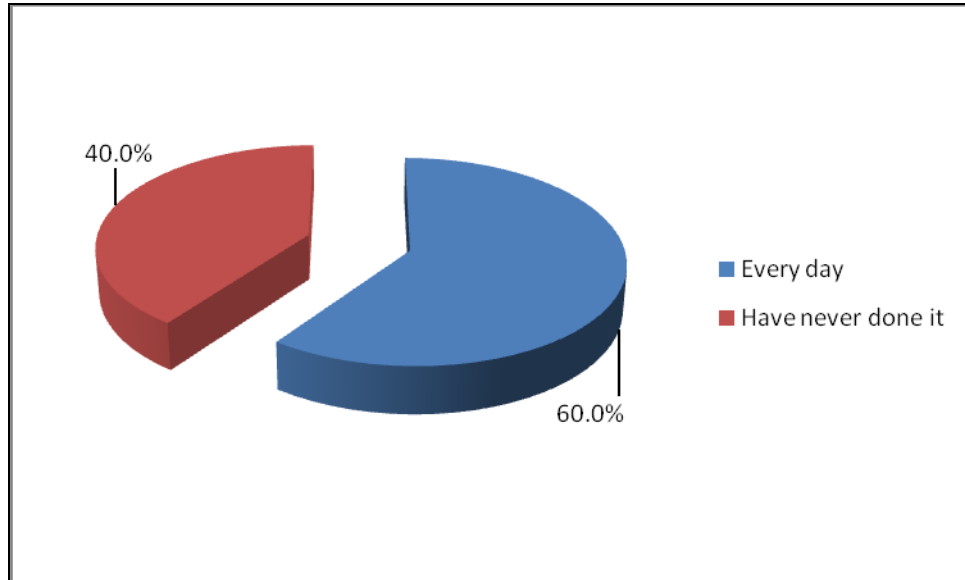


Figure 4.21: Frequency with which water containers were covered (N=40)

4.3.4.3 Frequency with which control measures were implemented (N=40)

Respondents needed to explain the frequency with which they applied the mentioned measures of controlling malaria. These control measures dealt with the process of diminishing the risk of being bitten by a mosquito. If it could be executed continuously and effectively malaria occurrences could be reduced. Protection against mosquito bites is the first line of defence, and this could be done by using a combination of the following measures:

- *Frequency with which the house was sprayed to kill mosquitoes (N=40)*

Almost all respondents, namely 97.5% (n=39) said that they never sprayed the exterior of the house to kill mosquitoes, while 2.5% (n=1) did it so at least once a week.

Figure 4.22 sums up the environmental control measure implemented by the Respondents

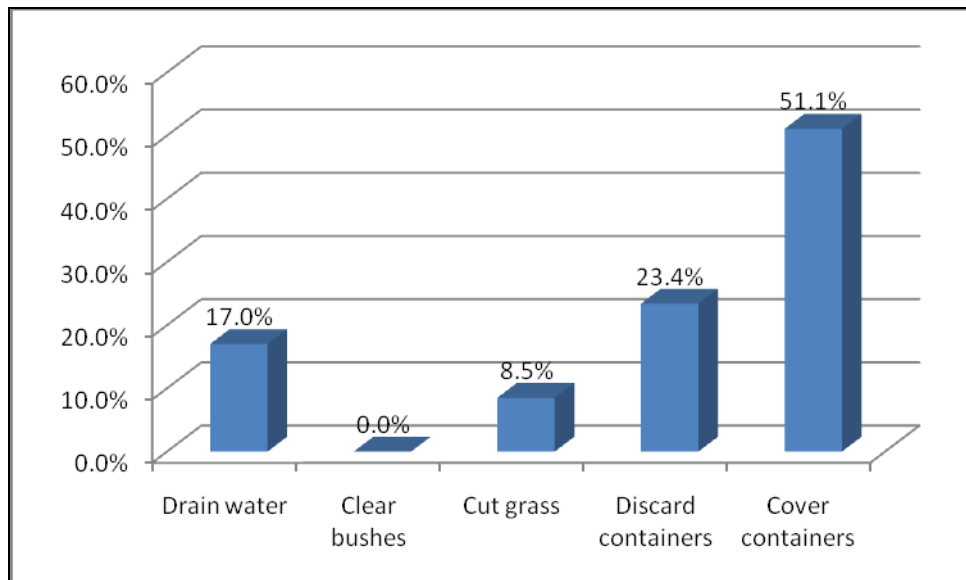


Figure 4.22: Environmental control measure implemented by respondents (N=40)

- *Frequency with which mosquito coils are used (N=40)*

Most of the respondents, namely 77.5% (n=31) indicated that they had never used mosquito coils, 10.0% (n=4) used it seldomly, 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. The burning of repellent coils or tablets is one of the preventive measures endorsed by World Vision Tanzania (2004).

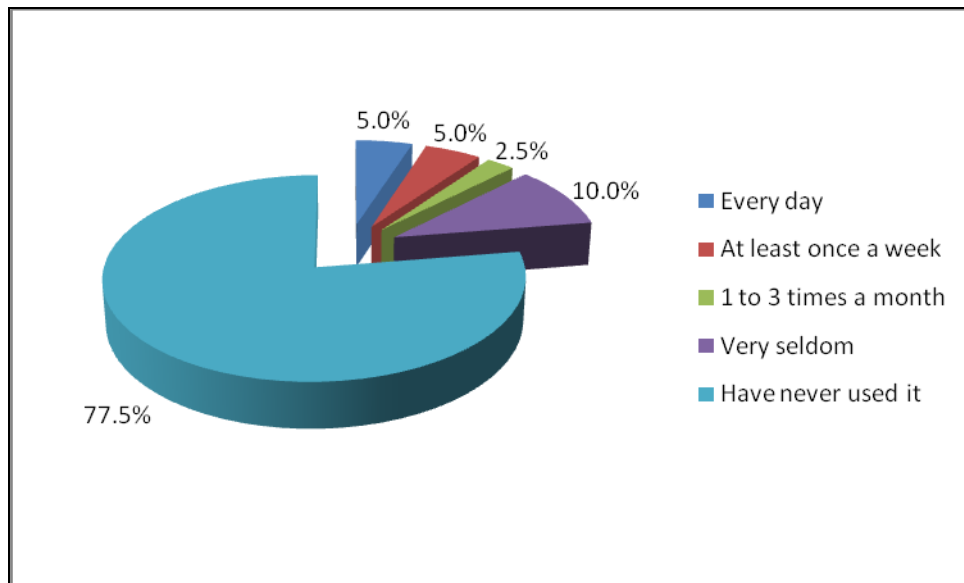


Figure 4.23: Frequency with which mosquito coils were used (N=40)

- *Frequency with which parents used traditional medicines (N=40)*

The majority of the respondents (97.5%, n=39) revealed that they had never used traditional medicines, while one respondent (2.5%) used it every day. It could be that they had never been given traditional medicines to use at home as three respondents (7.5%) indicated under Item C16 that a powder had been inserted in the baby's nostrils by the traditional healer for the treatment of convulsions.

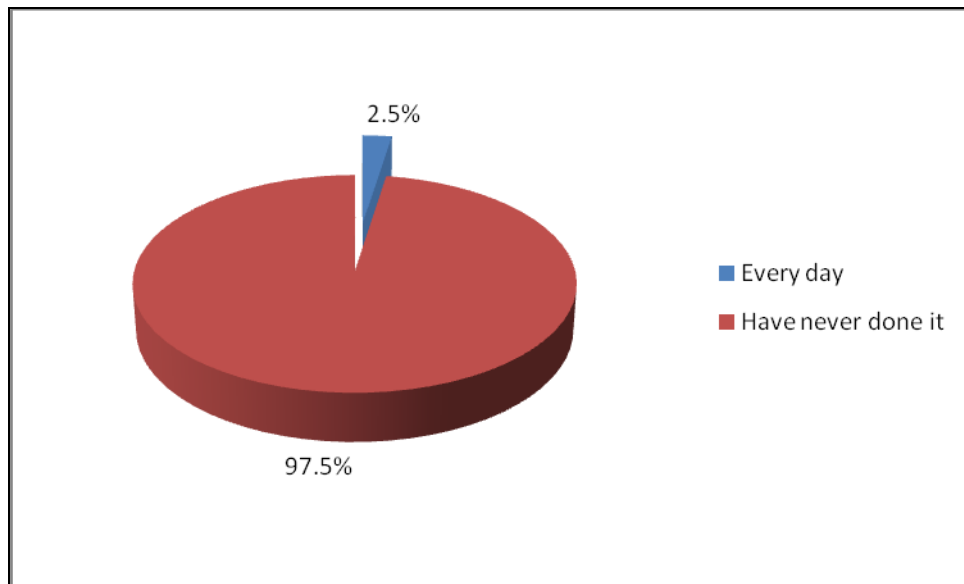


Figure 4.24: Frequency with which families used traditional medicine (N=40)

- *Frequency with which children were dressed with clothes that covered their arms and legs (N=40)*

Some respondents (35.0%, n=14) dressed their children in clothes which covered their arms and legs every day. According to these findings, 15.0% (n=6) did so at least once a month, 15.0% (n=6) did so seldomly and 35.0% (n=14) had never done so. Wearing of protective clothing (long-sleeved shirts, long trousers, long skirts, high socks) is a simple measure all parents could take to protect their children against mosquito bites. Even the poorest parent could do so (World Vision Tanzania 2004). See figure 4.25.

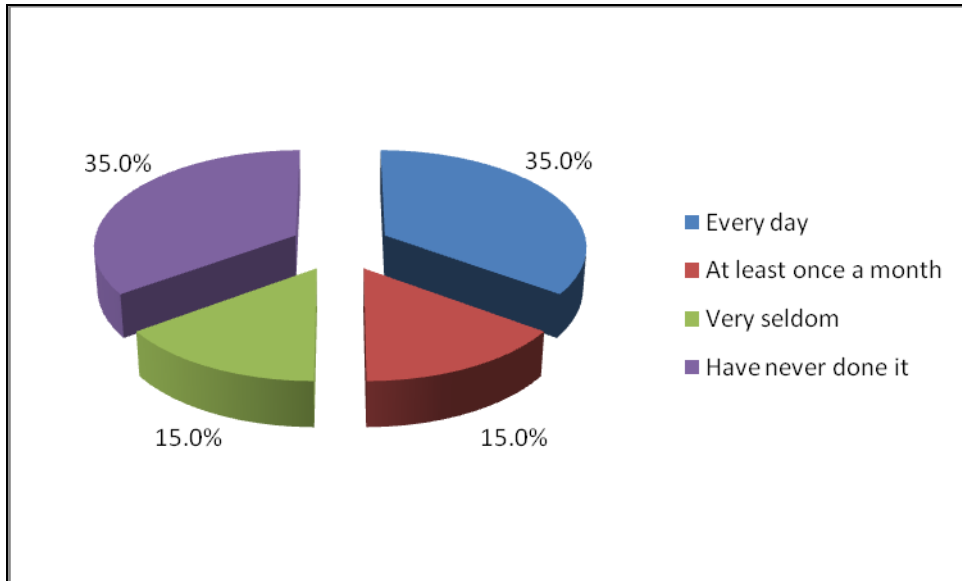


Figure 4.25: Frequency with which children were dressed with clothes that covered their arms and legs (N=40)

- *Frequency of the application of repellent to the skins of their children (N=40)*

The majority of the respondents, (97.5%; n=39), had never applied repellent to the skins of their children, while only one respondent (2.5%) reportedly applied it every day.

An effective mosquito repellent is one that contains diethylmetatoluamide (“deet”) as an active ingredient. With this concentration, it should be effective for about four hours. This product should not substitute ITNs (World Vision Tanzania 2004).

- *Frequency of spraying of the inside of houses to kill mosquitoes (N=40)*

The majority of the respondents, namely 85.0% (n=34), had never sprayed the interior of their homes to kill mosquitoes, 10.0% (n=4) did so seldomly, while 2.5% (n=1) did it every day and 2.5% (n=1) did it at least once a week.

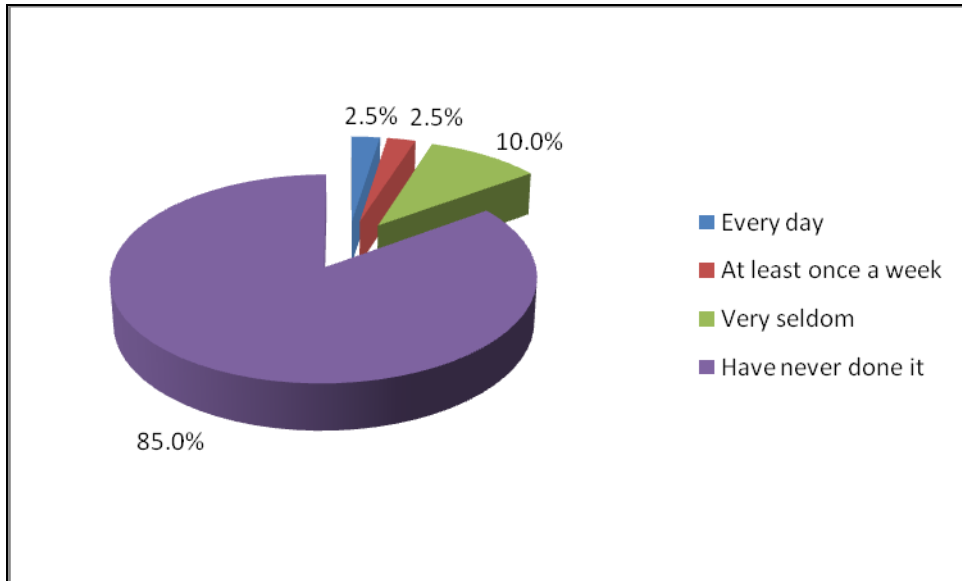


Table 4.26: Frequency of spraying the inside of houses to kill mosquitoes (N=40)

Although the widespread use of DDT has been banned due to the serious side-effects it has for humans and the environment, it is still considered to be one of the most effective methods to control malaria. An international anti-pesticide treaty allows for an exception to the ban in malarial areas. So far, Tanzania has resisted using DDT for the spraying of the exteriors and interiors of homes (Searching for solutions to the malaria crisis 2004). The use of insect sprays containing Pyrethroid in living and sleeping areas after dark and during the night can however, prevent the mosquitoes from biting people and thus prevent malaria (World Vision Tanzania 2004).

- *Frequency with which children were allowed to go outside after dark (N=40)*

A large number of respondents, (47.5%; n=19), never allowed their children to go outside after dark, 30% (n=12) allowed their children to go out every day, while 22.5% (n=9) did so very seldomly.

Table 4.2: Frequency with which children were allowed to go outside after dark (N=40)

How often	Number of respondents	
	N	%
Every day	12	30.0%
Very seldom	9	22.5%
Have never done it	19	47.5%
Total	40	100.0%

- *Frequency of use of smoking fires to keep mosquitoes away (N=40)*

None of the respondents had ever made fires at dusk to keep mosquitoes away.

Using smoke from cooking fires and local herbs as a mosquito control measure is a common practice, although complaints about the fumes causing breathing problems had also been reported. It was found in a controlled study in Papua New Guinea, that smoke from open fires acted as a cheap and effective means of repelling mosquitoes in the evening (Croft 2008; Brieger 2007a). None of the respondents could add to the above-mentioned measures. Figure 4.27 summarises the specific measures implemented by the respondents to safeguard their children from being bitten when they played outside after dark. Although 30.0% of the respondents allowed their children to play outside after dark, only 2.5% had applied mosquito repellents but they all dressed their children in clothes that covered their arms and legs. It is very hot in this area during the summer, so children would want to play outside after dark, without wearing long sleeves and long trousers.

