

# Utilization of malaria preventive methods among children diagnosed with malaria in Maputo, Mozambique



Master thesis in Medicin  
Petronella Pettersson

# **Utilization of malaria preventive methods among children diagnosed with malaria in Maputo, Mozambique**

## **Master thesis in Medicine**

**Petronella Pettersson, student of Medicine, the Sahlgrenska Academy,  
University of Gothenburg, Sweden**

### **Supervisors:**

**Elisabeth Lönnemark, MD, PhD, the Sahlgrenska Academy,  
University of Gothenburg**

**Maria de Fátima Cuembelo, MD, MPH, Faculty of Medicine,  
Eduardo Mondlane University**



**UNIVERSITY OF GOTHENBURG  
THE SAHLGRENKA ACADEMY**

Programme in Medicine, the Sahlgrenska Academy

Gothenburg, Sweden 2015

**Table of contents**

- 1. Abstract ..... 5
- 2. Background ..... 6
  - 2.1 Mozambique ..... 6
  - 2.2 Malaria ..... 8
    - 2.2.1 Epidemiology ..... 8
    - 2.2.2 Transmission ..... 8
    - 2.2.3 Risk groups..... 10
    - 2.2.4 Symptoms and complications..... 10
    - 2.2.5 Malaria and its societal economic impact ..... 11
  - 2.3 Malaria prevention ..... 11
    - 2.3.1 Prevention methods ..... 11
    - 2.3.2 Mosquito bed nets ..... 12
    - 2.3.3 ITN utilization and effects..... 13
    - 2.3.4. Barriers to use of mosquito bed nets ..... 13
    - 2.3.5 Indoor residual spraying (IRS) ..... 14
    - 2.3.6 Repellents ..... 14
    - 2.3.7 Malaria prevention in Mozambique ..... 15
- 3. Objective ..... 16
  - 3.1 Overall objective ..... 16
  - 3.2 Specific aims ..... 16
- 4. Method ..... 16
  - 4.1 Study setting ..... 16
  - 4.2 Study population and sample size ..... 17

4.3 Inclusion criteria.....	17
4.4 Study procedure and data collection .....	18
4.5 Data analysis and statistics .....	19
4.6 Ethical considerations .....	19
5. Results .....	20
5.1 Socio-demographics .....	20
5.2 Received information/education about malaria prevention .....	22
5.3 Knowledge about malaria transmission .....	23
5.4 Knowledge about malaria prevention methods .....	24
5.5 Utilization of malaria prevention measures .....	26
5.5.1 Utilization of mosquito bed nets .....	27
5.5.1.1 Utilization of insecticide-treated mosquito nets.....	28
5.5.1.2 Factors affecting net effectiveness .....	28
5.6 Factors affecting bed net utilization .....	28
5.6.1. Socio-demographic factors affecting bet net utilization .....	28
5.6.2 Knowledge about malaria affecting bed net utilization .....	30
5.6.3 Paying for net affecting utilization.....	30
6. Discussion .....	31
6.1 Strengths and weaknesses .....	36
6.2 Limitations regarding the study conduction.....	39
7. Conclusion.....	39
8. Populärvetenskaplig sammanfattning – Användande av malariaförebyggande metoder bland barn diagnosticerade med malaria i Maputo, Mozambique .....	39
9. Acknowledgements .....	41
10. References .....	42

## 1. Abstract

**Background:** Malaria is a preventable infectious disease affecting millions of people each year. Mozambique is highly burdened with almost 3 million cases annually, and malaria is the primary cause of child mortality in the country. An important step in lowering the high morbidity caused by malaria is the use of preventive methods such as mosquito nets, repellents and insecticides. Large-scale bed net distributions have taken place in Africa, yet far from all children are protected by a bed net every night.

**Objectives:** Investigate the utilization of malaria preventive methods in the home of children diagnosed with malaria. Further identify reasons for not using any preventive method and evaluate the knowledge about malaria transmission and prevention.

**Method:** Semi-quantitative study based on semi-structured interviews held with caregivers to children diagnosed with malaria at José Macamo Hospital in Maputo.

**Results:** Twenty-four out of 28 caregivers had a mosquito net, but the use of repellents and insecticides was low. The most commonly mentioned reason for not owning a bed net or not using insecticides or repellents was inability to pay for them. Several bed net owning caregivers stated that their child did not use the net every night, with the most common reasons being travelling/not sleeping at home or thinking that there were not many mosquitoes. Many caregivers stated incorrect, or no knowledge of, malaria transmission (32%) and prevention (25%) and the children of these caregivers slept under a bed net every night to a lesser extent than children of caregivers possessing correct knowledge.

**Conclusions:** Continued distribution of preventive means, along with provision of adequate information, is important in securing effective malaria prevention in all households.

## 2. Background

### 2.1 Mozambique

Mozambique is located on the eastern coast of Africa, with Tanzania to the north, Malawi and Zambia to the northwest, Zimbabwe to the west, and Swaziland and South Africa to the southwest. The capital and largest city is Maputo, which is situated in the very south, close to the South African border. Mozambique has approximately 26 million inhabitants, with 1.1 million living in the capital [1, 2]. The majority of the population resides in the northern half of the country, where poverty is greatly widespread and people have less access to education and health care than in the south.

Mozambique is a former Portuguese colonial state which was declared independent in 1975, after a 13 year long war of independency. Soon after the independency, Mozambique was further burdened by an armed civil war, lasting as far as 1992, depriving the country of most its economic gains from the past few decades [1, 3].

After the declaration of peace, Mozambique has had one of the highest economical growth rates in Africa, mainly based on agriculture, natural resources and aluminium industries. The government aims to secure the economical growth through new economic reforms, foreign investments, and by supporting the development of agriculture, transport and tourism [1, 3]. During the last decade, Mozambique has been making progress in terms of socioeconomic development, with investments made to increase the number of health services and skilled professionals, particularly in the rural areas [4].

Despite the economical growth, Mozambique is still one of the poorest countries in the world. The country's economy and prosperity have experienced major setbacks due to war, international economic crises and periods of severe flooding and droughts [5]. In 2013 the gross domestic product (GDP) per capita (current USD) was 605 USD, in relation to the

world average at 10,610 USD per capita and Sweden at 60,430 USD per capita. More than half of the population is living below the national poverty line, which is set at approximately 2 USD per day (PPP) [6, 7], and Mozambique is at the very bottom of the UN:s list of Human Development Index [8]. There are vast economical differences between rural and urban areas, with the poorest population living in the countryside. Further, there are major gaps in economical resources between different regions of the country. Despite 70 % of the population living on the countryside, and more than half in the north, almost all economic investments are concentrated in the capital of Maputo in the south [4, 6].

In 2012, fifty-one percent of the adult population were illiterate, the majority being women [6]. The government of Mozambique has made efforts to promote the access to education and enrollment in both primary and secondary school, resulting in an increase in the primary school enrollment and completion during the last decade. Still, the primary school completion rate was only 52% in 2012, with a slight overweight of boys completing primary school [6].

The fertility rate in Mozambique is high and almost half of the population is under 15 years of age [1, 6]. The life expectancy at birth is 49 and 51 years respectively for men and women. With investments done in the health sector, the mortality rate among children has dropped from 137 to 89 deaths per 1000 live births in the past decade. The maternal mortality rate has also declined from 680 to 480 deaths per 100,000 live births during the same period [6]. Despite investments done in the health sector, the Mozambiquan health expenditure is still very low, with only 37.2 USD spent per capita. The correspondent world average in 2012 was 1,030.4 USD per capita, and in Sweden 5319.4 USD per capita [6].