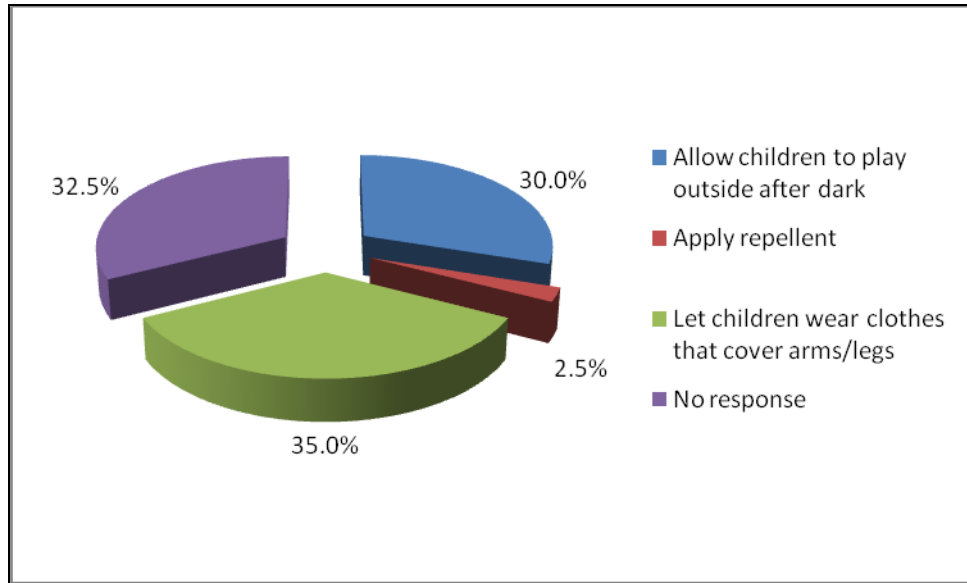


Table 4.27: Specific preventative measures to safeguard their children when playing outside after dark (N=40)

4.3.4.4 Covering of person and openings of dwellings (N=40)

In this section questions were asked to determine whether the respondents made attempts to cover themselves or the various openings of the dwellings to prevent mosquitoes of entering the structures and bit the inhabitants.

- *Covering openings of home (N=40)*

A large number of respondents, namely 62.5% (n=25), did not cover the openings of their homes with mosquito gauze, 35.0% (n=14) had all the openings of the house covered with gauze, and only one respondent (2.5%) had some of the openings covered. The term *opening* was used instead of windows, as not all the dwellings in this village have windows.

Table 4.3: Openings of home covered (N=40)

Openings covered	Number of respondents	
	N	%
All openings covered	14	35.0%
No openings covered	25	62.5%
Some openings covered	1	2.5%
Total	40	100.0%

- *Covering of doors of home with mosquito gauze (N=40)*

None of the respondents covered their doors with mosquito gauze. Mosquitoes could enter most of the homes of the parents, as most openings in their dwellings were not covered with gauze.

- *Condition of gauze screens (N=40)*

Of the respondents, 62.5% (n=25), had no mosquito gauze screens in front of their windows. Thirteen of the respondents 32.5% (n=13) revealed that the mosquito gauze was in tact, and one respondent (2.5%, n=1) indicated that some of the screens were in a good condition.

Table 4.4: Condition of mosquito gauze screens (N=40)

Condition of gauze screen	Number of respondents	
	N	%
Do not have mosquito gauze	25	62.5%
Yes, all in good condition	13	32.5%
None of them in good condition	1	2.5%
Some of them in good condition	1	2.5%
Total	40	100.0%

Most of the respondents who had gauze screens reported that these were in a good condition. It is expensive to cover door and window openings with gauze screens. As these are not subsidised by the government, it is difficult for the poor to put it up or maintain it.

- *Mosquito nets for children (N=40)*

All the respondents (N=40, 100%) had mosquito nets (ITNs) for their children.

To reduce costs to mothers with children under the age five years, the Tanzanian government launched a pilot system in 2003 (Searching for solutions to the malaria crisis 2004). Mothers received vouchers to buy ITNs from designated shops that would cost them between 500 Tsh (50 US cents) and 700 Tsh (70 US cents), depending on its size. The target was to have 60% of pregnant women and children under the age of five years using insecticide-treated nets by 2007 (Government of Tanzania 2003:22). This system made it possible for families with children in this age group to purchase ITNs.

In a survey conducted in the Mwanza urban area, Tanzania, it was found that 82.0% of households had at least one net, but on average only 12.0% of households owned one ITNs. It was also found that about 11.0% of children in the under the age of five years target group slept under ITNs in this area.

As all the respondents indicated that their children in the age group 0-5 years had ITNs, there was no need to ask the question (Item D9) to explain why they do not have nets for their children.

- *Condition of child's mosquito net (N=40)*

The majority, 87.5%; (n=35) of the respondents, said that the child's mosquito net was in a good condition, while 12.5% respondents (n=5) indicated that it was not.

According to Brieger (2007b), the distribution of ITNs should be accompanied by provision of information on how to handle, use and maintain nets properly. It is then the responsibility of parents to make sure that the net remains in a good condition.

- *Reasons for the poor condition of the mosquito net (n=5)*

Five (12.5%) of the respondents answered under Item 4.3.4.4 that the mosquito net of their child aged 0-5 years was not in a good condition. The reasons they provided were the following: *“I will buy one later”* or that they are in the *“process of buying a new one”*.

The availability and use of mosquito nets in the country varies according to location (rural/urban), malaria transmission pattern and presence of an ITN project in the area. The voucher system that subsidises the ITNs for the under the age of five years target group had only been implemented since March 2007. Twenty-two children of this target group received the service from March to the middle of April 2007 in Bukumbi village (Bukumbi Hospital Reproductive and Child Health records 2005:2). Not all respondents could have received nets from the government. ITNs can reduce mosquito bites by more than 80.0% and can kill more than 50% of all mosquitoes that enter houses, reducing the number of children killed by malaria by 27.0% (Searching for solution to the malaria crisis 2004).

- *Reasons why net is not treated with insecticide (n=4)*

Only two respondents (50.0%) provided answers to this question and both indicated that they forgot to have it treated. Keeping in mind their income levels, it could be that they conveniently “forgot” to have the nets treated as they have so many other demands to meet with their meagre income.

- *Frequency of treating the mosquito nets with insecticides (N=40)*

Just more than half of the respondents in this study (57.5%, n=23) treated the nets every 2 to 4 months, 27.5% of the respondents (n=11) treated the nets every 5 to 7 months after purchase. Two respondents (5.0%) treated the net every 8-12 months, one respondent (2.5%) treated it only once annually and 7.5% (n=3) of the respondents never treated the nets after they had purchased them. With the older insecticides available on the market, it is necessary to treat nets every three month, but with the newer insecticides, it is only necessary to treat the nets annually (World Vision Tanzania. 2004).

Table 4.5: Frequency of treating children's mosquito nets with insecticides (N=40)

How often nets treated	Number of respondents	
	N	%
Every 2 to 4 months	23	57.5%
Every 5 to 7 months	11	27.5%
Every 8 to 12 months	2	5.0%
Once annually	1	2.5%
Never	3	7.5%
Total	40	100.0%

Almost all the respondents, (95.0%, n=38) reported that Permetrin was used to treat mosquito nets, and the remaining 5.0% (n=2) respondents could not remember the name of the insecticide. Materials treated with insecticides reduce the number of mosquitoes in the house and also kill other insects such as ticks, lice, bedbugs and cockroaches (World Vision Tanzania. 2004).

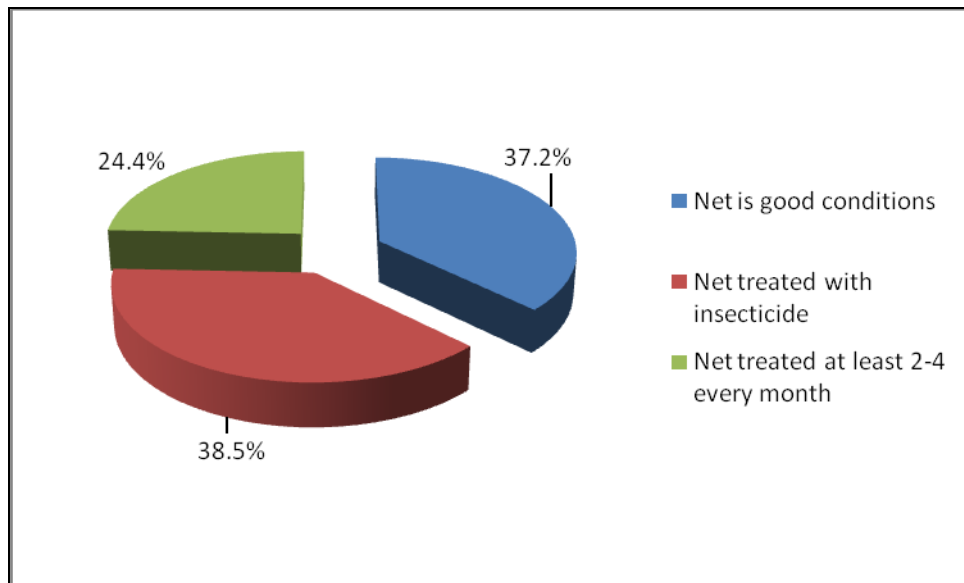


Figure 4.28: Condition of mosquito nets and treatment thereof for children 0-5 years (N=40)

4.3.5 Factors preventing the implementation of malaria preventive measures

In order to prevent malaria to under five-year-old children, the parents should prevent mosquito breeding by killing larvae with Larvicide, and through draining accumulated water. The respondents faced problems with the implementation of preventive measures, either economically or due to ignorance.

4.3.5.1 Availability of funds in the family to spend on mosquito spraying equipment (N=40)

Of the respondents, 65.0% (n=26) strongly disagreed with the statement that they had enough money to spend on spraying equipment, and eight (20.0%) disagreed, implying in fact means that the majority (85.0%, n=34) could not afford to purchase mosquito spraying equipment.

Table 4.6: Availability of funds to buy spraying equipment (N=40)

Opinion	Number of respondents	
	N	%
Strongly agree	4	10.0%
Agree	2	5.0%
Disagree	8	20.0%
Strongly disagree	26	65.0%
Total	40	100.0%

4.3.5.2: Time to spray homes consistently (N=40)

The parents could not purchase spraying material (Item E1.1), and they did not have time to spray their homes. The majority, namely (82.5%, n=33) disagreed that they had the time to spray their homes, consistently, while 17.5% (n=7) strongly disagreed. This finding is in line with 4.3.4.3 where the majority of respondents indicated that they did not spray their homes.

4.3.5.3 Parents have the energy to spray the home often (N=40)

The respondents did not have the funds, time or the energy to spray their homes. The majority of respondents (82.5%; n=33) strongly disagreed that they had enough energy to spray their homes, and 17.5% (n=7) disagreed. Item 4.3.3.14's responses indicated that the adults also suffered from malaria, as the majority reported at least one malaria episode in the previous year and 77 episodes had been reported for the group of 40 respondents over this period. The adults were often ill, they were poor, had to work outside their homes to earn an income and they had large families. They therefore did not have the energy to spray their homes or to implement many of the control measures that involved physical labour.

4.3.5.4 Parents' equipment to spray their homes (N=40)

Most of the respondents (72.5%, n=29) strongly disagreed that they had the equipment to spray their homes, and another respondent (2.5%) agreed. This finding is in line with the findings of 4.3.5.1 indicating that they did not have the funds, and therefore could not purchase spraying equipment. The respondents who indicated that they indeed sprayed their homes, did not do it often enough as they did not have the energy to do it, possibly due to their own illness.

4.3.5.5 Funds to buy insect repellents (N=40)

Of the respondents 50.0% (n=20) strongly disagreed that they had the necessary funds to buy insect repellent, and 12.5% (n=5) disagreed. Insect repellents can be expensive as it need to be replaced often. Poor families will rather spend their money on food, than on insect repellents.

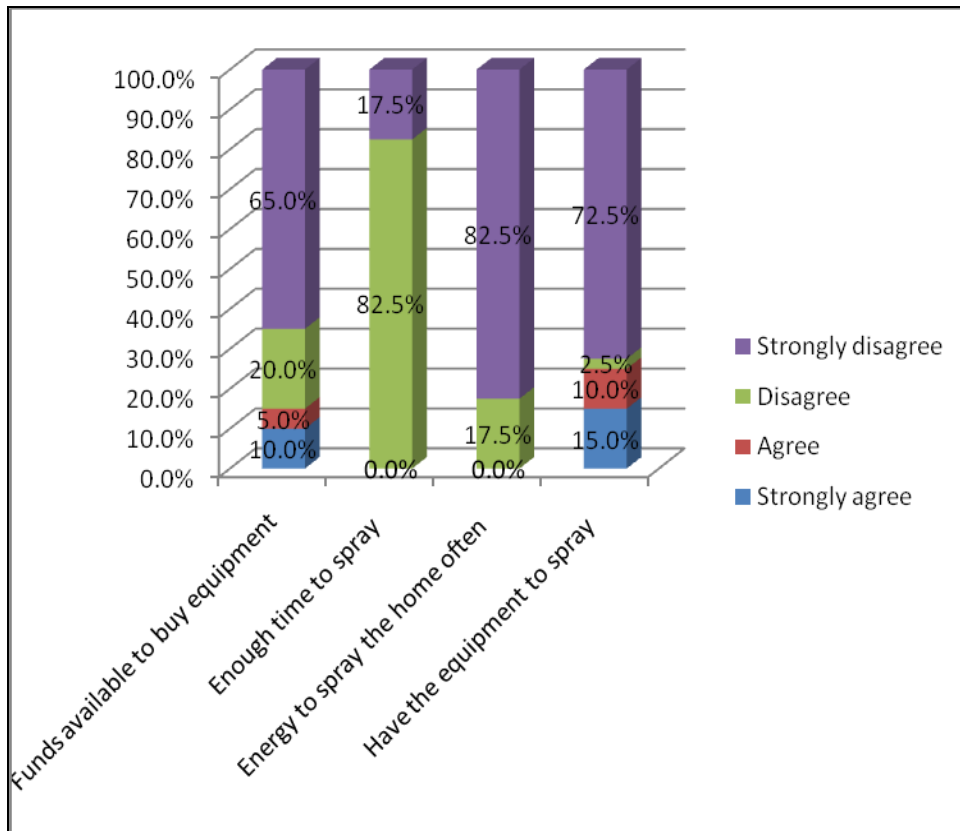


Figure 4.29: Responses related to the spraying of respondents' homes (n=40)

4.3.5.6 Money to replace broken gauze screens for all their homes' openings (N=40)

Fifty percent of the respondents (n=20) strongly disagreed that they had money to replace broken gauze screens for all the openings of their homes and 10.0% (n=4) disagreed with the statement.

4.3.5.7 Parents' prevention of stagnant water around the home (N=40)

Of the respondents 62.5% (n=25) strongly disagreed that they could keep up the pace to treat stagnant water around their houses, 12.5% (n=5) disagreed, while 22.5% (n=9) agreed, and one (2.5%) respondent strongly agreed.

The majority of the respondents did not treat stagnant water around the house. They lived in a tropical area with a high rainfall with constant pools of stagnant water. This area has a long rainy season from November to May, and a short rainy season which usually takes place during September and October with a rain fall of about 1 000-1 200 mm in total (Kalugula et al 2005:11-34). This means that parents would need to clear pools of stagnant water for nine months of the year.

4.3.5.8 Money to replace mosquito nets (N=40)

A large number (65.0%, n=26) of respondents disagreed that they had money to replace the mosquito nets, while 30.0% (n=12) strongly disagreed, and two respondents (5.0%) strongly agreed. Only 5.0% (n=2) of the respondents therefore reportedly had the funds to replace mosquito nets. This finding is in line with other findings related to the availability of funds.

4.3.5.9 Parents’ skills to replace the gauze screens themselves (N=40)

The majority of the respondents, namely 80.0% (n=32), strongly disagreed that they had the skills to replace the gauze screens themselves, one (2.5%) disagreed, two (5.0%) strongly agreed, four respondents (10.0%) agreed, and one respondent (2.5%) did not answer the question.

4.3.5.10 The availability of equipment to spray their homes (N=40)

Many respondents (65.0%; n=26) strongly disagreed that equipment to spray homes was always available in Bukumbi village, 15.0% (n=6) disagreed, 15.0% (n=6) agreed, and two respondent (5.0%, n=2) strongly agreed. Although equipment was available in Bukumbi village, the respondents did not have the funds to purchase it.

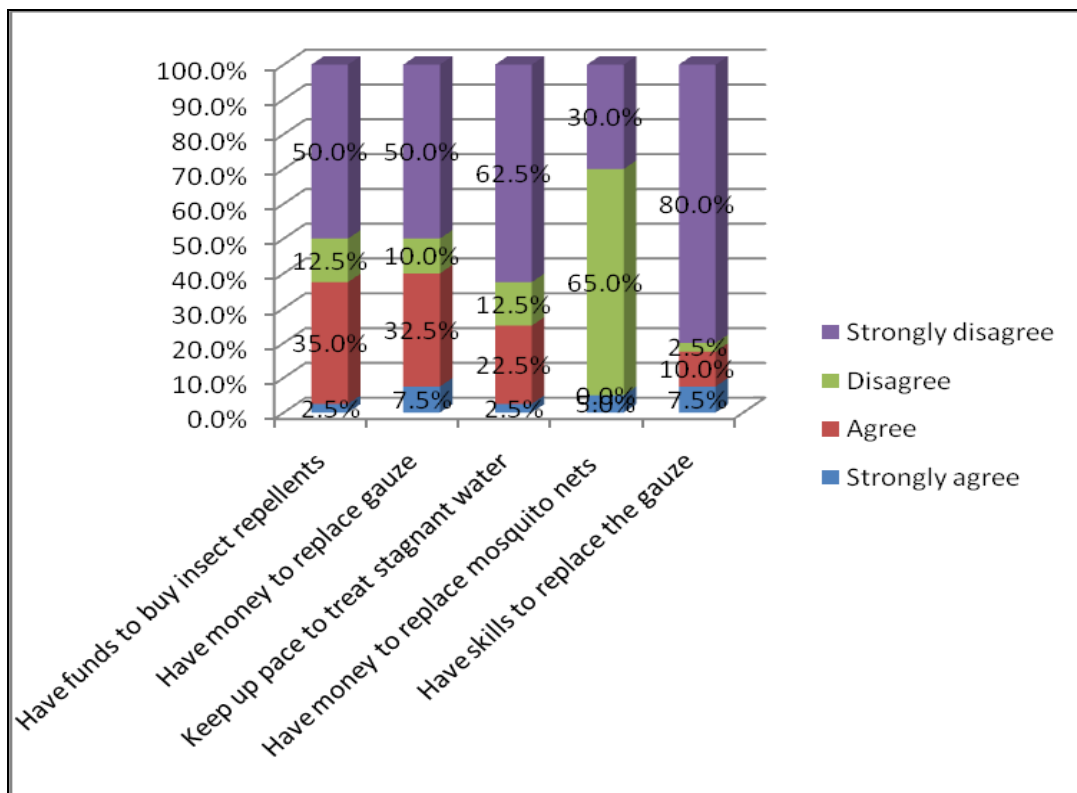


Figure 4.30: Funds available to buy and keep up control measures (N=40)

4.3.5.11 *Mosquito repellents' availability in Bukumbi village (N=40)*

Of the respondents 55.0% (n=22), disagreed that mosquito repellent was always available in Bukumbi village, 20.0% (n=8) strongly disagreed, whereas 5.0% (n=2) agreed, and eight respondent (20.0%, n=8) strongly agreed. Only one pharmacy in Bukumbi village stocked it, but some respondents might have been unaware of insect repellent's availability.

4.3.5.12: *Using vouchers for buying mosquito nets (N=40)*

Of the respondents 62.5% (n=25) strongly agreed that they used the coupon system for buying mosquito nets, and 5.0% (n=2) agreed.

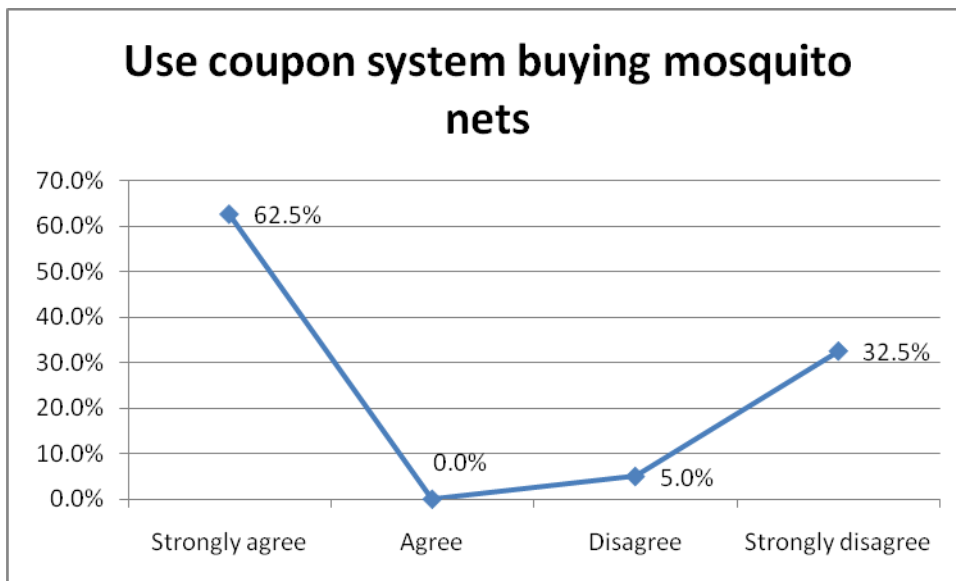


Figure 4.31: Parents' use of coupon vouchers for buying mosquito nets (N=40)

To reduce costs to women with children below five years, the Tanzanian government launched a pilot system in 2003. Women are given vouchers to buy ITNs from designated shops that cost them between 500 Tsh (50 US cents) and 700 Tsh (70

US cents) depending on the size. According to Bukumbi Hospital Reproductive and Child Health records (2005:2), only 22 families with children in this target group received treated mosquito nets from March 2003 to the middle of April 2007 in Bukumbi village (Searching for solution for the malaria crisis 2004).

4.3.5.13 *Parents' perceptions about combating malaria (N=40)*

The majority (90.0%; n=36), strongly disagreed that it is a waste of time to attempt to combat malaria, and 2.5% (n=1) of the respondents disagreed with the statement. These parents therefore felt that it was not a waste of time to attempt to combat malaria, although they faced many problems that made it difficult to do so.

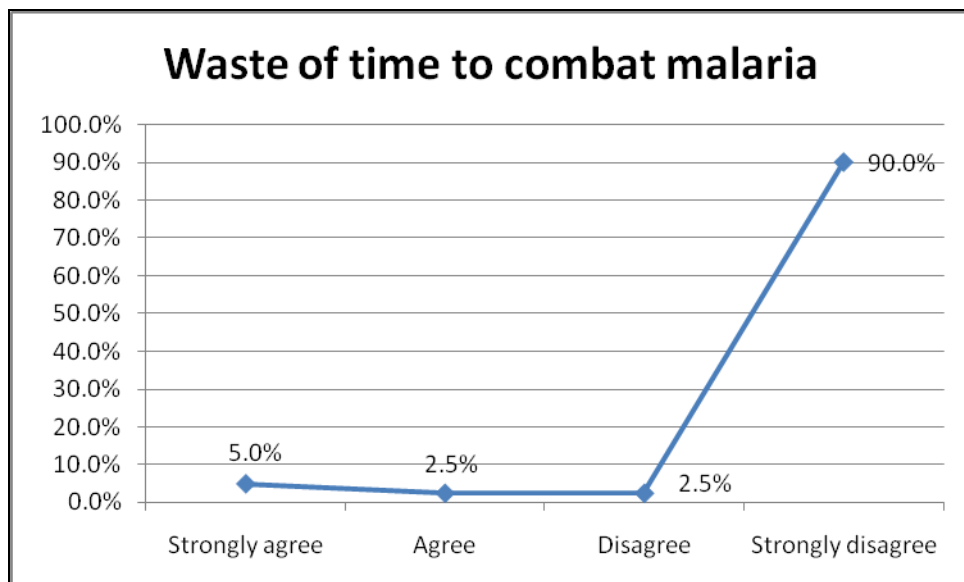


Figure 4.32: Parents' views that it was a waste of time to combat malaria (n=40)

4.3.6 **Control questions for knowledge of malaria**

Plasmodium, which is the causative organism of malaria, develops in the gut of the mosquito and is passed on to the human in the saliva of an infected insect every time the insect takes a new blood meal from a human. The mosquito injects some saliva into its victim to prevent blood from clotting and by doing so; the infected

mosquito actually injects plasmodium into its victim prior to sucking his/her blood. Respondents were asked some questions about the transmission of malaria to test their knowledge in this regard.

4.3.6.1 *Malaria can only be contracted from the bite of an infected female anopheles mosquito (N=40)*

Of respondents 50.0% (n=19), agreed that malaria could only be contracted from the bite of an infected female anopheles mosquito, while 39.5% (n=17) were unsure, and 10.5% (n=4) disagreed.

4.3.6.2 *Malaria can be transmitted through contact between two people (N=40)*

The majority of respondents, 62.5% (n=25) disagreed that malaria could be transmitted through contact between two people, while 22.5% (n=9) agreed, and 15.0% (n=6) were unsure. The finding that 37.5% of the respondents (n=15) did not know for certain that malaria could not be transmitted through personal contact between two people, was unexpected. This finding is in line with the findings under Item 4.3.6.1 where 50.0% (n=19) of the respondents did not know for certain that malaria could only be contracted from the bite of an infected female anopheles mosquito. This indicates that the health education did not provide them with enough knowledge about malaria.

4.3.6.3: *Malaria can be transmitted through the handling of contaminated food (N=40)*

Of the respondents 45.0% (n=18) disagreed that malaria could be transmitted through the handling of contaminated food, while 14 (35.0%) agreed, and eight (20.0%, n=8) were unsure. It is therefore clear that the majority of respondents (55.0%, n=22) were of the opinion that malaria could be transmitted through the

handling of contaminated food. This finding is also in line with the findings of Item 4.3.6.2.

4.3.6.4 *Malaria can be contracted by drinking contaminated (dirty) water (N=40)*

Most of the respondents (75.0%, n=30) agreed that malaria could be contracted by drinking contaminated water, while 17.5% (n=7) disagreed, and 7.5% (n=3) were not sure. The respondents lacked knowledge about the basic aspects of the transmission of malaria.

4.3.6.5 *Malaria can be contracted through sexual intercourse (N=40)*

Although 40.0% (N=16) of the respondents disagreed with the statement that malaria could be contracted through sexual intercourse, the majority of respondents (60.0%, n=24) were unsure.

4.3.6.6 *The most common symptoms of malaria with which a sick child will present (N=40)*

This section was included because, for proper prevention of complications, it is important for the respondents to know the common symptoms of malaria in their children, enabling them to seek early medical treatment for malaria.

- *High fever (N=40)*

Most respondents (95.0%, n=38) indicated that one of the most common symptoms of malaria with which a child will present is high fever, and two (5.0%) indicated that they did not know.

- *Listlessness* (N=40)

The majority (97.5%, n=39) were of the opinion that listlessness is one of the most common symptoms of malaria, while one respondent (2.5%, n=1) did not know.

- *Extreme tiredness* (N=40)

Again the majority (97.5%, n=39) agreed that one of the most common symptoms is extreme tiredness, while one respondent (2.5%, n=1) disagreed.

- *Convulsions* (N=40)

Most of the respondents (70.0%, n=28) indicated that convulsions are among the most common symptoms of malaria, while 20.0% (n=8) indicated that they did not know, and 10.0% (n=4) disagreed.

A convulsion is a state or a sudden attack of fits due to a burst of abnormal activity of brain cells. A high fever 4.3.6.4 can cause convulsions in children below the age of six years, as well as cerebral malaria, functional disturbances of the brain cells due to hypoglycaemia and electrolyte disturbances (dehydration), vomiting and watery stools (African Medical and Research Foundation 2001:435).

- *Pale skin* (N=40)

Most of the respondents (70.0%, n=28) said that the most common symptom is pale skin, while 20.0% (n=8) did not know, and 10.0% (n=4) answered “no” to this question.

- *Paleness of inside of mouth* (N=40)

A large number of respondents (52.5%, n=21) agreed that, among the most common symptoms of malaria “paleness inside the mouth” would be correct, while 27.5% (n=11) indicated that they did not know, and 20.0% (n=8) disagreed that it is one of the important symptoms. Almost as many respondents indicated that paleness inside the patient’s mouth was one of the most common symptoms of malaria as those who indicated that it was not. Anaemia is a complication that presents with paleness of the skin and mucous membranes. Anaemia has been discussed elsewhere in this chapter.

- *Cold fever with sweating* (N=40)

The majority, namely 75.0% (n=30), indicated that they were of the opinion that cold fever with sweating was one of the most common symptoms of malaria, while 17.5% (n=7) disagreed and (7.5%, n=3) indicated that they did not know. Cold fever is a condition of perspiration. In the mechanism of heat loss, most of the heat loss from the body occurs through the skin. During this process, evaporation takes place whereby the body is cooled when heat is used to convert the water in sweat into water vapour. Because of the excessive temperature due to malaria, the mechanism of heat loss results in excessive sweating, followed by periods of intense cold shivers (Waugh & Grant 2001:365).

- *Vomiting* (N=40)

The majority (95.0%; n=38) agreed that one of the most common symptoms of malaria is vomiting, while one respondent (2.5%) did not know, and one (2.5%) disagreed.

- *Yellow discolouring of skin and white areas of eyes* (N=40)

The majority (85.0%, n=34) agreed that one of the most common symptoms of malaria is a yellow skin (jaundice) and yellow eyes (sclera), while 12.5% (n=5) disagreed and one respondent (2.5%) did not know.

This occurs when the bilirubin concentration in the blood is abnormally elevated and all the tissues, including the sclera and skin, become yellow-tinged or greenish-yellow and the serum bilirubin level exceeds 2.5 mg/dL (Haslett et al 2002:56). During haemolysis, red blood cells are removed from the blood by reticulo-endothelial cells in the spleen and liver. Some haemoglobin breaks down to form bilirubin and is secreted as bile. Impairment of hepatic uptake causes jaundice (Smeltzer & Bare 2004:1081). This is a common symptom of malaria and also the cause of an enlarged liver.

- *Restlessness* (N=40)

The majority 92.5% (n=37) agreed that restlessness is one of the most common symptoms of malaria, while 7.5% (n=3) disagreed.

Feeling uncomfortable and being unable to rest is common in cases of malaria.

- *Stomach pain* (N=40)

The majority 85.0% (n=34) agreed that one of the most common symptoms of malaria is stomach pain, while 15.0% (n=6) disagreed.

Malaria itself and some of the medication may irritate the mucous membrane of the stomach and cause abdominal pain, nausea and vomiting (Waugh & Grant 2001:365).

- *Frequent watery stools* (N=40)

Most of the respondents (85.0%, n=34) agreed that frequent watery stools is amongst the most common symptoms of malaria, while 15.0% (n=6) disagreed.

Diarrhoea is among the clinical features of uncomplicated malaria (NMCP 2006a:18). Diarrhoea is increased and frequent bowel movements (more than three times per day, an increased amount of stool (more than 200 g per day) and altered consistency of stools occur in malaria (Smeltzer & Bare 2004:1030).

- *Unconsciousness* (N=40)

The majority (85.0%, n=34) indicated that they believed that unconsciousness is a common symptoms of malaria, while (10.0%, n=4) disagreed and two respondents (5.0%, n=2) did not know.

According to NMCP (2006a:18), unconsciousness may occur in malaria due to vomiting, which causes depletion of glycogen associated with hypoglycaemia, dehydration and cerebral malaria.

4.3.7 Symptoms of the child with malaria

Malaria is diagnosed by the clinical symptoms and microscopic examination of the blood (WHO 2004). It is very important for the parents to recognise the symptoms presented by their children under the age of five, in order to take them to the hospital for early treatment. According to Oladela and Kauna (2005:2-10), who refer to studies conducted in Tanzania, mothers were unable to recognise severe malaria despite health education on the signs and symptoms of the onset of childhood malaria. This section was included to determine which symptoms made parents bring their children to the hospital.

4.3.7.1 *The child could not swallow the anti malarial medicine properly (N=40)*

The majority of the respondents (80.0%, n=32) indicated that the fact that their children could not swallow medicine made them decide to take the children to hospital.