## **2.2 Malaria**

### **2.2.1 Epidemiology**

Malaria is a life threatening but preventable and treatable infectious disease, affecting millions of people in the world, especially children under five and pregnant women. In 2013, approximately 198 million people were infected with malaria and 584 000 malaria deaths occurred globally. Approximately 80% of cases and 90% of deaths are estimated to occur in Africa [9]. The dominating burden is concentrated to the Sub-Saharan Africa, Mozambique being part of it.

The transmission rate of malaria in Mozambique is high, making the disease a major cause of morbidity and mortality. In 2013 there were 3 million confirmed malaria cases in Mozambique among the nearly 26 million inhabitants [9]. Through blood testing of children across the country, the Ministry of Health has estimated the prevalence of malaria among children under five years to an average of 46 % in rural areas and 16% in urban areas [10].

Malaria is the single main cause of child mortality in Mozambique, with about 36.000 deaths annually [11]. It is also an enormous public health burden, since malaria is responsible for 40% of all outpatient visits and 60% of paediatric hospital admissions, according to the Mozambican Ministry of Health [12].

### **2.2.2 Transmission**

Malaria is caused by a protozoan parasite called *Plasmodium*. There are four *Plasmodium* species potent of infecting humans, more specifically the *P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae* [13]. The most common type of malaria in Africa is the one caused by the species *Plasmodium falciparum*. This is the most aggressive form that can rapidly proceed into a life threatening condition, demanding early diagnosis and treatment [13].



*P. falciparum* is exclusively transmitted from one human to another through the bite of an infected *Anopheles* mosquito [14]. The infected mosquito carries early life cycle forms of the *Plasmodium* protozoa in her salivary glands, and injects parasites into the bloodstream of the human when biting. The parasites then develop into mature forms, causing illness by infecting the red blood cells [15]. There are about 20 species of *Anopheles* that are locally important vectors worldwide, and all of them bite only between dusk and dawn, making those hours important of protecting oneself. The whole infectious reservoir of the Plasmodium parasite is localized to humans, so the vector mosquitoes must bite at least two humans during their life to transmit the infection [14]. The prevalence of malaria depends largely on the behaviour of local species of *Anopheles*. Transmission rates are higher in areas where the lifespan of the mosquito is long, allowing complete development of malaria parasites within its body, and where there is a preference of feeding on humans rather than animals. The relatively long lifespan and the strong habit of biting humans among the *Anopheles* species in Africa is the primary reason for the great majority of malaria cases and deaths occurring in Africa [15, 16]. The transmission rate is also affected by climate, such as humidity and temperature, with a higher temperature providing better living conditions and a faster parasite development [15]. Further, the amount of existing water reservoirs is an important factor, since the *Anopheles* mosquitoes breed in water. As in most malaria endemic areas, the transmission in Mozambique has a seasonal variation with a peak occurring during and after the rainy season, which occurs between November and March. This is caused by high temperatures and collections of water allowing reproduction of a greater amount of mosquitoes [16]. However, the tropical climate in Mozambique, in combination with the presence of some of the most efficient vectors for malaria transmission, facilitates malaria transmission throughout the entire calendar year [17]. Therefore it is important to protect oneself year round, even though the perceived mosquito burden might be low during the cold and non-rainy seasons [15].

### **2.2.3 Risk groups**

About 2.3 billion people in the world have been estimated to reside in areas where there is a risk of catching malaria [15]. In 2013, 97 countries and territories had on-going malaria transmission [16]. Individuals with a low immune system, like pregnant women, are more prone to malaria infection, and are more severely affected once infected. Also children under the age of five, which have not yet acquired immunity against malaria are especially vulnerable [18]. In areas of high transmission, partial immunity is acquired over years of exposure and while it does not provide complete protection, it reduces the risk of the malaria infection causing severe or life-threatening disease. Because of this, most malaria deaths in Africa occur in young children, while in areas of low transmission with consequently low immunity, all age groups are at risk [16]. Furthermore, poverty is associated with higher risk of malaria, as well as poorer prognosis. In addition to poor individuals having less means to protect themselves, people living in poverty more frequently suffer from malnutrition, leading to a poor health status, with lesser ability to resist and fight disease [12].

### **2.2.4 Symptoms and complications**

The manifestations of malaria can vary greatly, both between different regions and from person to person [18], but the characteristic symptoms are intermittent fever and chills every second or third day. Other symptoms may include nausea, headache, and muscle aches. The onset of severe malaria, most commonly caused by *P. falciparum*, can be rapid, occurring in a matter of hours [18]. The infected person may become unconscious and develop shock and deep coma [18]. In the case of severe *P. falciparum* infection, the most common and important complications in children are cerebral malaria, severe anaemia, respiratory distress and hypoglycaemia. Convulsions due to cerebral malaria occur in almost one third of severe cases of malaria, and 5-30% of these children develop neurological sequelae [19].

## **2.2.5 Malaria and its societal economic impact**

The impact of malaria on economic development is substantial. It is said that malaria reduces economic growth globally with 1 % per year [20]. The economic Commission on Macroeconomics and Health highlighted malaria, together with HIV/AIDS, as an avoidable condition responsible for a high proportion of the health deficit, which in turn is associated with a reduction in economic growth [21]. Malaria has slowed the economic growth in African countries by 1.3% per year, and as a result of which GDP for African countries is now 37 % lower than it would have been in the absence of malaria [22]. Yet, the disease can be controlled for only a fraction of the costs it yields [21].

Those who suffer most in Africa are the most impoverished, and malaria keeps them poor. People in Mozambique often face high costs when seeking care or requiring hospitalization due to malaria, not uncommonly exceeding catastrophic payments (payments exceeding 10 % of monthly income or 40% of non-food expenditure) for a single malaria episode [23]. According to a study conducted in southern Mozambique, a poor family living in a malaria-affected area may spend up to 25% or more of its annual income on prevention and treatment. With 70% of expenditures being on the essentials of food, housing, cooking fuel, little income is left for other necessities [24].

## **2.3 Malaria prevention**

### **2.3.1 Prevention methods**

Increased control of malaria transmission is essential in the struggle of lowering the high morbidity and mortality caused by malaria in low income countries. The key to controlling malaria transmission is the use of different preventive measures. Prevention of malaria includes vector control on a larger scale, as well as the individual protecting oneself from illness [25].

At individual level, personal protection against mosquito bites represents the first line of defence. For people living in endemic areas it includes the use of window screens, mosquito nets

and repellents, as well as wearing covering clothes during night time. If travelling to endemic areas, taking prophylactic antimalarial medication is recommended [25].

At community level, vector control is the main way to reduce the burden of malaria, as it is the only intervention that can reduce malaria transmissions significantly. To accomplish this, WHO recommends two main interventions, namely the use of insecticide-treated mosquito nets (ITNs) and Indoor spraying with residual insecticides (IRS) [16].