This means that the child was unable to swallow the drugs because of conditions such as unconsciousness (Item 4.3.6.6.4) and convulsions (Item 4.3.6.6.4), or because the child was able to swallow the drugs but was unable to retain it due to vomiting (Item 4.3.6.6). It is clear that the respondents knew about the outcome of the failure to swallow the anti-malarial drugs, and therefore decided to take the children to hospital.

4.3.7.2 *The child seemed pale (N=40)*

Most of the respondents (87.5%, n=35) reported that the fact that their children appeared to be pale made them decide to seek medical help. Paleness is the serious symptom, as it might be a sign of severe anaemia, which is a serious complication of malaria.

4.3.7.3 *The child vomited (N=40)*

All the respondents indicated that their children vomited and that it made them decide to take them to the hospital for treatment. Vomiting is a serious symptom, which might bring the child into a state of shock.

4.3.7.4 *The child had a fever (N=40)*

Of the respondents 85.0% (n=34), said that they decided to seek medical help for their children because they presented with fevers. High fever is the serious

symptom as it might cause convulsions in a young child. High fever is one of the complications of malaria.

4.3.7.5 *The child was listless (N=40)*

All the respondents indicated that their children's listlessness made them decide to take the children to hospital for treatment. Listlessness might be one of the first signs that the child is going into shock or that he or she might go into a coma.

4.3.7.6 *The child was restless (N=40)*

Most of the respondents (85.0%, n=34) indicated that their children were restless and that this was the reason why they went to the hospital to seek medical care.

Restlessness in malaria discussed under Item F2.10, is a serious symptom. If proper treatment is not given early, it might lead to shock and unconsciousness.

4.3.7.7 *The child had cold fever with sweating (N=40)*

More than half of the respondents (52.5%, n=21) indicated that their children experienced cold chills and fever which made them decide to seek medical help. Cold fever, discussed in item 4.3.6.6, is not a serious symptom in malaria, as the body is busy with the process of evaporation, and during this process, the body cools down. It is, however, better to identify the problem and treat it early.

4.3.7.8 *The child had multiple fits (convulsions) (N=40)*

Most of the respondents (70.0%, n=28) agreed that multiple convulsions made them decide to take the children to hospital. As discussed under Item F2.4, convulsion is a very serious symptom. The child will need proper management as soon as possible, because the child's life is in danger, of shock, unconsciousness and death.

4.3.7.9 *The child was unconscious (N=40)*

Nine of the respondents (22.5%) indicated that their children were unconscious and that, together with other symptoms, made them take their children to hospital. Unconsciousness may cause the death of a young child and the child therefore needs immediate and correct management.

4.3.7.10 *Time interval between appearance of first symptoms and parents taking the children to the hospital (N=40)*

Forty percent of the respondents (n=16) took more than 24 hours after the first symptom of malaria presented to take them to a health institution for medical care; 32.5% (n=13) waited for between 5-8 hours and 25.0% (n=10) took between 2-4 hours to take their sick children to hospital. Only one (2.5%) respondent arrived at the institution within one hour after the first symptom appeared.

Table 4.7: Time span between appearances of first symptoms and arrival at health institution (N=40)

Time span	Number of respondents	
	N	%
Within one hour	1	2.5%
Between 2 and 4 hours	10	25.0%
Between 5 and 8 hours	13	32.5%
More than 24 hours	16	40.0%
Total	40	100.0%

The reasonable time for taking a child to hospital is:

- as soon as possible after the appearance of the first symptom; or
- at least within one hour for those who live near the health institution.

For the parents who live far from the hospital, a reasonable time to reach the hospital after the appearance of the first symptoms of malaria is estimated between two and four hours. If parents take longer than the estimated times, the condition of the child might worsen. It is therefore safe to deduct that the child should at least reach the hospital within four hours after the appearance of the first symptom of malaria (Oladela & Kauna 2005: 2-10).

- *Reason for not taking child to the health institution sooner (n=39)*

This was an open-ended question where the respondents could give their personal reasons for their delays in taking their children to hospital. Of the 97.5% (n=39) respondents who reached the hospital after more than two hours, most of them, namely 75.5% (n=30) indicated that they self-medicated their children and observed whether the children's condition would improve. They indicated that they bought malaria drugs from the pharmacy, but when the condition became worse, they decided to seek medical help. One respondent (2.5%) indicated that he/she gave the child Panado, and another respondent (2.5%) mentioned Fanador.

Other reasons for delays in taking the child to the hospital sooner were:

- One (2.5%) respondent – *“I consulted the traditional healer first for the management of the convulsions, as it could not be properly treated in hospital.”* In 4.3.7.10 it was revealed 27.5% (n=11) of the respondents consulted the traditional healers from time to time. Visiting a traditional healer before they go to the hospital was not the major reason for the delays in seeking medical treatment.
- One (2.5%) respondent said – *“I was trying to borrow money from my neighbours.”* According to the Government of Tanzania (2003:20), the cost of outpatient care, per case, has been conservatively estimated to be

Tsh 41 600, while that for in-patient care is at least Tsh. 20 000⁵ per case. Poor people are at increased risks of becoming infected with malaria more frequently (Africa Malaria report 2003).

- One (2.5%) respondent said – “*Because of transport problems especially on crossing the lake*”.
- The fact that the children became ill during the night also caused problems for three (7.5%) respondents, as one respondent expressed it, “*It was during the night, I feared to go to the hospital as I was alone.*”
- One respondent (2.5%) indicated that he/she thought that it was merely a minor fever, and therefore did not react immediately.

These findings are in line with research done by Oladela and Kauna (2005: 2-10), indicating that parents with small children delayed taking their children to hospital within a reasonable time, because they:

- waited for their husbands;
- preferred to self-medicate their children;
- administered traditional treatment for the convulsions; and
- waited until fits ceased before taking action.

4.3.7.11 Time lapse between arrival at the health institution and receiving medical help (N=40)

A few respondents (42.5%, n=17) indicated that it took between two and four hours to receive medical help after their arrival at the institution, 37.5% (n=15) received medical help within one hour, while 17.5% (n=7) received medical help between five and eight hours after arriving at the institution. One respondent (2.5%, N=1) indicated that it took more than a day and a night before they were attended to.

⁴ This is equivalent to less than 1.6 American dollars during May 2007.

⁵ This is equivalent to less than 20 American dollars during May 2007.

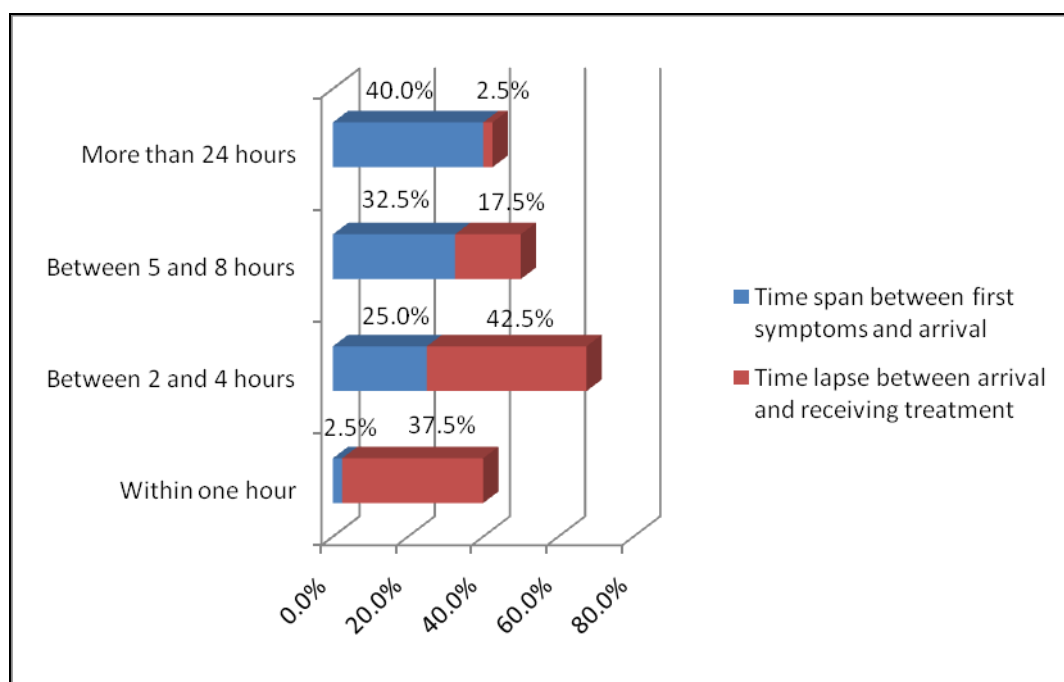


Figure 4.33: Time lapse between first symptom and arrival; arrival and receiving treatment (N=40)

When a child arrives at the hospital, the health personnel are supposed to start treatment soon after or at least between one and two hours after arrival. The delay in hospitals sometimes occurs due to the large number of patients and a shortage of nurses, doctors and laboratory technicians. Any delay in treatment could jeopardise the child's chances for recovery.

4.3.7.12 The treatment the child had received for malaria (N=40)

This was an open-ended question. The objective of this question was to determine whether the respondents knew what treatment their children were receiving.

All respondents could provide the name of at least one drug the child received in hospital. In 12.5% (n=5) cases where they could not name the drug by name, they mentioned that their children received an intravenous infusion and/or injections. The parents thus knew with which drugs their children had been treated.

4.3.7.13 *Complications present in children (N=40)*

Complications are new problems or illnesses that make a condition more difficult to treat. The respondents had to identify with which of the listed complications their children presented. According to the WHO (2006:52), complications could develop in children 0-5 years of age, such as coma, hyperpyrexia, convulsions, hypoglycaemia, severe anaemia, acute pulmonary oedema, acute renal failure, spontaneous bleeding and coagulopathy, metabolic acidosis and shock.

- *Coma (N=40)*

Only 30.0% (n=12) of the respondents indicated that their children were in a coma due to malaria. This is in line with the findings under Item G 1.9 where 22.5% (n=9) of the respondents indicated that their children were unconscious before taking them to the hospital.

- *High temperature (N=40)*

Most of the respondents (85.0%, n=34) agreed that their children presented with high temperatures.

- *Low blood sugar (N=40)*

Only six respondents (15.0%) indicated that their children presented with low blood sugar levels. Low blood sugar occurs when blood glucose is below 2.5 mmol/L. Vomiting due to malaria, may cause a state of “starvation” where the liver is depleted of glycogen, which is associated with hypoglycaemia. The quinine over-stimulates the excretion of insulin, which causes hypoglycaemia. If left untreated, it may result in death or brain damage (NMCP (2006a:28).

- *Severe anaemia (paleness of skin)* (N=40)

Most of the respondents 87.5%, n=35 indicated that their children were anaemic. See 4.3.7.2. Anaemia is a condition in which the haemoglobin concentration is lower than normal, as a result of which the amount of oxygen delivered to body tissues is also diminished (Smeltzer & Bare 2004:877). During the course of malaria infection, red blood cells (RBCs) are destroyed, either as a result of inadequate treatment or parasite resistance or because of no treatment at all. Haemolysis of parasites, non-parasite RBCs, enhanced splenic uptake of RBCs, impaired RBC production, and unexplained massive intravascular haemolysis may complicate some malaria episodes (NMCP 2006a:40). Anaemia is a complication that is indicated by paleness (Item F2.5) of the skin and mucous membranes. This might cause other serious complications in the child, such as restlessness, listlessness, and chest problems.

- *Convulsions* (N=40)

Seventy percent (n=28 of the children in this study experienced convulsions, which is a complication of malaria. See also 4.3.7.8.

- *Chest pain* (N=40)

Quite a few respondents (n=23, 57.5%) agreed that chest pain was among the complications presented by their children. The chest pain is due to congested lungs (pulmonary oedema) and anaemia, which leads to congestive cardiac failure. Malaria can cause respiratory distress due to lactic acidosis and/or pulmonary oedema, restlessness and blood-stained frothy sputum (NMCP 2006a:28).

- *Diarrhoea* (N=40)

The majority of respondents, namely 80.0% (n=32) agreed that diarrhoea was among the complications presented by the child. According to NMCP (2006a:18), diarrhoea is among the clinical features of uncomplicated malaria. Diarrhoea is an increased amount of stool (more than 200 g per day) and an altered consistency of the stool (Smeltzer & Bare. 2004:1030). It is a common symptom, as indicated by most of the respondents.

- *Acute renal failure* (N=40)

Many respondents, namely 60.0% (n=24), agreed that renal failure was among the complications presented by the child. In renal failure, the urinary output is below 0.3 ml/kg/hr in children (NMCP 2006a:18), there is also a rise in serum creatinine level of 25% or more. Renal failure occurs due to vomiting (hypovolemic shock) and diarrhoea.

- *Spontaneous bleeding due to a blood-clotting problems* (N=40)

None of the children in this study experienced spontaneous bleeding as a complication of malaria. Blood coagulation factors, such as prothrombin, fibrinogen, Ac globulin, proconvertin, thromboplastin and Stuart power factor, are synthesised in the liver. Due to haemolysis (discussed in Item F2.9) and liver problems (Item G7.1), the amounts of these factors needed to maintain coagulation and haemostasis diminish and could result in spontaneous/easy/prolonged bleeding (Smeltzer & Bare 2004:915; Waugh & Grant 2001:68). Haemolysis results in the reduction of platelets, which carries important factors responsible for blood clotting, which leads to spontaneous bleeding. According to these findings, it was an uncommon problem.

- *Shock* (N=40)

A few respondents (67.5%, n=27) revealed that shock was among the complications presented by their children. Shock is a clinical syndrome marked by inadequate perfusion and oxygenation of cells, tissues, and organs. Circulatory collapse is characterised by low systolic blood pressure (BP) < 50 mmHg and a fast pulse rate \geq 50/minute and cold extremities (NMCP 2006a:53).

- *Other complications*

The respondents mentioned no other complications.

4.3.7.14 *Conditions with which the children presented after recovering from malaria (N=40)*

In the section of the interview schedule, the respondents were asked with which of the listed conditions their children presented *after* they had recovered from their last malaria episodes.

- *Enlargement of the liver* (N=40)

Only two respondents (5.0%) indicated that their children had developed enlarged livers after they had recovered from malaria. An enlarged liver may be caused by infections such as malaria, where the red cells containing schizonts adhere to the capillary endothelial⁶ of the liver, the vessel congested and anoxic damage resulted in enlargement of the liver (Haslett et al 2002:53). In children, the liver may be considered as enlarged when its lower boarder reaches more than 3 cm below the

⁶ Is a thin layer of cells that line the interior surface of blood vessels, forming an interface between circulating blood in the lumen and the rest of the vessel wall.

costal margin in the midclavicular line (Africa Medical and Research Foundation 2001:352). It was an uncommon complication.

- *Listlessness* (N=40)

The majority of the respondents (77.5%, n=31) reported that their children experienced listlessness after recovering from malaria.

- *Anaemia (pale skin, face)* (N=40)

Only 27.5% (n=11) of the respondents indicated that their children became anaemic after recovering from malaria.

At the end of the interview, the respondents were asked whether they would like to add something or have something to say. Seven respondents (17.5, n=7) voiced their opinions as follows:

- *“We should find different ways to prevent malaria.”*
- *“If we could get free nets from a donor it could help – also free drugs for malaria.”*
- *“Health providers could visit us several times [at home] to give us advice – it would help.”*
- *“All people should be taught environmental sanitation, how to properly care for their children and given other health education. It will prevent the mortality and lower morbidity rates of malaria in the children under the age of five years”.*
- *“Emphasis should be placed on the use of treated mosquito nets to prevent our babies of contracting malaria.”*

4.5 CONCLUSION

In this chapter, the analysed data obtained from the structured interviews were discussed and presented in tables and graphs.

Chapter 5 provides a summary and recommendations based on the findings of the research. Limitations of the study will also be addressed.

CHAPTER 5

SUMMARY, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In the previous chapter, data obtained from the structured interviews were analysed, discussed and presented graphically. In this chapter, the research findings are summarised, research limitations and conclusions of the research are discussed, and recommendations are made, as deduced from the research findings.

As mentioned in Chapters 1 and 3, the extent of the effectiveness of the preventive measures against malaria, implemented by parents of the under five-year-old children population group has been assessed by evaluating the knowledge of the parents. This research used pillars 2 (vector control) and 4 (malaria epidemic prevention and control issues) of the *Malaria Medium-Term Strategic Plan* as starting point (The Government of Tanzania 2003:8).

In this chapter, a summary of the findings related to every research question will be provided. Conclusions, deduced from the research findings will be presented. Finally, the limitations of the research are discussed and recommendations are provided for improvement of the measures parents of children under the age of five years could implement to control malaria. Recommendations for further research on this topic are also provided.

5.2 SUMMARY

The prevalence of malaria as preventable health problem was the rationale for the development of the Tanzanian *Medium-Term Strategic Plan* regarding malaria, which

comprises four pillars, involving vector control, malaria epidemic prevention and control, prevention of malaria in pregnancy and case management (The Government of Tanzania 2003:8). Malaria is of particular importance due to the high morbidity and mortality rate in children under the age of five years. The Tanzanian Department of Health therefore provide health education to parents on topics related to the control of malaria in an attempt to address these high rates. Parents are then required to implement these measures to prevent re-infection of malaria.

The malaria education programme usually takes place in January each year at health institutions, and health personnel anticipate a decrease of malaria morbidity and mortality rates among children under the age of five years. There was no noticeable decrease in the morbidity and mortality rate in children under the age of five years after the implementation of this initiative in 2003 (Savigny et al. 2004:2-19; Government of Tanzania 2003:8).

The aim of the research was to investigate which of the measures had been taught to the parents of under five-year-old children in Bukumbi village, Tanzania had been implemented to control malaria. The objectives of the research, also formed the conceptual framework of the study, namely:

- explore and describe the knowledge parents with children under the age of five years in Bukumbi village, Tanzania, have about malaria;
- explore the knowledge parents with children under the age of five years in Bukumbi village, Tanzania, have of the control of malaria;
- determine where parents with children under the age of five years in Bukumbi village, Tanzania, obtained their knowledge; and
- explore and describe the suggested measures to control malaria that have been implemented by parents of the under five-year-old target group in Bukumbi village, Tanzania;
- identify the factors that prevented the parents of the under five-year-old target group of Bukumbi village, Tanzania, to implement malaria control measures.

Quantitative research was conducted to study this problem. As no records could be found of the evaluation of the health education provided to parents in Bukumbi village, this research could be seen as explorative. The research was also descriptive by nature as it accurately portrayed the frequency with which certain phenomena occurred.

The research population consisted of 705 parents of under five-year-old children who have recently contracted malaria during the preceding five years and who resided in Bukumbi village.

Purposive sampling method was used by selecting 40 respondents, who fitted the criteria for inclusion in the study. Twenty respondents from Bukumbi Hospital and 20 from Bukumbi disabled care dispensary were selected.

Data were collected from the respondents during personal interviews with the respondents and by making use of a structured interview schedule. The schedule contained open-ended and closed questions. The structured interview schedule was designed to obtain the following types of data:

- bibliographical data of respondents;
- data on the measures, which the parents had to implement during the control and prevention of malaria;
- items that tested parents' knowledge of the disease;
- parents' personal views about malaria in their children; and
- the reasons why parents could or could not implement the prescribed measures.

The research instrument was peer-reviewed, discussed with experts in the field and pre-tested before the actual data collection process. The corrected research instrument was then used during the interview with the parents.

Because this research was considered to be sensitive as it involved parents with sick children, the ethical aspects were considered to be very important. For this reason,

special attempts were made to obtain the necessary permission from all parties involved in the research and to ensure the safety and privacy of the participants, sick children and institutions. All data gathered were kept confidential unless permission was obtained to make it known. Data analysis was facilitated by coding the items in the research instrument. The data analysis was done by making use of the SPSS version 14 computer program.

The structured interview schedule were analysed by analysing the findings of the sections. The interview schedule were also analysed in terms of the sections as a whole:

- Section A: Biographical information
- Section B: Health education received by respondents regarding on malaria
- Section C: Respondents' knowledge on malaria
- Section D: Preventive measures implemented by parents
- Section E: Factors that prevented respondents from implementing preventive measures
- Section F: Control questions to test participants' knowledge of malaria, and
- Section G: Symptoms with which children presented.

5.3 CONCLUSIONS

The following were the most important conclusions based on the findings of the research:

5.3.1 The biographical data of the respondents

Below are the most important findings on the biographical descriptions of respondents:

- the ages of the children treated for malaria ranged between the ages 6 months and 5 years, with the majority between the ages 7 to 12 months;

- the fathers of these children were older than the mothers – most fathers were between the ages of 31 and 50, and the mothers' ages ranged between 21 and 30;
- the majority of mothers were married;
- just over half of the mothers in the sample, namely 60.0% (N=24) had primary school education, whereas more fathers, namely 62.5% (N=25), had primary school education;
- the majority of parents had an income, although they could be considered to be poor, as 80.0% (N=32) of the mothers and 65.0% (N=26) of the fathers were small scale peasant farmers.
- the highest combined income for the families of the respondents were Tsh260 000/- per year, while the lowest income was reportedly Tsh6700/- per year, while the average income of the families per year according to respondents was 50 260/-. All the families in this study risked contracting malaria as Savigny et al (2004:2-19) indicate that the malaria problem is greatest among the poorest households. This could be true in Tanzania where individual households have to buy insecticides, gauze for their houses' openings and clear stagnant water;
- to compounding their poor socio-economic problem, was the fact that the majority of parents had three to four children.
- parents of 65% of the families reported that none of their children had died of malaria during the research period, and the majority, namely 70.0% (N=28) of their children in the under five-year-old target group had only contracted malaria once;
- the number of episodes for the children younger than five years, were generally higher compared to other age groups, as about 55% of them had malaria more than five times during the previous year and 30% had two to four episodes. Because most of them tended to develop an improved immunity against malaria as they grew older, the findings revealed that the number of malaria episodes decreased in children between the ages 6 and 10, 11 and 15, as well as children older than 16 years of age (African Malaria Report 2003).

5.3.2 The malaria health education respondents received

The analysed data revealed the following important findings on the health education parents received on malaria.

- Health education services at this facility where malaria as topic is discussed, is scheduled for January only. This was not enough for the respondents, because not all mothers of children under the age of five years visited the hospital for treatment during that month, therefore they did not receive this life-saving information. Therefore 75.0% of the respondents never received any health education on the prevention of malaria from health services in Bukumbi village. This is confirmed by the fact that parents could not answer the questions during these interviews.
- Nine respondents who received health education from health personnel found the information to be helpful and only one indicated that this was not the case. It seems that some of the respondents did not receive health education on malaria before their own children became ill. Parents could have benefited from the health education and the knowledge might have prevented a malaria episode had parents implemented the suggested preventive measures.
- The common source of knowledge for most of the respondents, namely 97.5%, was the villagers. It seems to be a poor source of knowledge, however, as the respondents were not well informed on the measures they could have implemented to control malaria. This was substantiated by the following findings:
 - none of the respondents could provide a proper answer to the cause of malaria;
 - 39.5% of the respondents did not know for certain that malaria could only be contracted from the bite of an infected female anopheles mosquito; and
 - 55.0% of the respondents believed that malaria could be transmitted through the handling of contaminated food.
- Most of the respondents, 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. These findings have serious implications for the control of malaria at grass roots level.

5.3.3 Respondent's knowledge on malaria and control questions to test their knowledge

- The following are the most important findings on the knowledge respondents had on malaria as disease:
- Not all respondents were able to mention the following signs and symptoms of malaria: prostration, impaired consciousness, respiratory distress, abnormal bleeding, jaundice and haemoglobinuria.
- In the control questions, respondents could recognise the common symptoms of malaria with which children may present when prompted by providing the possible answers. Respondents then confirmed that the following were symptoms of malaria:
 - high fever (95%);
 - listlessness (97.5%);
 - extreme tiredness (97.5%);
 - convulsions (70.0%);
 - pale skin (70.0%);
 - paleness of the inside of the mouth (52.5%);
 - cold fever with sweating (75.0%);
 - vomiting (95.0%);
 - yellowing of the skin and white areas of the eyes (85.0%);
 - restlessness (92.5%);
 - stomach pain (85.0%);
 - frequent watery stools (85.0%);
 - and unconsciousness (85.0%).
- About 66.5% could not mention specific signs showing that the child's condition is deteriorating. Fifty-five percent of the respondents mentioned that their children in this target group experienced more than five malaria episodes during

the previous year and 30.0% said that their children had between two and four episodes during this period.

- In relation to the treatment administered to the respondents' children, 7.5% did not know the drug their children were receiving, and 22.5% indicated either "yellow syrup", or "red syrup" as they did not know the actual names. It seems that their knowledge on the treatment their children is receiving is very superficial.

5.3.4 The preventive measures implemented by parents

The analysed data revealed the following important findings on the measures implemented by parents to control malaria in and around their homes and also taken to protect their children from contracting the disease.

- The majority, namely 42.5%, did not know how malaria could be prevented.
- About 32.5% of the respondents indicated that they did not know how to safeguard their children from contracting malaria.
- None of the respondents mentioned the use of repellent creams and sprays, screened windows, and the use of burning repellent coils or tablets.
- One respondent indicated that malaria could be prevented "By following the instructions of the health personnel." The same respondent indicated in the interview that the health education obtained from health personnel was most helpful. This implies that, if health education could reach most of the villagers, and if they would apply the preventive measures, it would be possible for them to control malaria.
- On measures that could be taken to inhibit mosquito breeding around the house, respondents were not familiar with preventing breeding by larvicide, because none of them mentioned the use of oil in preventing breeding by larvicides, and only 17.5% indicated that they did not know what could be done to inhibit mosquito breeding.
- Twenty percent of the respondents indicated that they did not know how to prevent mosquito bites, and 2.5% mentioned that it was difficult to achieve.

- The majority 75.0% (N=30) indicated that they did not know the reasons why special care should be taken to prevent malaria to under five-year-old children. This is a reflection on the health education on malaria prevention conducted by the Tanzanian government as education does not seem to be effective enough. The message also did not reach most of the respondents in time to make any difference to the prevalence of malaria in this area.
- Very few actions were taken to inhibit mosquito breeding around the house. For instance 67.5% of the respondents had never drained accumulated water around their houses and 40% had never discarded containers with stagnant water.
- As regards the use of insect repellents, the following was found:
 - the majority of respondents, 97.5%, had never sprayed the outsides of houses to kill mosquitoes;
 - 77.5% had never used mosquito coils;
 - 97.5% had never applied repellents to the skins of their children;
 - 75% did not know whether repellents were available in Bukumbi village;
 - 85.0% had never sprayed the inside of their houses; and
 - 80% did not know that the spraying equipment could be bought in Bukumbi village.
- Thirty percent of the respondents allowed their children to go outside every day after dark.
- No respondent had made fires at dusk to keep mosquitoes away.
- Of the respondents 62.5%, did not cover all openings of their homes. They lacked the skills to replace the gauze screens themselves.
- All the respondents indicated that they owned mosquito nets, and 67.5% indicated that the use of the coupon system for the mosquito nets simplified its availability. The nets seemed not to be well maintained by 12.5% of the respondents, while 10% had not been treated with insecticide and 5% could not remember the name of the insecticide used. This state of affairs could be due to a lack of knowledge about the prevention of malaria.

5.3.5 The preventive measures not implemented by parents

The findings revealed that parents often had legitimate reasons for not implementing malaria preventive measures.

- Although parents face many problems that make it difficult to combat malaria, the majority of them, namely 92.5% felt that it was not a waste of time to attempt to combat malaria.
- The factors that prevented parents from implementing all preventive measures were all related to their financial situation, as almost 75.0% of the parents did not have the equipment to spray their homes for the following reasons:
 - 85.0% of the respondents could not afford to purchase spraying equipment;
 - 75.0% did not have money to purchase insect repellent;
 - 60.0% did not have the money to replace broken gauze screens;
 - 60.0% indicated that they did not have enough money to keep up the pace to treat stagnant water around the house; and
 - 77.0% did not have money to replace mosquito nets.
- The respondents also did not seem to listen to radio broadcasts. Many advertisements are broadcasted on malaria, with information on special prices for products. Whether they owned a radio was unfortunately not asked during the interview.
- It is also clear that the respondents did not do things, which they themselves could do and that would not cost them anything. It would only imply that some labour activities could be done by themselves, for instance by simply clearing the environment of stagnant water, repairing nets and taking responsibility for the health of their children by keeping them inside their homes after dark.

5.3.6 Reasons for delaying treatment

The findings revealed that delays in treatment could be contributed partly to the parents themselves, to the health services and lack of knowledge (especially about the early

symptoms of malaria) or of resources. Among the causes that prevent parents from taking their children to the health institution sooner is the fact that most of the respondents, namely 75.5%, self-medicated their children by buying drugs from the pharmacy and waiting to see whether there was an improvement in the child's condition.

- Some respondents, namely 27.5%, consulted traditional healers from time to time, although this does not seem to be the major reason for the delay in taking their children to hospital. This is in line with studies done in Nigeria, Zambia, Sudan, Malawi, West Africa and in rural Tanzania (Fawole & Onadeko 2001:152-157; Kaona & Tuba: 2005:28; Munthali 2005:127-146; Oladele & Kauna 2005:2-10; Schellenberg, Armstrong, Mushi, Savigny, Mgalula, Mbuya, & Victoria 2003:581-590; Warsame, Kimbute, Machinda, Ruddy, Melkisedeck, Peto, Ribeiro, Kitua, Tomson, & Gomes. 2007:789).

The delay in seeking medical care could perhaps also be contributed to parents' financial circumstances, such as a lack of transport or having to pay for transport to take a sick child to hospital.

Delays also occurred in the health institutions after the respondents had taken their children for treatment. It took between one and four hours from patients' arrival at the institution and the children receiving treatment. This could be attributed to the large number of patients who reported for treatment and the shortage nurses, doctors and laboratory technicians. Any delay in treatment could jeopardise the prognosis of a child suffering from malaria.

5.3.7 The role of the lack of proper family planning services in the control of malaria

Family planning in this villages did not impact on family size, and services were not used to improve the control of malaria, because:

- 35.0% of the respondents had more than five children per family and 35.0% had three or four children.
- Most mothers in this study were between 21 and 30 years old, implying that the majority of the mothers were still young, which could further increase the number of children per household.
- Big families keep the parents busy working in difficult situations in order to earn food for the families, which leads to improper management of their under five-year-old children and this might result in an increase of the mortality rates in this age group.

5.3.8 Complications of malaria present in the children of the respondents during the acute stage

Complications can be prevented or managed if parents could be trained to handle these. It was therefore important to determine which complications presented in the children of this sample and whether the parents recognised them.

- The complications of malaria, which the respondents did not mention, included coma, convulsions, hypoglycaemia, severe anaemia, acute pulmonary oedema, acute renal failure, spontaneous bleeding and coagulopathy, metabolic acidosis and shock.
- Complications mentioned by the parents in the study, included:
 - 30% of respondents indicated that their children went into a coma due to a recent malaria episode;
 - 15.0% indicated that their children presented with low blood sugar;
 - 40.0% experienced convulsions;
 - 60.0% revealed that their children presented with renal failure;
 - 67.5% revealed that shock was among the complications with which their children presented; and
 - 87.5% indicated that their children were anaemic.

These findings have serious implications for the health education strategies to control malaria.

5.4 LIMITATIONS

A number of limitations have been identified in this research.

- The sampling method caused difficulty as the respondents who had been included in the research population could not be found again for the sample. This was due to the fact that the homes of the villagers were not numbered. This problem could have influenced the findings in some way although measures were taken to counteract the effects of this problem.
- If the researcher could have observed the extent to which control measures had actually been implemented, findings might have been different.

5.5 RECOMMENDATIONS

The following recommendations can be made based on the findings of the research:

5.5.1 Recommendation to improve the control measures of malaria taken by parents of children under the age of five years

5.5.1.1 *Health education*

- The health education programme on malaria in Bukumbi village needs to be improved urgently. Providing health education on malaria only in January each year, is inadequate. Parents also have to attend health institutions to obtain the necessary information to combat the disease. Better planned health education sessions, which cover all aspects of the disease, should be offered over a longer period in the villages not only at hospitals.
- Seeing that health education on malaria is spread mostly by word of mouth in this village, health personnel should make sure that this avenue is pursued and that villagers are well informed.
- The success of the health education measures should be measured on a regular basis and the success should be based on evidence of improvement.