### **2.3.2 Mosquito bed nets**

Bed nets form a protective barrier around the people sleeping under them, which in itself acts as a preventive measure. Despite all nets providing a protective barrier, nets impregnated with an insecticide offers much greater protection than untreated nets [26, 27]. The effect of an insecticide treated bed net (ITN) is mainly that mosquitoes coming in contact with the net die. Additionally, some insecticides also act as a repellent, lowering the amount of mosquitos near the bed [25]. ITNs are either regular, initially untreated mosquito nets that have been impregnated with insecticide, or mosquito nets where the fibers of the net have been saturated with insecticide during manufacturing. It is estimated that mosquito nets impregnated after manufacture are effective for about a year, while the effect of industry-treated nets lasts for about 5 years, why they are called long-lasting insecticide treated nets LLTNs [28].

Previously, most ITNs approved by WHO lasted for a shorter period of time and had to be retreated every 6 to 12 months. Washing the net and exposing it to sunlight could wear out the net even faster. Nets are retreated by dipping them in a mixture of water and insecticide and allowing them to dry in a shady place. The need for frequent retreatment was a major barrier to widespread use of ITNs in endemic countries. The additional cost of the insecticide, as well as the inconvenience of getting the insecticide and re-impregnating the net, combined with a lack of understanding of its importance, resulted in very low retreatment rates in most African countries [25]. In the last decade, more LLINs have been approved, and most nets used in malaria control

programmes are LLINs [29]. The higher durability of LLINs overcomes some of the barriers faced with the previous nets with a shorter lifespan.

### **2.3.3 ITN utilization and effects**

Regarding ITNs, WHO recommends coverage for all people living in malaria endemic areas. The most effective way to achieve this is through provision of free ITNs [16]. Massive scale-ups in malaria control programmes in 2008-2010 have resulted in the provision of ITNs to protect more than 578 million people in Sub-Saharan Africa [30]. This has led to a great decrease in deaths caused by malaria since the year of 2000. In Africa, ITNs have shown to reduce all-cause mortality for children under the age of 5 by 17 %, and several trials in sub-Saharan Africa show that insecticide-treated nets are beneficial to the health of pregnant women and new-born babies [31]. Except for the direct benefit for the individual sleeping under the net, it is also shown that individuals' not sleeping under an ITN, but living in an area with high ITN coverage, are at decreased risk of infection due to the resulting reduction in overall malaria transmission [32, 33]. But to achieve such effects, more than half of the people in a community must use an ITN [25].

### **2.3.4. Barriers to use of mosquito bed nets**

The use of ITNs in the African continent remains far below the WHO recommendations, with only 18.5% of children in stable malaria transmission areas being protected by a net [34]. The low coverage demands further intervention, partly through a continued distribution of nets, but also through addressing barriers to using a net despite owning one. It has been shown that only one third of available mosquito nets were used among households in Niger, why ownership is not the only obstacle to achieving reductions in malaria morbidity and mortality through ITN use [34]. Not using a mosquito net despite owning one can be attributed to various reasons, such as lack of knowledge of mosquitoes causing disease [12], as well as discomfort, primarily due to heat [35], and a perceived low mosquito density [34]. Practical barriers associated with hanging the

mosquito net, the temporary unavailability of a normally available net, as well as wanting to save the net for the future are also probable causes of not using a net according to a review article on reported reasons for not using an available net [14]. Further, the use of nets seem to be higher during rainy seasons, which further shows that the perceived mosquito density highly affects the motivation of using a net [36, 37].

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

IRS means coating the walls, roof and other surfaces of a house with a long-lasting insecticide spray that lasts for about 6 months. The insecticide acts by killing mosquitoes and other insects that come in contact with these surfaces. The main effect of IRS is not to directly prevent people from being bitten by mosquitos, but to kill mosquitos that come to rest on the sprayed surface after having been fed. By this, it prevents the spread of the infection to other individuals [16].

IRS is an effective way to rapidly reduce malaria transmission in high endemic areas and during malaria epidemics. A study conducted in the province of Zambezia in Mozambique, showed that children living in a house with IRS had a malaria prevalence of 46%, in comparison to unprotected children among which the prevalence was 61% [38]. But the potential of IRS is realized first when at least 80% of houses in targeted areas are sprayed, and it must be consistently applied over several years in order to avoid revival of the vector in an otherwise unprotected population [25].

### **2.3.6 Repellents**

There are different kinds of repellents available on the market, such as repellents applied to the skin or coils. A coil is a repellent shaped as a spiral, which by burning produces mosquito-repelling smoke. They are recommended for out-door use or for semi-enclosed places. In quantitative tests, they provide about 80% protection [39]. Baygon is a pesticide brand of short-

lasting insecticide spray used for indoor spraying, lasting for up to eight hours. Other, not well-proven, traditional ways to repel mosquitoes include burning cashew or mango tree leaves, or other combustible materials.

### **2.3.7 Malaria prevention in Mozambique**

In 1982, the Mozambican Ministry of Health, along with several national and international partners, created the National Programme of Malaria Control (NMCP) focusing on prevention from, and eradication of, malaria in Mozambique [12]. Since then, several malaria control initiatives, such as bed net distributions, have been implemented in Mozambique. In 2010 the NMCP formed The Malaria Strategic Plan, with an aim to scale up malaria control activities and expand efforts to fight malaria at the household level. Specific goals for the years of 2012-2016 was set, including [17] country districts having the capacity to manage their own malaria control activities and the entire population having access to at least one malaria preventive measure. Even though the control of malaria in Mozambique has improved, these goals have not been entirely met. The one remaining goal is that the all of the population should have received information about malaria prevention and treatment by 2016 [21].

In recent years, one of the greatest efforts in the combat of malaria in Mozambique have been the distribution of mosquito nets in a majority of the provinces in the country [9]. Since the year of 2000, the Mozambican Ministry of Health, supported by various partners including UNICEF, have distributed more than 6 million insecticide treated bed nets across the country [11]. According to the Demographic Health Survey presented by the National Institute of Statistics in 2011, fifty-seven percent of Mozambican households were in possession of at least one mosquito net, untreated or not, and 51% were in possession of at least one ITN [12].

The Mozambican Ministry of Health, through the NMCP, provides annual routine IRS prior to the rainy season in some of the districts of Mozambique, thereamong Maputo City and Maputo Province [40]. In 2011, an average of 19% of households in the country were sprayed

with IRS during the last 12 months, which is far from the level required to provide efficient protection (80%) [12, 25].

Regarding children being protected, the Demographic Health Survey presented data based on interviews held in households all over the country, showing that 39% of children under the age of 5 had been sleeping under some kind of net (impregnated or not) during the past night, and 36% had been sleeping under an ITN. Nearly half of the children was sleeping with some kind of protection, meaning under an ITN or in a house with IRS done in the last 12 months [12].

### **3. Objective**

#### **3.1 Overall objective**

- Investigate the utilization of malaria preventive methods in the home of children diagnosed with malaria at José Macamo Hospital.

#### **3.2 Specific aims**

- To investigate to what extent malaria preventive methods (mosquito nets, short and long lasting indoor spray, skin repellent, coils and traditional preventive methods) are used in the home of the children diagnosed with malaria.
- To evaluate the general knowledge about malaria transmission and prevention among the caregivers of children diagnosed with malaria.
- To map factors affecting the utilization of bed nets in the homes of the children diagnosed with malaria.
- To identify reasons to why the children diagnosed with malaria have not been protected by a mosquito bed net or other preventive measures every night.

### **4. Method**

#### **4.1 Study setting**



This semi-quantitative study was based on semi-structured interviews, conducted at the public Hospital José Macamo in Maputo, Mozambique, between the 3rd November 2014 and 28th November 2014.