- Special attempts should be made to educate others, as they are caregivers of children. It would empower them with the necessary knowledge and skills, which would result in a reduction of the morbidity and mortality rates.
- Mothers should be motivated to make use of family planning services and defaulters of this programme should be identified and visited at home to ensure that they make proper use of contraceptive methods.

5.5.1.2 *Cooperation between role players*

- Authorities should work together with members of the village in an attempt to number homes, name streets and blocks to make recording and follow up of cases possible.
- District health officials should visit villagers at home to assist them in the practical implementation of the control measures. Such steps would be seen by the villagers as a serious attempt by authorities to control malaria and this might then make it easier to follow-up the sample. Villagers should also have the opportunity to find answers for issues in their personal circumstances, which will make them more committed to make a difference in their circumstances.
- Poverty, poor education and unemployment should be addressed in this village. The Government of Tanzania will have to mobilise various state departments such as Education, Finance, Welfare, Labour, Health and Agriculture, to improve the circumstance of the villagers.
- Special programmes will have to be planned and implemented to empower parents with knowledge and skills not only to combat malaria, but also to improve their circumstances.
- Education of mothers is of the utmost importance as they care for the children's well-being, and this should include the prevention of malaria.
- The infrastructure of the village needs to be improved to prevent delays in transporting children to hospital.
- Authorities could also improve transport facilities in this village.

- Health personnel should attempt to reduce the waiting time for parents with sick children. This will also improve these children's prognosis.
- Health officials should ensure that mosquito nets are provided on a regular basis to members of this village, particularly those with children in the under five-year-old age group. With the handing over of the nets to the parents, health officials should make sure that parents know exactly how to care for the nets, when and how to treat these with insecticides and they should also provide them with the necessary equipment to do so.
- As malaria remains to be a major problem in Bukumbi village, the villagers should receive more assistance in the short term to combat the disease.
- Education and training of adults should be a priority in order to break the cycle of poverty and disease in Bukumbi village. This would enable them to learn about the issues related to malaria and understand these.

5.5.2 Recommendations for further research

More research is necessary to control malaria in Bukumbi village. The following research topics are suggested:

- Vigorous attempts could be made to provide the villagers with the correct health education on the control of malaria after which the success of the health education campaign could be evaluated.
- More research is necessary on the best avenue or communication method to convey the message of malaria control that would have the greatest impact on the villagers.
- More research is necessary on the reasons for not implementing the control measures for malaria by villagers.
- Research could be done on ways to improve the quality of life of the villagers, which should include ways to increase household income and poverty relief.
- Environmental studies should be done to combat malaria in this area.

5.6 CONCLUDING REMARKS

This chapter dealt with the general summary of the study, the limitations, a conclusion and the recommendations.

This study found that parents of the under five-year-old age group in this village are caught in a vicious cycle of poverty, lack of resources, lack of knowledge, education and training, as well as a lack of knowledge of malaria, poor paying jobs, lack of transport, large families, and a high incidence rate of malaria.

Only hard work, the necessary funds and a multi-disciplinary, multi sectoral approach, which should also include members of the village, can break this cycle. In order to prevent unnecessary deaths of children under the age of five years in Bukumbi village, the study concluded that three major aspects urgently need to be dealt with. Firstly, the poverty of members of this village should be addressed. Secondly, education and training of the villagers should take place and should include health education in the control of malaria. Thirdly, service delivery by health and other officials whose responsibility it is to combat the conditions should be improved.

The government of Tanzania has implemented some control methods, such as health education and the provision of mosquito nets. The problem with health education sessions is that the topic of malaria is only covered during January each year at the Bukumbi health services, and the only people who can benefit from these are parents who bring their children for medical attention during this period. Health education is also provided at the family planning clinics, but if women do not attend these clinics, they do not receive the necessary information on malaria. Mosquito nets are provided for children under the age of five years in this village, but are not always properly maintained or treated with insecticide.

Parents of children can also do more themselves to control the disease in and around their homes by draining stagnant water pools or by covering such water with a thin layer of oil to arrest the mosquitoes' breeding cycles.

UNIVERSITY OF SOUTH AFRICA
Health Studies Research & Ethics Committee
(HSREC)
College of Human Sciences

CLEARANCE CERTIFICATE

Date of meeting: **15 May 2007** Project No: **3513-543-3**

Project Title: **Measures taken by parents to prevent malaria**

Researcher: **Ms AE Dinho**

Supervisor/Promoter: **Mrs MM van der Merwe**

Joint Supervisor/Joint Promoter: **Prof VJ Ehlers**
Department: **Health Studies**

Degree: MA Cur

DECISION OF COMMITTEE

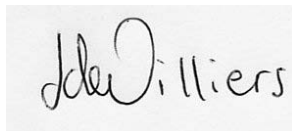
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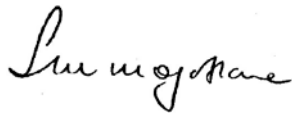
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20 June 2007
Date:



Prof L de Villiers
RESEARCH COORDINATOR: DEPARTMENT OF HEALTH STUDIES



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ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

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CHAPTER 1

OVERVIEW AND ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Malaria is a disease caused by the plasmodium parasite, and it is transmitted by the bite of an infective female anopheles mosquito (National Malaria Control Programme (NMCP 2006b:3). Approximately 5% of the world's population is infected, and there are globally approximately one million malaria deaths each year (Cook & Zumla 2003:1205). About 90% of these deaths occur in Africa south of the Sahara. The majority of infections in Africa are caused by plasmodium falciparum, the most dangerous of the four human malaria parasites. Other parasites are plasmodium vivax, plasmodium ovale, and plasmodium malariae (Haslett, Chilvers, Boon, Colledge & Hunter 2002:51). Plasmodium falciparum is dangerous because it is the most effective malaria vector. The headache, nausea and vomiting experienced by patients infected with this plasmodium are usually more severe than other malarial infections and there is a greater tendency towards the development of delirium, haemolytic jaundice and anaemia. This type of malaria is the most difficult to control, it causes severe disease and the mortality rate is much greater than in other forms. Almost all deaths are caused by falciparum (Cook & Zumla 2003:1206; Africa Malaria Report 2003).

Malaria continues to be the largest single component of the burden of disease in sub-Saharan Africa (Savigny, Mayombana, Mwageni, Masanja, Minhaja, Mkilindi, Mbuya, Kasale & Reid 2004:2-19). Young children and pregnant women are the population groups at highest risk, because of low immunity. Ninety percent of all malaria deaths in Africa occur in young children (Africa Malaria Report 2003).

It is estimated that 94% of Tanzania's 34.6 million people are at risk of the disease as they live in areas where transmission is possible (Malaria 2002; Government of Tanzania 2003:20). Malaria in Tanzania is believed to be directly or indirectly responsible for about 16 million malaria episodes annually and 100 000 to 125 000 deaths annually, reportedly 70 000-80 000 episodes in the under-five-year-old age group accounted for 64% of all malaria episodes in Tanzania (The Government of Tanzania 2003:19).

Savigny et al (2004:2-19) state that malaria is estimated to consume 3.4% of the gross domestic product (GDP) of Tanzania, at about US\$213 annually per person. Savigny et al (2004:2-19) further say that the problem is greatest in the poorest households and that it is aggravating the poverty cycle. Children are the more common victims of malaria, with mortality rates amongst those aged five years and younger being the highest. The under five-year-old malaria mortality rate in Tanzania during 2004 was 112 per 1 000 live births (Fighting malaria in Tanzania 2004).

In Bukumbi village, 67% of the under five-year-olds were diagnosed with malaria in 2006. Of the total number of malaria-infected children in this village 2.7% died from malaria in 2004 (Tanzania. The state of malaria in Misung District (Mandike commission) 2006:2).

Malaria is a preventable disease. Measures have been planned and implemented to address this problem in Tanzania, such as the *National Strategic Malaria Control Programme*, which consists of four pillars, namely, improved malaria case management, the national scaled-up use of insecticide treated nets (ITNs), the prevention of malaria during pregnancy, and malaria epidemic prevention and control (Savigny et al 2004:2-19; The Government of Tanzania 2003:8). Pillars number two and four are applicable to this research. These preventative measures have been implemented in Bukumbi village by educating parents and other people who attended the hospital for obtaining treatment for their sick children. Despite this educational

programme, the under five-year-old malaria rates are fluctuating although declining slowly. See Table 1.1.

Table 1.1 The prevalence rate of malaria in Bukumbi village

Year	Total population under five-year-olds	Malaria diagnosis under five-year-olds	Deaths due to malaria to under five-year-olds	Prevalence rate
2002	890	720	31	8.1%
2003	913	755	21	8.3%
2004	915	667	20	7.3%
2005	934	426	29	4.6%
2006	942	636	19	6.8%

(Tanzania. The state of malaria in Misung District (Mandike commission) 2002, 2003, 2004, 2005, 2006)

Should the education of parents not be successful, more unnecessary deaths due to malaria amongst children of Bukumbi village could occur.

1.2 BACKGROUND TO THIS RESEARCH

Malaria continues to be the largest single component of disease in sub-Saharan Africa (SSA). Approximately 300 million people worldwide are affected by malaria and 1.5 million people die from malaria every year. Previously extremely widespread, malaria is now mainly confined to Africa, Asia and Latin America (WHO 2004).

Tanzania has the third largest population who are at risk of stable malaria in Africa, after Nigeria and the Democratic Republic of Congo. The United Republic of Tanzania has a population of 34.6 million according to the census of 2002, all of whom are at risk of malaria, as malaria is the most common and dangerous disease in Tanzania (Savigny et al 2004:2-19; Kalugula, Mwinuka, Salim & Mohamed 2005).

According to the government of Tanzania (2003:18), malaria is endemic in almost all parts of Tanzania. Its endemicity varies and is conventionally classified as *unstable seasonal malaria*, *stable malaria with seasonal variations*, and *stable perennial malaria*.

Unstable seasonal malaria occurs with a transmission period of not more than three months a year. In these areas malaria may occur in epidemics with associated increased transmission, morbidity and mortality. The areas where this phenomenon occurs are mountainous, temperatures up to 20°C and mean vapour pressures of 13-15 millibars. In higher altitude areas, there is usually no malaria transmission. In recent years, this has been changed, and the number of epidemics increased, generally with little immunity. People in all age groups are susceptible to severe malaria in these areas.

Stable malaria with seasonal variations occurs where there is seasonal intense transmission for three to six months per year. It occurs in high altitude plains, with temperatures above 15°C, and mean vapour pressures of 10-20 millibars. About 33% of the Tanzanian population live in these areas. These people have weak immunity in all age groups, and are therefore susceptible to severe malaria.

Stable perennial malaria occurs along the Tanzanian coast, extending inland as far as 160-240 km. These areas have annual temperatures of 24-32 C, mean vapour pressures of 26-29 millibars, and are inhabited by about 42% of the population. Most age groups have considerable immunity, which increases with age.

Tanzania is one of the poorest countries in the world with an annual Gross Domestic Product (GDP) of US\$213 per capita in 2000, implying that 36% of the population live below the basic needs poverty line (Savigny et al 2004:2-19). It is, however, very expensive for any country to control malaria. Malaria is estimated to consume 3.4% of the Tanzanian GDP or about US\$240 million annually (Tanzania National Bureau of Statistics, 2003, cited by Savigny et al 2004:2-19). Tanzania spends approximately \$11.37 on the health of one individual according to Ministry of Finance, government of

Tanzania, 2001, cited by Savigny et al 2004:2-19). Of this, US\$2.14¹ is spent on malaria services alone. About 75% of malaria expenditures are borne by the households, with the government contributing 20% and partners such as the Global Fund to Fight Aids, Tuberculosis and malaria, the Japanese International Co-operation Agency and the World Health Organization (WHO) contributing 5% of the household malaria expenditure. Of this figure, about one third is spent on anti-malarial drugs and almost half on mosquito nets for beds, insecticides, mosquito coils and other preventive strategies. The financial burden is therefore greatest on the poorest households, contributing to the continuing poverty cycle (Savigny et al 2004:2-19; The Government of Tanzania 2003:21). The problem of controlling malaria in poor communities is aggravated by inadequate health structures and poor socio-economic conditions (WHO 2004).

Malaria can, however, be controlled with the cooperation of all stakeholders, including members of a community. The new global policy *Health for all in the twenty-first century* also reinforces active client participation in health care delivery as part of the Primary Health Care (PHC) strategy (Stone, McGuire & Eigsti 2002:43). Unfortunately, pervasive morbidity and high mortality of malaria persist because of failed commitment between those at risk of malaria transmission and the available preventive and curative health systems (Savigny et al 2004:2-19).

The Tanzanian Ministry of Health (MoH) has taken steps to address the malaria problem by introducing the *National Malaria Medium-Term Strategic Plan*. This programme is built around four pillars, namely

- improved malaria case management;
- vector control “National scale use of insecticide treated nets (ITNs)”;
- prevention of malaria in pregnancy; and
- malaria epidemic prevention and control, which emphasise parents’ knowledge about prevention and control issues to their under five-year-old children to reduce

¹ 1 American dollar is more or less equal to 10000 Tanzanian shilling in May 2007.

malaria mortality and morbidity rates in this age group (Savigny et al 2004:2-19; The Government of Tanzania 2003:8).

In this research, the success of the implementation of pillars number 2 and number 4 of the *National Malaria Control Programme Strategic Plan* for parents of the under five-year-old target group has been investigated. The reasons for selecting only the second and fourth pillars were that:

- parents are educated about early diagnosis, treatment and the measures that they could take to prevent malaria;
- should parents do what they are taught, this could lower the morbidity and mortality rates of the under five-year-old group; and
- the study of all four pillars would form part of a large project, falling beyond the scope of this study.

The hospital and disabled care dispensary centre of Bukumbi village, where this research was conducted, are located in Idetemya ward, Usagara division, in the Misungwi district of the Mwanza region. The Mwanza region lies between the latitudes 2°S and 3°S, and 31°E and 34°E. It has long periods of rain, which occur from November to May, and short periods of rain (about 1 000-1 200 mm) from September to October. Its altitude ranges from 1 000-2 000 metres above sea level (Kalugula et al 2005:11-34), therefore it falls within the unstable seasonal malaria geographical area.

The Bukumbi hospital serviced a population of 4 290 in 2006. In terms of preventive care, the health care workers provide health education to patients in the outpatient department (OPD) and in the wards. Twelve health-education topics are covered each year with each topic running for one month. According to this schedule, malaria is taught in January only. This type of health education is usually conducted whenever the clients attend to the Reproductive and Child Health Clinic (RCH) or when patients are admitted to the children's ward (Bukumbi Hospital RCH clinic records 1999-2003).

This following map has been included to indicate where Tanzania is within the African

continent.



Figure 1.1: Map of Africa (The African Guide, Sa).

This following map is of Tanzania to indicate where the Mwanza region is. The Bukumbi village where this research was conducted is situated in this region.



Figure 1.2 Map of Tanzania (World Atlas, Sa).

Bukumbi Disabled Care Centre dispensary is situated about 1 km from the hospital, and deals with outpatient services for the villagers and referrals for seriously ill patients to Bukumbi Hospital. The hospital also conducts health education services, including topics on malaria. The patients are taught as they present for medical assistance. Parents are then required to implement the measures that have been explained to them to prevent re-infection of malaria. These measures include the

- implementation of proper environmental sanitation;
- use of protective measures, such as screening their houses' windows and doors with mosquito netting;
- use of mosquito bed nets impregnated with insecticide;

- wearing of protective clothes that cover most of the body, especially the ankles, at dusk; and
- use of sprays/coils to kill mosquitoes.

Despite the health education programme provided to patients (and parents of children) in hospital, the under five-year-old children's morbidity and mortality rates fluctuated, declined slowly and remained higher than those of adults (Tanzania. The state of malaria in Misung District (Mandike commission) 2006:3). According to this commission's report, the under five-year-old children's' population of Bukumbi village were 942 in 2006, of whom 636 (67.5%) contracted malaria. Among 3 348 adults, only 991 (29.6%) got malaria during the whole year.