## **4.2 Study population and sample size**

Participants were caregivers with at least one child under the age of 15, diagnosed with malaria at José Macamo Hospital in Maputo, Mozambique. Caregivers of both children attending to the outpatient department, and caregivers to children admitted to the department of paediatrics (inpatients) were included. Caregivers to children at the outpatient department were directed to us by the nurse in charge, after the child had received the diagnosis malaria through a diagnostic test. Caregivers at the department of paediatrics were recruited by speaking to the treating health care personnel who had knowledge about which children were admitted due to the diagnosis malaria. A positive malaria diagnosis was defined as a positive rapid diagnostic test (RDT) and/or microscopy.

The study included participants who attended to the hospital within the time period of November 3<sup>rd</sup> to November 28<sup>th</sup> 2014. The number of new malaria cases per day during this period of the year was between 1 and 4. During the days of data collection, all caregivers to admitted children were interviewed. On two occasions, when interviews were already ongoing, new cases of malaria found in the triage were waived from participation.

## **4.3 Inclusion criteria**

- Caregivers with at least one child under the age of 15 attending the outpatient department or department of paediatrics at José Macamo Hospital.
- The child had been diagnosed with malaria (positive RDT and/or microscopy) at José Macamo Hospital at the time of the interview.
- The child was present at the hospital during the date of the interview.

#### **4.4 Study procedure and data collection**

A pilot study was conducted before starting the interviews. After the pilot study only small changes were made in the questionnaire, and the pilot interviews were included in the final analysis of this study.

The interviews were held in privacy and conducted face to face after informed consent (Appendix 1) from the interviewee. If the participant orally agreed on participating but was unable to sign the informed consent sheet, participation was still approved. An assistant trainee, who works at the Faculty of Medicine, held the interviews in Portuguese or the local language Xichangana by using a standardized questionnaire (Appendix 2). If accepted by the participant, both of the study researchers were present during the interview to answer questions if needed.

The questions were read out loud, and the answers of the interviewee were put down on the questionnaire by ticking the corresponding boxes or writing comments on the questionnaire sheet. The questions in the questionnaire aimed at mapping factors around the caregiver and the child diagnosed with malaria, referring to:

- socio-demographic factors,
- knowledge about malaria and its transmission,
- knowledge about malaria prevention methods,
- ownership and utilization of mosquito bed nets and other prevention methods (short and long lasting indoor spraying, skin repellent, coils, traditional preventive methods), and
- reasons for not using a mosquito bet net or other preventive measures

If the participant did not want to answer a question, the question was skipped and a note was put in the margin of the questionnaire that the participant did not want to answer.

No information regarding the identity of the child or the caregiver was documented during the interviews. The interviews were held in a separate room to secure privacy and confidentiality.

## **4.5 Data analysis and statistics**

The quantitative data were collected, entered and analysed using IBM SPSS Statistics 22. Patient demographics and clinical characteristics of the cohort were summarized using descriptive statistics. Correlations between patient factors, knowledge about malaria transmission and prevention, and utilization of mosquito bed nets were described using crosstabulations. Socio-demographic factors were dichotomized before being correlated to the utilization of bed nets. The significance of the findings was tested using Fisher's exact test.

Answers from the open ended questions were entered as citations in the results section to further illustrate the findings.

## **4.6 Ethical considerations**

The project, the questionnaire and the informed consent sheet were approved by the Medical Scientific Committee of Eduardo Mondlane University, and the Committee of Bioethics and Health at the Faculty of Medicine and Central Hospital in Maputo, Mozambique.

Information about the study and the interview was given both orally and in written, and participants needed to provide informed consent before any study related procedure was conducted. All answers were handled strictly confidential. The interviews were held in privacy. Participants were designated a number in order to secure anonymity throughout the study. No information regarding the identity of the caregiver or the child was documented during the interview. No blood tests or other invasive examinations were used. Participation was completely voluntary, refusal to participate did not affect the child's treatment in any way, and participants were not given any payment for completing the interview. Contact with a counsellor (HIV counsellor) employed at the hospital was established before the collection of data started in order to be able to offer professional support to participants who expressed concerns after the interview was finished. None of the researchers received any payment for conducting this study. There are no conflicts of interest.

## **5. Results**

Twenty-eight people consented to participate in the study and no interview was excluded from the analysis. Two caregivers were excluded from the study due to only being available during already on-going interviews, and one caregiver declined to participate.

Two participants declined the researchers' presence in the interviewing room and two caregivers declined to answer the question regarding their monthly income. No caregiver expressed any concerns after the interview, why a counsellor was never needed.

### **5.1 Socio-demographics**

Table 1 describes the socio-demographic characteristics of the cohort. Self-dependent business includes selling fruits, clothes or other items or offering simple services such as hair braiding on the street, and not having a stable income. Of those working, a majority had an income below public minimum wage at 3000 MZN (90 USD at current rate). In all cases where the caregiver stated having a partner with an income, all partners earned more than minimum public wage at 3000 MZN. The majority of participants lived in basic houses, with walls and roof made of conventional material such as bricks or concrete but lacking toilet and kitchen inside as compared to conventional houses.

**Table 1. Descriptive demographics**

<b>Table 1. Descriptive demographics</b>					
<b>Category</b>	<b>Frequency (N=28)</b>	<b>%</b>		<b>Frequency (N=28)</b>	<b>%</b>
<b>Sex of participant</b>			<b>Partner with income</b>		
Female	27	96,4	Yes	19	67,9
Male	1	3,6	N	9	32,0
<b>Age of participant</b>			<b>Type of housing</b>		
15-20	4	14,3	Conventional house	1	3,6
21-30	15	53,6	Basic house	23	82,1
31-40	5	17,9	Hut	3	10,7
41-50	2	7,1	Schack/Improvised home	1	3,6
51-60	2	7,1			
Median	28,0				
Range	19-60				
<b>Sex of child</b>			<b>Number of people in the household</b>		
Female	11	39,3	Median	4,5	
Male	17	60,7	Range	3-12	
<b>Age of child</b>			<b>Main source of drinking water to the household</b>		
0-4	21	75,0	Piped water into house	6	21,4
5-15	7	25,0	Piped water into yard	14	50,0
Median	3,0		Water from neighbour	6	21,4
Range	1-11		Water from public tap	1	3,6
			Water from well or borehole	1	3,6
<b>Educational level</b>			<b>Main type of fuel used for cooking</b>		
No education	2	7,1	Firewood	16	57,1
Primary level, 1 <sup>st</sup> grade (year 1-5)	15	53,6	Charcoal	11	39,3
Primary level, 2 <sup>nd</sup> grade (year 6-7)	7	25,0	Electricity from grid or town gas	1	3,6
Secondary level, 1 <sup>st</sup> circle (year 8-10)	4	14,3			
<b>Income source</b>			<b>Type of toilet facility in the household</b>		
Salary from full-time paid employment	7	25,0	Flush toilet inside	1	3,6
Salary from irregular employment	2	7,1	Improved latrine or flush toilet outside	11	39,3
Income from year round self-dependent business	8	28,6	Latrine	14	50,0
Income from irregular self-dependent business	1	3,6	No toilet in the household	2	2
Do not earn an income	10	35,7			
			<b>Main type of fuel used for cooking</b>		
			Firewood	16	57,1
			Charcoal	11	39,3
			Electricity from grid or town gas	1	3,6
<b>Income per month</b>			<b>Time traveling to hospital</b>		
0-499 MZN	1	3,6	<30 min	13	46,4
500-999 MZN	2	7,1	31-59 min	9	32,1
1.000-2.999 MZN	7	25,0	1-2 h	3	10,7
3.000-4.999 MZN	5	17,9	>2 h	3	10,7
5.000-9.999 MZN	1	3,6			
Do not earn an income	10	35,7	<b>Type of caregiver interviewed</b>		
Declined to answer	2	7,1	Child inpatient at hospital	16	57,1
			Child outpatient at hospital	12	42,9

## 5.2 Received information/education about malaria prevention

Fifteen caregivers (54%) stated that they had received some kind of information or education about malaria prevention before coming to José Macamo hospital. The most common sources of information were school (11 caregivers) and at health care facilities (7 caregivers). Four caregivers stated talking to friends and family or other people in the community. Figure 1 shows the most common answers given to the question about what kind of information the caregivers had received, and the number of caregivers stating each answer (the same caregiver often stated more than one thing).

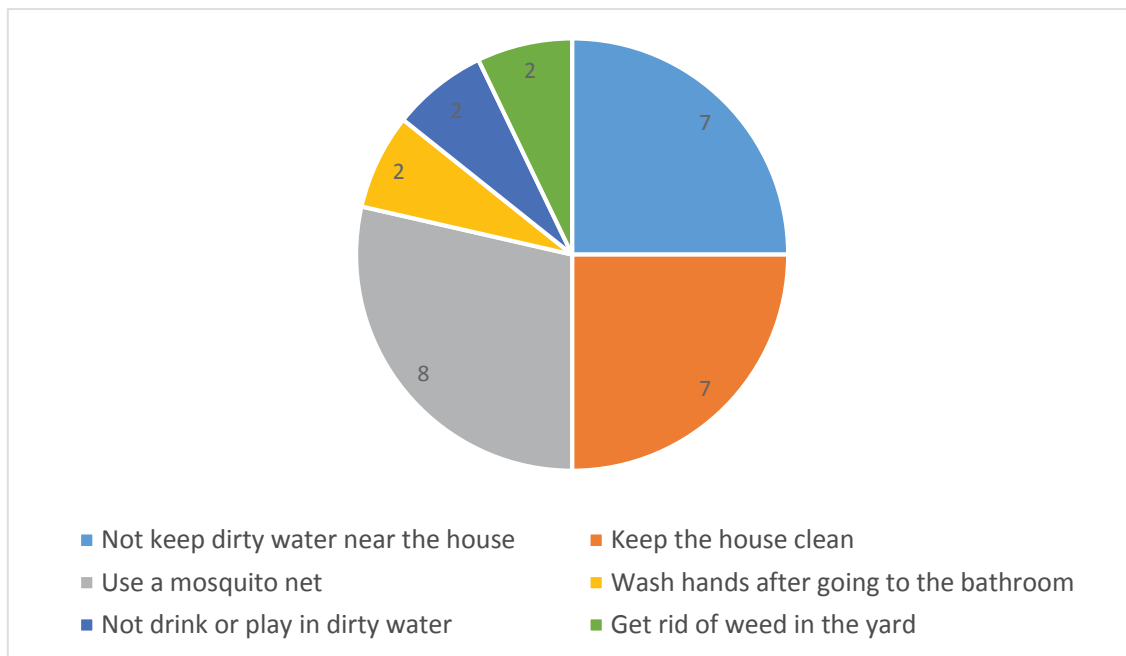


Figure 1. Most common information received about malaria prevention, and number of caregiver stating each kind.

The following citations further illustrates the information received:

*“I got information from nurses at the health centre and hospital. To avoid malaria you have to use a mosquito net and clean the house. You also need ditches that lead away water from the house so that you don’t have stagnant water close” – Mother, 33*

*“At a meeting at the health centre they talked about how malaria is transmitted and the symptoms. They said you get malaria from dirty water... When the children play in dirty water by the road they can get malaria. Also, when you don’t use a mosquito net you can get malaria” – Mother, 22*

### 5.3 Knowledge about malaria transmission

As seen in table 2, a majority of the caregivers associated mosquitoes to malaria transmission, but several of them also mentioned incorrect ways of malaria transmission in addition to mosquitoes. Almost a third mentioned only incorrect ways or no knowledge of malaria transmission. Figure 2 demonstrates the most commonly mentioned incorrect ways of malaria transmission.

<b>Table 2. Number of caregivers stating correct, incorrect or no knowledge of malaria transmission.</b>	
	<b>N (%)</b>
<b>Stated mosquitoes and/or mosquito bites as only way of transmission</b>	13 (46.4)
<b>Stated mosquitoes and/or mosquito bites but also other ways of transmission</b>	6 (21.4)
<b>Stated only incorrect, or no knowledge of, ways of transmission</b>	9 (32.2)

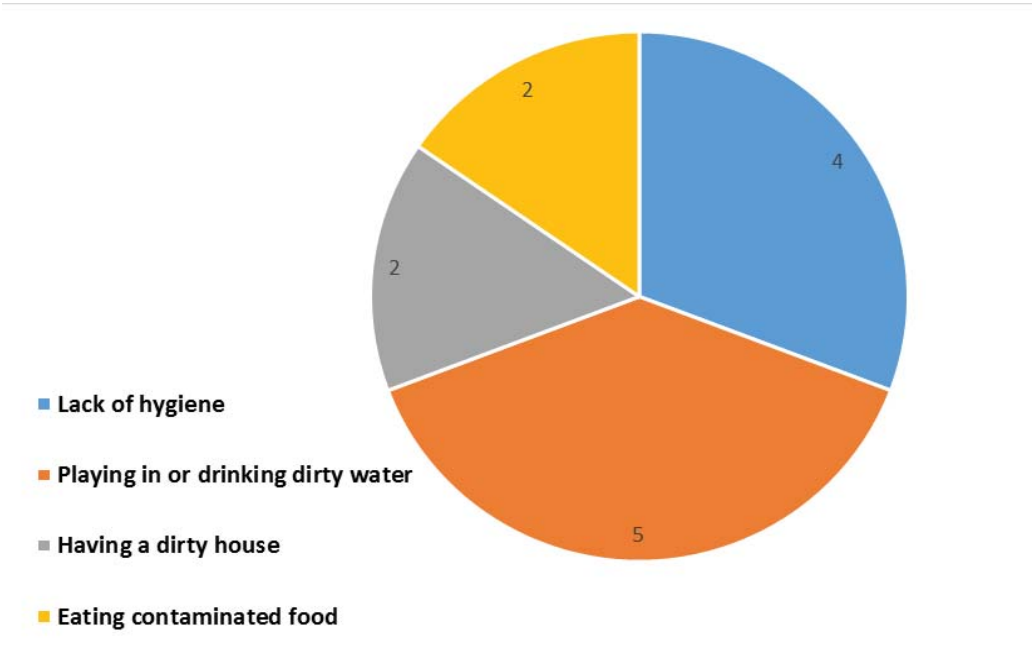


Figure 2. Most commonly mentioned incorrect ways of malaria transmission, and the number of caregivers stating each.