It was therefore imperative to explore the extent of the effectiveness of the preventive measures implemented by the parents of the under five-year-old population group to enable leaders to take the necessary steps to address the problem of malaria morbidity and mortality rates.

1.3 RATIONALE OF THE RESEARCH PROBLEM

It was on the basis of the following aspects that the research problem was selected.

- Proper preventive measures for malaria help to lower morbidity and mortality rates of the communities, particularly among under five-year-old children.
- Although preventive measures for malaria seem to be practised in different areas in Tanzania, the morbidity and mortality rates of under five-year-old children are still higher than those of adults.
- Parents with under five-year-old children should be competent to apply effective measures concerning malaria prevention to their under five-year-old children.
- Health care providers have been teaching patients about malaria for many years. There is, however, no official way of evaluating the practicality of what is already known.

- The effectiveness of parents regarding the prevention of malaria needs to be investigated.
- No proof could be found of any research previously done in the Bukumbi village, Tanzania, to determine whether the parents of under five-year-old children have indeed implemented the measures they have been taught to prevent malaria.

1.4 STATEMENT OF THE PROBLEM

The morbidity and mortality rates of malaria for the under five-year-old children are higher than those of adults in Bukumbi village, Tanzania. The rates could be lower if parents implement the preventive measures they have been taught. It is therefore important to investigate to what extent these measures are implemented by the parents of Bukumbi village regarding their under five-year-old children. From this problem statement the following research questions were derived.

1.4.1 Research questions of the study

The research questions which directed the research process were the following:

- What do the parents of under five-year-old children in Bukumbi village, Tanzania know about malaria?
- What do the parents of under five-year-old children in Bukumbi village, Tanzania know about the measures that could be implemented to control malaria?
- Where did the parents of under five-year-old children in Bukumbi village, Tanzania get their knowledge?
- Which of the measures to control malaria have the parents of Bukumbi village, Tanzania implemented?
- Which factors prevented the parents of under five-year-old children in Bukumbi village, Tanzania, from implementing malaria control measures?

1.5 AIM OF THE RESEARCH

The aim of the research was to investigate which of the measures that have been taught to the parents of under five-year-old children in Bukumbi village, Tanzania have been implemented to control malaria.

1.6 RESEARCH OBJECTIVES

In view of the aim and problem statement, the objectives of the research were to:

- Explore and describe the knowledge of the parents on malaria in the under five-year-old target group of Bukumbi village, Tanzania;
- explore the knowledge of malaria control of the parents of the under five-year-old target group of Bukumbi village, Tanzania;
- determine where the parents of under five-year-old children of Bukumbi village, Tanzania obtained their knowledge;
- explore and describe which of the suggested measures by the health authorities to control malaria have been implemented by parents of the under five-year-old target group in Bukumbi village, Tanzania.
- identify the factors that prevented parents of the under five-year-old target group of Bukumbi village, Tanzania, to implement malaria control measures.

1.7 SIGNIFICANCE OF THE RESEARCH

It was important to conduct this research as no recorded research could be found on the measure taken by parents with under five-year-old children in Bukumbi village, Tanzania, for the control of malaria.

Findings of the current research could be used to improve malaria control programmes and ultimately to address the problems parents of the under five-year-old target group might experience, which prevent the successful implementation of control measures.

1.8 OPERATIONAL DEFINITIONS

Concepts relevant to this research include the following:

► *Preventive measures*

According to the Chambers English Dictionary (2001:561) and the Oxford Advanced Learner's Dictionary (2002:922), *preventive measures* refers to the ability to hinder or stop someone from doing something, or stopping something bad from happening in the capacity that can be evaluated.

In this research, the term *preventive measure* implies the activities executed by the parents of children under the age of five years in Bukumbi village, Tanzania to prevent malaria infection from occurring among the under five-year-old target group.

► *Parents*

According to the Taber's Cyclopedic Medical Dictionary (2005:1598); Oxford Advanced Learner's Dictionary (2002:847) and Chambers English Dictionary (2001:510), a *parent* is someone's father or mother or the adopter or guardian of a child.

In this research, the term *parents* refers to the under five-year-olds' father, mother, or guardian, who has to implement the malaria control measures as regards that he or she had been taught.

► *Malaria*

Malaria is a parasitic disease caused by the protozoa (plasmodium), transmitted by the bite of an infective female anopheles mosquito that produces recurring bouts of fever, usually in hot countries (Ministry of Health and Social Welfare (MHSW) 2006:3; Taber's Cyclopedic Medical Dictionary 2005:1291; Macmillan English Dictionary 2002:866; Chambers English Dictionary 2001:424).

In this research, the term *malaria* refers to a serious parasitic illness caused by the bite of an infected female anopheles mosquito that produces recurring bouts of fever and

which could be fatal to children under the age of five years in Bukumbi village, Tanzania.

► *Falciparum malaria*

A tropical parasitic disease caused by one of the genus plasmodium and carried by infected anopheles mosquitoes. This parasite uses red blood cells to complete its reproductive cycle. Common symptoms of a malaria attack include fever, chills, sweats and body aches (Biology-online Dictionary 2007). In this research, falciparum malaria is the parasitic disease of the genus plasmodium.

► *Complicated malaria*

This type of malaria is characterised by a severe, rapid downhill course, caused mainly by plasmodium falciparum and rarely by plasmodium vivax, and has a poor prognosis (Crusade against malaria 2007). In this research, it also indicates complicated malaria characterised by severe signs of malaria with poor prognosis, caused by plasmodium falciparum.

► *Stable malaria*

The term is used where the populations are continuously exposed to a fairly constant rate of malarial occurrences (WHO 2006:5).

► *Uncomplicated malaria*

The type of malaria classified by milder infections, caused by plasmodium vivax. The chance of involvement of other organs besides the liver is much less (Crusade against Malaria 2007).

In this research, it refers to malaria that is classified as a milder disease and which does not involve the internal organs of the under five-year-old children of Bukumbi village.

► *Incidence*

The number of new cases or events occurring over any specified period. The term is used to record an intense, short-lived disease.

► *Prevalence rate*

According to Stone et al (2002:352), this comprises –

The number of new cases in a specified period X multiplier

Population at risk during the same period.

In this research prevalence means the number of new under five-year-olds-children in Bukumbi village malaria cases, for the period of one year.

1.9 RESEARCH METHODOLOGY

A quantitative, descriptive, explorative research design was used to investigate the control measures implemented by the parents of under five-year-old children in Bukumbi village.

1.9.1 Quantitative research

Quantitative research is a systemic scientific investigation of quantitative properties and phenomena and their relationships. It is often an interactive process whereby evidence is evaluated, theories and hypothesis are refined and technical advances made. The quantitative research paradigm is normative, measures objective data and is often applied for scientific investigations in nursing (Burns & Grove 2001:26; Polit & Beck 2008:16).

As this research measures how many times parents applied the measures they were taught to prevent malaria among their under five-year-old children, quantitative research was the best method to use in this study.

The quantitative method as applied in this research will be discussed in more detail in Chapter 3.

1.9.2 Exploratory research

According to Polit and Beck (2008:20), exploratory research begins with some phenomenon of interest and explores the full nature of the phenomenon. Since a structured research method has been used to collect data and no research findings could be located where this problem has been researched in the past, this research design could also be considered to be exploratory by nature.

The characteristics of explorative research will be discussed in more detail in Chapter 3.

1.9.3 Descriptive research

Descriptive research provides an accurate portrayal or account of characteristics of a particular individual situation or group (Polit & Beck 2008; 19; Burns & Grove 2001:29). The current research explored the problem that existed in the implementation of the preventative measures the parents of under five-year-old children had been taught and describes the measures these parents implemented, as well as the reasons why some measures were not implemented, to prevent malaria among under five year old children.

1.9.4 Conceptual framework of the research

The value of conceptual frameworks is that it directs attention to the specific phenomena of interest and focuses attention on particular types of relationships (Mugenda & Mugenda 2003:214).

According to the government of Tanzania (2003:52), Community Health Management Teams (CHMTs) will encourage individual and community leaders from the village, faith-

based organisations, community-based organisations and village health committees to take an active role in creating awareness about malaria and the available control interventions in their respective constituencies. Messages should aim to promote positive behaviours towards malaria control among community members and households.

Health education is provided to community leaders, school teachers, estate workers and communities in epidemic prone districts (covering vector control, self-protection and use of insecticide-treated nets [ITNs] as well as recognition of the early signs of fever/malaria and case management). Other measures applied to control epidemics include larviciding and house spraying (Government of Tanzania 2003:22).

This research investigated which measures taught to parents to prevent malaria among their children under the age of five years, had actually been implemented in Bukumbi village, Tanzania.

1.9.5 Research population

In this study, the research population comprised 705 parents whose children in the under five-year-old target group had been treated by the outpatient department and admitted to the Bukumbi Hospital, and parents whose children in the under five-year-old-target group had been treated as outpatients in the Bukumbi Disabled Care Centre on account of malaria over the past five years. Parents had to come from Bukumbi village, and had to be willing to participate in the study.

1.9.6 Sampling method

A purposive sampling method was selected for this research. This technique involves the conscious selection by the researcher of certain subjects or elements to include in the study. It is also sometimes referred to as *judgment sampling*, as the researcher has to use his/her own judgment in selecting the respondents that would be representative of the phenomenon studied (Burns & Grove 2001:376).

This method will be discussed in more detail in Chapter 3.

1.9.6.1 *The sample size*

From a total of 705 parents, of children under the age of five years who had been diagnosed with malaria, and who had been treated in the Bukumbi Hospital and Bukumbi Disabled Care Centre, only 40 respondents were available to take part in the research.

The sample comprised 40 (5.7%) of the 705 parents who met the inclusive criteria.

1.9.7 Data collection approach

The research instrument used to collect data from the parents of under five-year-old patients with uncomplicated malaria was the structured interview schedule. Interviews are methods of data collection where a researcher questions a respondent personally (Brymen 2004:113; Burns & Grove 2001:421). The structured interview was considered the best method to collect data as many of the villagers in Bukumbi are illiterate and would therefore not have been able to complete questionnaires.

The interview schedule consisted of mainly closed-ended questions, but some open-ended questions have been included to allow the respondents to give their honest opinions in their own words on certain aspects (Mugenda & Mugenda. 2003:72).

The research instrument and the way it was compiled, tested and used is discussed in more detail in Chapter 3.

1.9.8 Analysis of data

Data analysis was done electronically, making use of the Statistical Package for Social Science (SPSS) version 14 data analysis computer program. The findings are presented in tables, pie and bar diagrams and graphs in Chapter 4 of this dissertation.

Data analysis procedures will be discussed in more detail in Chapters 3 and 4.

1.10 RELIABILITY AND VALIDITY OF THE RESEARCH INSTRUMENT

Research findings are worthless unless it can be proven that the instrument was reliable and valid.

1.10.1 Reliability

The reliability of a research instrument is concerned with consistency, accuracy, precision, stability, equivalence and homogeneity (Polit & Beck 2008:195).

The research instrument used in the current research (structured interview schedule), was compiled by the researcher after a literature review had been done. Two experts in malaria control were consulted. The instrument was then pre-tested at a hospital, which did not participate in the actual survey, by interviewing five parents who were excluded from the final study.

1.10.2 Validity

A research instrument can be considered to be valid when it accurately measures what it is supposed to measure (Mugenda & Mugenda 2003:102; Polit & Beck 2008: 196).

The interview schedule was properly calibrated by defining *malaria* and identifying the measures the parents of under five-year-old children with uncomplicated malaria were

supposed to implement in order to prevent future occurrences of malaria. The research instrument was tested for face validity by two supervisors at the University of South Africa (UNISA) and during the pre-testing of the instrument, and by two colleagues who are experts in malaria control.

Reliability and validity will be discussed in more detail in Chapter 3.

1.11 AN OVERVIEW OF ETHICAL CONSIDERATIONS

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

- district medical officer, Misungwi district, where the village is situated. (See Annexure A);
- village executive officer of Bukumbi village, where the participants lived. (See Annexure A);
- medical officer in charge of the Bukumbi Hospital where the respondents' children had been admitted. (See Annexure A);
- person in charge of the Bukumbi camp dispensary. (See Annexure A);
- respondents themselves. (See Annexure B); and
- the Ethics and Research Committee of the Department of Health Studies, UNISA (See Annexure C).

During the research, special attention was given to the ethical aspects of the research, such as

- the respondents' rights to self-determination; and
- respect and privacy of respondents and institutions.

Informed consent was obtained from each interviewee (see Annexure B).

The ethical principles applied in this research are discussed in more detail in Chapter 3.

1.12 CHAPTER LAYOUT

This research report has been divided into the following chapters:

Chapter 1: Introduction and overview of the study

Chapter 2: Literature review

Chapter 3: Research methodology

Chapter 4: Data analysis and discussion

Chapter 5: Summary, limitations, conclusions and recommendations

1.13 CONCLUSION

To curb malaria nationwide, the Tanzanian Ministry of Health developed the *National Malaria Medium-Term Strategic Plan*. This strategic plan consists of "four pillars". The second and fourth pillars concentrate especially on health education for malaria epidemic prevention and control, but also on the use of ITNs. Educating the parents of children under the age of five years, who were the most at risk of developing malaria, could help to reduce the under five-year-old malaria morbidity and mortality rates.

Although parents with children under the age of five years who have been admitted with malaria at the Bukumbi Hospital have received the above-mentioned health education, the morbidity and mortality rates have been fluctuating and finally gone down slowly. It is therefore imperative to explore and describe what these parents were taught, what they knew about the preventative measures were and whether recipients implemented what they had been taught.

In this chapter, the background of the research, the rationale, objectives and research questions, as well as the conceptual framework of the research were briefly outlined. An overview was also given of the design and methodology used to collect data and of the reliability and validity of the research instrument. Ethical aspects pertaining to the research were also considered.

In the next chapter, a literature review relevant to the prevention and control of malaria will be presented.

BUKUMBI NURSING SCHOOL

P.O.BOX 1798

MWANZA, TANZANIA

13TH MAY 2007

Research and Ethics Committee

Department of Health Studies

University of South Africa

Dear Committee members,

REQUESTING PERMISSION TO CONDUCT RESEARCH

I am hereby requesting permission to collect data for my master's dissertation titled:

Measures taken by parents to prevent malaria.

Mrs M M van der Merwe is my supervisor and the co-supervisor is Mrs JE Smith.

Methodological information related to the study is that:

- A quantitative, explorative, descriptive research design is used.
- The aim of the research is to determine which of the malaria control measures suggested by the Tanzanian government parents of children in the age group 0-5 years have implemented.
- The sample will consist of 53 respondents.
- The researcher will conduct the interviews by making use of a pre-tested interview schedule.
- Data will be analysed by the SPSS version 14 computer program.

My supervisors have ensured that all relevant ethical aspects have been considered and will monitor the research process.

A copy of the interview schedule can be obtained from the supervisor.

Yours faithfully,

Ms A Dinho

MEASURES TAKEN BY PARENTS TO PREVENT MALARIA

by

ANASTAZIA EMIL DINHO

submitted in partial fulfilment of the requirements

for the degree of

MASTER OF ARTS

in the subject

HEALTH STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: MS M M VAN DER MERWE

JOINT SUPERVISOR: PROF V J EHLERS

FEBRUARY 2009

MEASURES TAKEN BY PARENTS TO PREVENT MALARIA

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South Africa

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Summary

A quantitative, explorative, descriptive contextual study was conducted to determine to what extent the malaria control measures proposed by the Tanzanian government had been implemented by parents of children between the ages 0-5 years who lived in Bukumbi village. Structured interviews were conducted with 40 parents of children who had been admitted for malaria treatment during 2007, and the data analysed by computer. Although respondents had a basic knowledge of preventive measures they did not implement actions preventing the anopheles mosquitoes' breeding in this tropical area. The vicious cycle of poverty, malaria episodes and lack of proper malaria health education hampered the implementation of control measures such as the spraying of houses with insecticides. Although the government of Tanzania subsidises insecticide treated bed nets the respondents did not maintain these nets and did not renew the insecticide treatment of these nets. The incidence of malaria is unlikely to decline in the Bukumbi village unless all identified factors are addressed.