Following citations further illustrate the perceptions of malaria transmission:

*“When it is not clean at home it can give mosquitoes that bite and give you malaria”- Mother, 38*

*“Where people live close to ditches and stagnant water you can find many cases of malaria, but I don’t know why”- Mother, 29*

Regarding associating mosquitoes to malaria transmission, there was a significant difference ( $p=0.042$  using Fisher’s Exact Test) between the participants who had received previous information about malaria prevention and the ones who had not, as can be seen in Table 3. However, there was no difference in stating mosquitoes as the *only* way of transmission, and caregivers who had received information stated incorrect ways of malaria transmission to a higher extent than caregivers who had not received information (43% and 23% respectively). Fifty-four percent of the participants who had not received previous information stated having no knowledge of malaria transmission, while only one of the caregivers who had received information did so.

		Associates mosquitoes to malaria transmission		Total N
		Yes N	No N	
<b>Received education/information about malaria prevention</b>	Yes	13	2	15
	No	6	7	13
<b>Total N</b>		19	9	28

## **5.4 Knowledge about malaria prevention methods**

Table 3 shows that a majority of the participants knew at least one correct malaria preventive method, but several of them additionally stated incorrect ways of malaria prevention. A fourth of the participants stated only wrong or no knowledge of malaria preventive methods. Figure 3 demonstrates the most commonly mentioned incorrect malaria preventive methods.



	N (%)
<b>Stated only correct malaria preventive methods</b>	15 (56.3)
<b>Stated a mix of correct and incorrect preventive methods</b>	6 (21.4)
<b>Stated only incorrect, or no knowledge of, preventive methods</b>	7 (25.0)

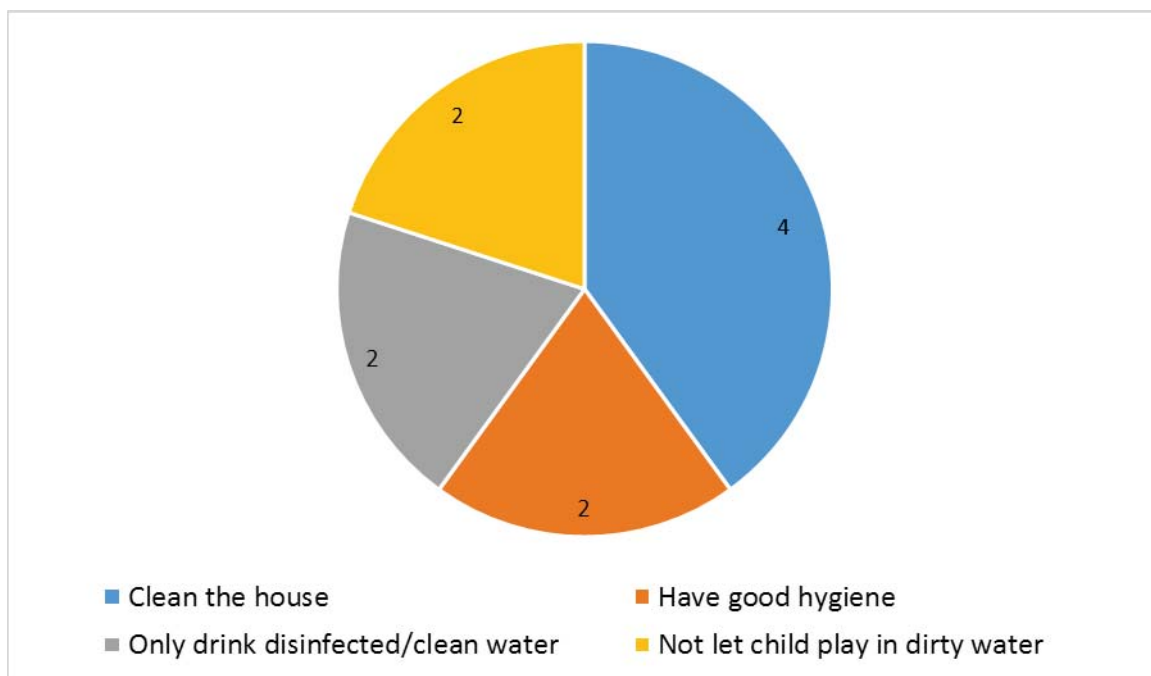


Figure 3. Most commonly mentioned incorrect ways of malaria prevention, and the number of caregivers stating each

The following citation further illustrate the perceptions of malaria prevention:

*“What? Can you protect yourself from malaria? I did not know that.” – Woman, 19*

*“You have to make sure that you clean enough and that you use a mosquito net.” – Mother, 28*

*“We have to use clean things and clean water. You should wash your hands after going to the bathroom, and clean the house to not get mosquitoes.” – Mother, 38*

As in the case of knowledge of malaria transmission, there was a significant difference ( $p=0.029$  using Fisher's Exact Test) between the participants who had received previous information about malaria prevention and the ones who had not, regarding stating at least one correct way of malaria prevention. This is shown in Table 5. Caregivers who had received information stated incorrect ways of malaria prevention to a higher extent than caregivers who had not received information (40% and 16%) respectively. Forty-eight percent of the participants who had not received previous information stated having no knowledge of malaria prevention, while none of the caregivers who had received information did so.

		Stated at least one correct way of malaria prevention		Total N
		Yes N	No N	
<b>Previously received education/information about malaria prevention</b>	Yes	14	1	15
	No	7	6	13
<b>Total N</b>		21	7	28

## 5.5 Utilization of malaria prevention measures

Twenty-five caregivers (89 %) stated that they used some kind of prevention method at home. The methods used, as well as the number of caregivers using each method, can be seen in Table 4. Some caregivers stated more than one than method.

	N
<b>Mosquito net</b>	24
<b>IRS</b>	7
<b>Short lasting insecticide spray</b>	2
<b>Coils</b>	3
<b>Skin repellent</b>	1

Not affording to buy preventive measures was the only reason mentioned for not using any kind of prevention method at home, and lack of money was also mentioned among several

caregivers as a reason for not using nondurable prevention methods, i.e. repellent, coils or spray, in addition to mosquito nets. Further, a low perceived amount of mosquitoes was mentioned as a reason for not using some of the preventive methods.

*“I used coils a couple of days last week, but not everyday because there were not a lot of mosquitoes. I don’t use it all the time because I don’t have money for that. Also, we don’t have a mosquito net because we cannot afford it.” – Mother, 29*

*I don’t use coils on days when there are not many mosquitoes.” – Mother, 21*

*“I don’t use Baygon. I can not buy that all the time, there is no money.” – Mother, 37*

### 5.5.1 Utilization of mosquito bed nets

Out of the 24 caregivers that stated that they owned a mosquito bed net, everyone stated that their child had access to the net every night. Still 7 out of 24 (29 %) children did not sleep under the net every night during the last 14 days. Additionally, some caregivers mentioned that even though their child had slept under the net every night during the last 14 days, the child does not sleep under the net every night throughout the year. Figure 4 shows the most common reasons mentioned for not using a net every night despite owning one. Perceived low mosquito burden means that the caregiver stated not using the net due to thinking there were not many mosquitoes, either seasonally (winter/cold season) or from day to day (temporary low burden).

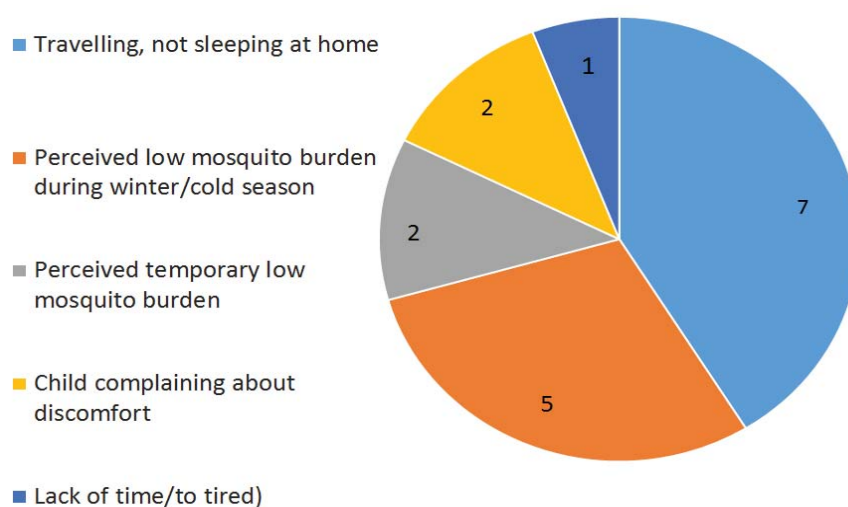


Figure 4. Most commonly mentioned reasons for not using an available mosquito net, and the number of caregivers stating each reason.

The following citations further illustrate the findings regarding not using an available net:

*“Sometimes, when she is on holidays at her grandmother’s house, she does not use a net.”-  
Mother, 33*

*“Right now we do not use the net, because there are no mosquitoes.”- Mother, 29*

#### **5.5.1.1 Utilization of insecticide-treated mosquito nets**

Only 6 (25 %) of those caregivers who owned a net knew if the net that their child was sleeping under was impregnated with insecticide when buying or receiving it. Fourteen caregivers (58 %) did not know if the net was insecticide-treated or not when buying or receiving it, and 4 caregivers (17 %) bought the net despite it not being impregnated. Only 5 (18 %) caregivers stated having impregnated or re-impregnated the net themselves during the last year. Of those, everyone had got hold of the bed net one year ago or less.

#### **5.5.1.2 Factors affecting net effectiveness**

Seven caregivers (25 %) stated that the net their child slept under it had holes in it.

Every one of the 24 caregivers who stated using a bed net had the same daily routines with folding and tying the net and putting it on top of the suspension attachment. No one reported ways of handling the net that could be considered careless.

Washing an insecticide-treated net without re-treating it can make the net lose its ability to kill or repel mosquitoes. Twenty caregivers (71 %) had washed the net since they bought it or re-impregnated it, with 8 being the mean number of times.

### **5.6 Factors affecting bed net utilization**

#### **5.6.1. Socio-demographic factors affecting bed net utilization**

Table 5 show the utilization of bed nets among different socio-demographic groups of the cohort. Each variable was dikotomized and then crosstabulated against the child sleeping

under a bed net every night during the last two weeks or not. Girls slept under a bed net every night to a slightly higher extent than boys, as well as children under the age of five compared to older children. The caregivers of age 31-60 years more often had a child sleeping under a bed net every night compared to younger caregivers, and there was a slightly higher use of bed nets among caregivers with more than 5 years of formal education than among caregivers with less than 5 years of education. However, no significant difference regarding any of the variables was found (all  $p > 0.05$  using Fisher's Exact Test).

Because of the limited cohort size in combination with a homogeneity in regards of markers of economic conditions (type of housing, main source of drinking water, main type of cooking fuel and type of toilet facility in household), no comparison with these economic markers and the utilization of mosquito nets was made.

**Table 7. Socio-demographic factors affecting bed net use**

	Child sleeping under bed net every night during last two weeks		Total N
	Yes N (%)	No N (%)	
<b>Sex of child</b>			
<b>Female</b>	7 (78)	2 (22)	9
<b>Male</b>	9 (64)	5 (36)	14
<b>Age of child</b>			
<b>0-4 years</b>	13 (76)	4 (24)	17
<b>5-15 years</b>	3 (50)	3 (50)	6
<b>Age of participant</b>			
<b>15-30 years</b>	10 (33)	5 (67)	15
<b>31-60 years</b>	6 (75)	2 (25)	8
<b>Educational level of participant</b>			
<b>0-5 years</b>	8 (62)	5 (38)	13
<b>6-10 years</b>	8 (80)	2 (20)	10
<b>Monthly income of participant</b>			
<b>&lt;3000 MZN</b>	13 (68)	6 (32)	19
<b>&gt;3000 MZN</b>	2 (67)	1 (33)	3

## 5.6.2 Knowledge about malaria affecting bed net utilization

As can be seen in Table 6, a larger share of the participants stating at least one correct way of malaria prevention, or associating mosquitoes to malaria transmission, had a child sleeping under a bed net every night during the last two weeks than caregivers stating incorrect or no knowledge of it (no significance, all  $p > 0.05$ ). Half of the caregivers stating incorrect, or no knowledge of, malaria prevention or transmission still slept under a bed net every night during the last 14 days.

No correlation was found between the child sleeping under the bed net every night during the last 14 days and the child having had one or more previous episodes of malaria. Neither was there any correlation to caregivers stating that they had received information about malaria prevention. Equally as many caregivers who had received information about malaria prevention had children sleeping under the net every night, as caregivers not having received any information.

	<b>Child sleeping under bed net every night during last two weeks</b>		<b>Total N</b>
	<b>Yes N (%)</b>	<b>No N (%)</b>	
<b>Caregiver stating at least one correct malaria preventive method</b>			
Yes	13 (76)	4 (24)	17
No	3 (50)	3 (50)	6
<b>Caregiver associating mosquitoes to malaria transmission</b>			
Yes	12 (80)	3 (20)	15
No	4 (50)	4 (50)	8

## 5.6.3 Paying for net affecting utilization

Among those owning a net, 13 (54%) did not pay for the net. A slight insignificant difference in bed net utilization was found between the caregivers who stated to have paid for their child's net and those who stated getting it for free. Among those who paid for their net,

87.5% had their child sleeping under it every night, comparing to 61 % using it every night among those not paying for the net.

### **5.6 Knowledge of malaria transmission and prevention after hospital visit**

On the question if the participants had gained any greater knowledge about malaria transmission during their hospital visit, 79 % answered no. Even more, 89 %, had not gained any greater knowledge of methods of protecting oneself from malaria. Still, 71 % stated that they were planning on taking new measures in their home to prevent their children from future malaria, the majority of them mentioning that they were going to try harder or be more thorough using the methods they already were using or knew of.

## **6. Discussion**

Due to a small cohort, no general conclusions should be drawn from the findings in this study. However, the study points at some interesting occurrences among the caregivers that were interviewed.

In a population where malaria has been a common and widespread problem for a very long time, the knowledge about malaria transmission and prevention must be considered insufficient since as many as almost a third of the participants stated only incorrect, or having no knowledge of, ways of malaria transmission, and a fourth stated only incorrect, or having no knowledge of, malaria prevention. In order to achieve the national goal of all inhabitants having received information about malaria prevention and transmission by 2016 [17], more effort need to be put into informing about malaria, and doing so in an efficient way. Gladly, one can assume that the number of people possessing knowledge about malaria is on an increase, since the National Malaria Indicator Survey from 2007 stated that only 35% of the people related malaria

transmission exclusively to mosquitoes, and only 28.6% of women knew that mosquito nets are a means of prevention [40].