KEY TERMS:

Environmental control, insecticide treated mosquito nets, malaria, malaria control, malaria morbidity and mortality rates, spraying of houses with insecticides, Tanzania, under-five-year-old children.

Dedication

*This study is dedicated to all children under
the age of five years, particularly those
with malaria, in Tanzania.*

Acknowledgement

Glory to almighty God, and thanks to Him for His inexpressible gift in Jesus Christ, and for giving me the opportunity to complete this study.

I would also like to thank the following persons for their invaluable support and unending encouragement:

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- Ms Jackie Viljoen, who undertook the language and technical editing.
- Mr FC van der Merwe, for helping me with finalising the typing of the dissertation.

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ANNEXURE

- A Requesting and obtaining permission to do research
- B Informed consent of respondents
- C Permission received from Ethics Committee of Department of
Health Studies to collect data
- D Interview schedule
- E Proof of the services of an editor

LIST OF ABBREVIATIONS

ALu	Artemether-Lumefantrine
CHMTs	Community Health Management Teams
DBL	Duffy Binding-Like
FANC	Focused antenatal care
GDP	Gross domestic product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV/Aids	Human immuno-deficiency virus (HIV) and acquired immune-deficiency syndrome (Aids)
IPT	Intermittent presumptive treatment
ITNs	Insecticide treated nets
MED	Macmillan English Dictionary
MHSW	Ministry of Health and Social Welfare
NATNETS	National Nets Strategy's
NIMR	National Institute of Medical Research
NMCP	National Malaria Control Programme
OAD	Oxford Advanced Dictionary
OPD	Outpatient department
PHC	Primary Health Care
RBCs	Red blood cells
RBM	Roll Back Malaria
RCH	Reproductive and Child Health Clinic
SMARTNET	Social marketing campaign
SPSS	Statistical Package for Social Science data analysis computer program
SSA	Sub-Saharan Africa
TCMD	Taber's Cyclopedic Medical Dictionary
UNISA	University of South Africa UNISA
WHO	World Health Organization
Tshs	Tanzanian shillings

PARENTS

I am Ms AE Dinho a student at the University of South Africa

- ◆ I need to collect data for my research, and have chosen you to take part.
- ◆ The purpose of the research is to determine which malaria control measures parents in Bukumbi village have implemented.
- ◆ The data collection process should not take more than 2hours.
- ◆ You are requested to answer the questions as honestly and truthfully as possible.
- ◆ 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.
- ◆ 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.
- ◆ Your participation is voluntary and you may withdraw at any stage of the study if you feel threatened.
- ◆ No harm will be done to you or your child and no information you share with the researcher will be used to harm you.
- ◆ The information collected might however benefit the villagers in Bukumbi should the research findings be implemented.
- ◆ Your privacy will be ensured during the interview.
- ◆ Should you feel uncomfortable during the interview in any way, please discuss it with the researcher.
- ◆ Should you have any questions at any time, please direct it to the researcher.

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The researcher requested and obtained permission to do research from various authorities and institutions involved. As she would like to protect the individuals, authorities and hospitals who gave permission, the letters were not included in the dissertation. It is however available from the researcher and supervisors.

INTERVIEW SCHEDULE

Office use only

Number of respondent

1-2

SECTION A

DEMOGRAPHICAL DATA

1 How old is your child?

Key: Younger than 6 months = 1
 7-12 months = 2
 13 months to 2 years = 3
 25 months to 3 years = 4
 37 months to 4 years = 5
 49 months to 5 years = 6

3

2 How old is the father of the child?

Key: 11–20 years = 1
 21–30 years = 2
 31–40 years = 3
 41–50 years = 4

4

3 How old is the mother of the child?

Key: 11–20 years = 1
 21–30 years = 2
 31–40 years = 3
 41–50 years = 4

5

4 Is the mother of the child married?

Key: Single = 1
Married = 2
Divorced = 3
Widow = 4

6

5 What is the level of education of the mother?

Key: No formal Education = 1
Primary Education = 2
Post Primary Education = 3
Other (Specify).....

7

6 What is the level of education of the father?

Key: No formal Education = 1
Primary Education = 2
Post Primary Education = 3
Other (Specify).....

8

7 What is the occupation of the father?

Key: Unemployed = 1
Small scale farmer = 2
Large scale farmer = 3
Employed = 4
Own business = 5
Other (Specify).....

9

8 What is the occupation of the mother?

- Key: Unemployed = 1
- Small scale farmer = 2
- Large scale farmer = 3
- Employed = 4
- Own business = 5
- Other (Specify).....

10

9 How many children are born to your family?

- Key: 1-2 children = 1
- 3-4 children = 2
- 5-6 children = 3
- More than 6 children = 4

11

10 How many of your children have died of malaria?

12-13

11 How many of your children under the age of five has had malaria?

14-15

12 Please provide the combined income per month of all the members of your household.

SECTION B**HEALTH EDUCATION RECEIVED ON MALARIA**

1 How many times have you received health education on the prevention of malaria from any of the health services in Bukumbi village?

Key: At least 10 times = 1
 Between 5-9 times = 2
 Between 1-4 times = 3
 Never = 4

18

2 From which of the following sources have you received information on malaria?

2.1 Have you received any information on malaria through radio broadcasts?

Key: Yes = 1
 No = 2

19

2.2 Have you received any information on malaria from the printed media?

Key: Yes = 1
 No = 2

20

2.3 Have you received any information on malaria from the villagers?

Key: Yes = 1
 No = 2

21

2.4 Have you received any information on malaria from health personnel?

Key: Yes = 1
No = 2

22

2.5 Have you received any information from other sources?

Key: Yes = 1
No = 2

23

2.6 Specify these sources-----

24

3 Health education received

3.1 When was the last time you received health education from health personnel 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

25

3.2 How helpful was the health education you received from health personnel?

Key: Most helpful = 1
Helpful = 2
Not very helpful = 3
Not at all helpful = 4

26

3.3 Which of the following statements are appropriate to you?

Apply the following key to answer items 5.1-5.13

Key:

I learned this the first time through the health education = 1

I gained some knowledge through the health education = 2

I have always known this, the health education did not teach me anything about this = 3

3.3.1 That malaria is a dangerous disease?

27

3.3.2 That malaria could be prevented?

28

3.3.3 The cause of malaria?

29

3.3.4 That children are more at risk of getting malaria?

30

3.3.5 What you could do to prevent your children of getting malaria?

31

3.3.6 How malaria is transmitted?

32

3.3.7 That malaria could be treated?

33

3.3.8 How malaria is treated?

34

3.3.9 What symptoms you should look for in young children?

35

3.3.10 When you should take your children for medical help when they are sick?

36

3.3.11 How to determine that the malaria treatment of your child is working?

37

3.3.12 How you would know that your child's condition is deteriorating?

38

3.3.13 How to prevent the mosquito from breeding?

39

SECTION C

KNOWLEDGE OF MALARIA

1 What causes malaria?

2 How does the transmission of malaria take place?

3 What are the symptoms of malaria with which a child will present?

4 Which symptoms would make you decide to take your child (0-5 years) to hospital?

5 How is malaria prevented?

6 What can you do to prevent your children of getting malaria?

7 Which symptoms should make parents seek medical help for their child?

8 How would you know that the malaria treatment of your child is working?

9 How would you know that your child's condition is deteriorating?

10 What type of drug treatment was administered to your child who has/had malaria?

11 What are the complications of malaria in a child?

12 What could be done to inhibit mosquito breeding around the house?

13 What can be done to prevent mosquito bites on children (0-5 years)?

14 Why should one take special care in preventing malaria in children younger than five years?

15 What symptoms were present in your sick child that made you decide seek medical help?

16 Did you consult a traditional healer before seeking medical help?

Key: Yes = 1

No = 2

40

17 How many malaria episodes have each of the following age groups of your family in your household experienced in the past year?

Key: Only once = 1
 2-4 times = 2
 More than 5 times = 3

17.1 Number of episodes for the children younger than five years?

41

17.2 Number of episodes for the children between the ages 6-10 years?

42

17.3 Number of episodes for the children between the ages 11-15 years?

43

17.4 Number of episodes for the children older than 16 years?

44

17.5 Number of episodes for the adults?

45

18 How often have you consulted of a traditional healer in the past for malaria?

Key: At least 5 or more times = 1
 Between 2-4 time = 2
 At least once = 3
 Never = 4

46

19 What type of care did the traditional healer give you for malaria?

SECTION D

PREVENTIVE MEASURES IMPLEMENTED BY PARENT

1 What actions have you taken around the house to inhibit mosquito breeding around the house?

2 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

2.1 Drain any accumulation of water around the house.

47

2.2 Clear bushes along water banks.

48

2.3 Cut grass short along water banks.

49

2.4 Dispose of all containers likely to hold water

50

2.5 Keep water containers covered.

51

3 How often do you do the following to control mosquitoes?

Key: Every day = 1

At least once a week = 2

1-3 times a month = 3

Very seldom = 4

Have never do it = 5

3.1 Spray the outside of the house to kill mosquitoes

52

3.2 Use mosquito coils

53

3.3 Make use of traditional medicine (Leaves of certain plants)

54

3.4 Dress the child with clothes that covers his/her arms and legs

55

3.5 Apply mosquito repellent on the skin of your child

56

3.6 Spray the inside of the house to kill mosquitoes

57

3.7 Allow the child to go outside after dark

58

3.8 Make smoky fires at dusk to keep mosquitoes away

59

4 Describe any other measures you take to control mosquitoes

5 Are the openings in your home covered with mosquito gauze?

Key: Yes, all of them = 1
 None of them = 2
 Some of them = 3

60 **6 Are the doors of your house covered with mosquito gauze?**

Key: Yes, all of them: = 1
 None of them: = 2
 Some of them: = 3

61 **7 Are the mosquito gauze screens in tact? (Not torn or broken)**

Key: Yes, all of them = 1
 None of them = 2
 Some of them: = 3

62 **8 Do you have a mosquito net for your child?**

Key: Yes = 1
 No = 2

63 **9 If your answer to question 8 is no, explain why you do not have a mosquito net for your child**

10 Is the mosquito net in a good condition?

Key: Yes = 1
 No = 2

64

- 11 If you answer to question 10 is no explain why your net is not in a good condition.
-

- 12 Is the net treated with insecticide?

Key: Yes = 1

No = 2

65

- 13 If your answer to question 12 is no, explain why the net is not treated with insecticide.
-

- 14 How often do you treat the mosquito net with insecticide?

Key: Every 2-4 months = 1

Every 5-7 months = 2

Every 8-12 months = 3

Once annually = 4

Never = 5

66

- 15 What kind of insecticide do you use to treat the net?
-
-

SECTION E

FACTORS PREVENTING THE IMPLEMENTATION OF PREVENTIVE MEASURES

1 Which of the following statements describe the factors the best that influence the implementation of preventive measures against malaria at home?

Key: I strongly agree = 1
 I agree = 2
 I disagree = 3
 I strongly disagree = 4

- 1.1 I do have enough money to spend on spraying equipment. 67
- 1.2 I do have the time to consistently spray the home. 68
- 1.3 I do have the energy to spray the home so often. 69
- 1.4 I do have the equipment to spray the home. 70
- 1.5 I do have the necessary funds to buy insect repellents. 71
- 1.6 I do have the money to replace broken gauze screens for all the openings of my home. 72
- 1.7 I can keep up the pace to treat the many stagnant water around the home. 73
- 1.8 I have the money to replace mosquito nets. 74

- 1.9 I do have the skills to replace the gauze screens myself. 75
- 1.10 The equipment to spray homes is always available in Bukumbi village. 76
- 1.11 Mosquito repellent is always available in Bukumbi village. 77
- 1.12 I make use of the coupon system for the mosquito nets 78
- 1.13 I feel it is a waste of time to attempt to combat malaria, children will get it in any case 79

SECTION F

CONTROL QUESTIONS FOR KNOWLEDGE OF MALARIA

1 How does the transmission of malaria take place?

- Key: Yes = 1
 No = 2
 I am not sure = 3

- 1.1 You get malaria only from the bite of an infected female anopheles mosquito. 80
- 1.2 It can be transmitted through contact between two people. 81
- 1.3 It can be transmitted through the handling of contaminated food. 82
- 1.4 You can contract malaria by drinking contaminated (dirty) water. 83

1.5 You can contract malaria through sexual intercourse.

84

2 What are the *most common* symptoms of malaria with which a child will present?

Key: Yes = 1

No = 2

I do not know = 3

2.1 High fever.

85

2.2 Listlessness.

86

2.3 Extreme tiredness.

87

2.4 Convulsions.

88

2.5 Pale skin.

89

2.6 Paleness of inside of mouth.

90

2.7 Cold fever with sweating.

91

2.8 Throwing-up.

92

2.9 Yellow of skin and white areas of eyes.

93

2.10 Restlessness

94

2.11 Stomach pain

95

2.12 Frequent watery stools.

96

2.13 Unconsciousness.

97

SECTION G

SYMPTOMS WITH WHICH CHILDREN PRESENTED

1 Which of the following symptoms *did your* child (0-5 years) experience that made you decide to take/send your child to the hospital?

Key: Yes = 1

No = 2

1.1 The child could not properly swallow the anti malarial medicine.

98

1.2 The child seemed pale.

99

1.3 The child vomited.

100

1.4 The child had a fever.

101

1.5 The child was listless

102

1.6 The child was restless.

103

1.7 The child had cold fever with sweating.

104

1.8 The child had multiple fits (convulsions).

105

1.9 The child was unconscious.

106

2 How long after the first symptoms appeared did you take your child to the health institution?

Key: Within one hour = 1
 Between 2-4 hours = 2
 Between 5-8 hours = 3
 More than a whole day or night = 4

107

3 For what reasons couldn't you take the child sooner?

4 How long after you arrived at the health institution did he/she receive medical help?

Key: Within one hour = 1
 Between 2-4 hours = 2
 Between 5-8 hours = 3
 More than a whole day or night = 4

5 Describe the treatment your child is receiving for malaria.

6 Which of the following complication have your child experienced?

Key: Yes = 1
 No = 2

6.1 Coma.

108

6.2 High temperature.

109

- 6.2 High blood sugar. 110
- 6.2 Severe anaemia (paleness of skin). 111
- 6.2 Convulsions. 112
- 6.3 Chest problem. 113
- 6.4 Diarrhoea. 114
- 6.5 Acute renal failure 115
- 6.6 Spontaneous bleeding due to a blood clotting problem 116
- 6.8 Shock 117
- 6.9 State any other complication**
-
-

7 Have any of your children (0-5 years) been sick with any of the following conditions *after* they have recovered from malaria?

Key: Yes = 1
 No = 2
 I'm not sure = 3

- 7.1 Enlargement of the liver? 118
- 7.2 Listlessness? 119

7.3 Anaemia (Pale skin, face)?

120

Anything else you would like to say?

Thank you for your cooperation.

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ANNEXURE

- A Requesting and obtaining permission to do research
- B Informed consent of respondents
- C Permission received from Ethics Committee of Department of Health Studies to collect data
- D Interview schedule
- E Proof of the services of an editor

LIST OF ABBREVIATIONS

ALu	Artemether-Lumefantrine
CHMTs	Community Health Management Teams
DBL	Duffy Binding-Like
FANC	Focused antenatal care
GDP	Gross domestic product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV/Aids	Human immuno-deficiency virus (HIV) and acquired immune-deficiency syndrome (Aids)
IPT	Intermittent presumptive treatment
ITNs	Insecticide treated nets
MED	Macmillan English Dictionary
MHSW	Ministry of Health and Social Welfare
NATNETS	National Nets Strategy's
NIMR	National Institute of Medical Research
NMCP	National Malaria Control Programme
OAD	Oxford Advanced Dictionary
OPD	Outpatient department
PHC	Primary Health Care
RBCs	Red blood cells
RBM	Roll Back Malaria
RCH	Reproductive and Child Health Clinic
SMARTNET	Social marketing campaign
SPSS	Statistical Package for Social Science data analysis computer program
SSA	Sub-Saharan Africa
TCMD	Taber's Cyclopedic Medical Dictionary
UNISA	University of South Africa UNISA
WHO	World Health Organization
Tshs	Tanzanian shillings