Most participants that had received some kind of information/education about malaria prevention before coming to José Macamo stated that it had been provided either in school or at a health care facility. Even though the information comes from what could be considered reliable sources, the information given had in many cases been a mix of correct information about malaria, mosquitos and the importance of using a bed net, but also general information about hygiene. This might cause confusion about what is really effective in protecting oneself from malaria, possibly directing efforts towards the use of ineffective prevention methods, which has previously been stated an issue regarding malaria prevention [41].

Incorrect information being provided is further indicated by the fact that participants that had received information about malaria prevention to a greater extent answered incorrect malaria preventive methods and ways of transmission than participants not having received information. Many of the incorrect answers were specifically linked to cleanliness and hygiene, just like most of the incorrect information mentioned by the caregivers having been provided to them. There was only one of the caregivers having received information that stated having no knowledge of malaria prevention or transmission, compared to more than half and a third respectively among caregivers not having received information. This further indicates that the incorrect information about malaria transmission and prevention stated by the caregivers have been provided to them as information related to malaria. Even though hygiene is an important factor in avoiding many diseases, it is unfortunate if information about it is provided in a context of informing about malaria, causing misperceptions about different disease preventive measures.

Eighty-five percent of the households stated to own a mosquito net, which is a higher share than expected since the national average has been estimated to little over half of all households [12]. This could be explained by a majority of the participants not having paid for their net, suggesting that distribution programs in the area have been somewhat successful,



coherent with previous studies showing higher rates of net ownership after implementation of distribution campaigns [42, 43]. Yet, there is not full coverage since four households was not in possession of a mosquito net. In similarity to other studies in Sub-Saharan Africa, the reason stated for not owning a net was inability to pay for it [24, 44]. This suggests that continued full or partial subsidies are important in helping and encouraging households in obtaining bed nets.

Cost was also an issue regarding the use of other prevention methods than mosquito nets among the participants. The use of coils, repellants and short-lasting spray was low, and the repeatedly mentioned reason for this was not affording to by nondurable products for prevention. Cost being a barrier to the use of coils and repellent, and nets being considered more economical, have previously been found in Niger [35]. This further shows the importance of providing long-time protection through net subsidization programmes and IRS initiatives in the communities, since other prevention methods are too expensive for many households.

Despite owning a mosquito net, almost one third of the net-owning households had not used the net every night in the past two weeks, meaning that the user rate is lower than the targeted coverage (80%) of the Roll Back Malaria Partnership [28]. Repeatedly mentioned reasons for not using an available net was believing that there were not many mosquitoes, both from day to day and during winter months, as well as not using a net due to some kind of discomfort or inconvenience. This is coherent with previous studies on barriers to use of bed nets, showing that perceived low mosquito burden [36, 37] and perceived discomfort and practical issues [35] are important obstacles to sustained use. All above mentioned reasons for inconsistent use of an available net are barriers that might be overcome by clarifying the potential severity of malaria, the risk of being infected year round and the importance of consequently using the net to achieve protection. The most commonly mentioned reasons for not using a net, namely not sleeping at home or travelling, is harder to overcome without the caregivers buying or being provided nets that are possible to carry with. Further studies investigating issues regarding mosquito protection while traveling could be motivated.

More than three quarters of caregivers knowing the correct way of malaria transmission and prevention had a child sleeping under a bed net every night, compared to half of the caregivers stating incorrect way or no knowledge of it. In other words, possessing knowledge about why mosquito bed nets are protective from malaria is a motivator for using a bed net. This has previously been shown by a study in Tanzania stating that individual knowledge of malaria transmission and prevention among pregnant women highly affected their use of mosquito nets, with higher knowledge resulting in greater use of bed nets [45]. Therefore, a further explanation to why a third of net owning household did not use the bed net every night could be low knowledge of malaria transmission creating low incentives to using a bed net. Thus, providing adequate information about malaria transmission along with net distribution is likely to be essential for successful malaria transmission control. This could be realised by malaria control campaigns investing a portion of their funds towards educating the recipients of preventive measures about malaria transmission, as have been suggested by a previous study in Mozambique [24].

There was no difference found between caregivers stating they had received information about malaria prevention and caregivers who had not, in regard of their child using a bed net every night or not. This is consistent with the assumptions previously discussed, that information provided about malaria prevention might not have been entirely correct in many cases, and therefore not effective in promoting the use of bed nets.

The use of prevention methods other than mosquito nets and IRS among the participants was low, and the repeatedly mentioned reason for this was not affording to by nondurable products for prevention. Cost being a barrier to the use of coils and repellent, and nets being considered more economical, have previously been found in Niger [35]. This shows the importance of providing long-time protection through net subsidization programmes and IRS initiatives in the communities, since other prevention methods are too expensive for many households.

Even though just using a bed net is a protection against malaria, major effects on malaria transmission is achieved when using insecticide treated bed nets [26, 27]. Since more than half of the caregivers stated not knowing if their net was impregnated when they got it, we can not evaluate whether the children had been protected by insecticide treated bed nets or not. What we can say is that a majority of the caregivers had washed their net repeatedly since getting hold of it or last re-impregnating it, and this is probable to have impaired the effectiveness of the majority of the mosquito nets even if they had originally been impregnated.

Our findings show just a slightly higher use of mosquito nets among participants having reached higher educational level than primary school, compared to those who had not. The slight non-significant difference in use of nets, and the fact that the difference in educational level between the two groups is not very big, means that no conclusions should be drawn from this finding.

Caregivers buying their own mosquito net had their child sleeping under the net everyday to a slightly higher extent than caregivers having received the net for free. It has been shown that the willingness to pay for a net is higher among people with formal education [24], who are probable to have some knowledge about malaria transmission. Thus, a possible explanation to caregivers buying their own net having their child sleeping under it to a higher extent, could be that they are familiar with the reasons for using a bed net, possibly more so than caregivers having received the net through distribution. If so, it would be a further indication that more information has to be provided along with nets being distributed.

According to our findings, very few of the participants had received any kind of information about malaria prevention, or gained any greater knowledge about malaria transmission or prevention during their visit at José Macamo Hospital. A study from Nigeria have shown that even though 93% of health care workers were aware of ITNs being an effective method of prevention, only a bit more than half had ever informed of or recommended it to patients [46]. In other words, a very good opportunity for the health staff to inform about malaria

prevention is lost. Caregivers seeking care with a sick child are probable to be susceptible to information about the illness in particular, and how to prevent themselves from future illness. Also, the wish to do more to protect their children is shown by the fact that many participants state that they plan on taking new measures of protection in their home even though they have not learned any new methods. The new measures then mean that they are going to try harder, being more thorough using the methods they already know, some of them ineffective.

## **6.1 Strengths and weaknesses**

This study has several weaknesses. The insufficient data due to the low number of participants makes the generalizability of this study very limited.

Setting the study location to a public hospital in the suburbs of Maputo, open to all and surrounded by various villages of diverse character and living standards, we hoped to reach a variety of people with different socio-economic backgrounds and dissimilar perceptions of malaria related issues including transmission and prevention. But the availability of private health care facilities in Maputo drives some people with higher income to those providers, leading to a misallocation of the Mozambican population within the public and private health care. Even more importantly, the fact that the focus of this study was caregivers actually reaching hospital care could be considered selection bias.

As a result of the study context, the population of our study ended up as being homogenous. We were therefore not able to explore differences in use of preventive measures between different caregiver or child factors and socio-economic characteristics. All of this, in combination with the very low number of participants, make the results of this study not generalizable on the population of Maputo, and maybe not even applicable on the clientele of José Macamo Hospital. Interviewing people in the community or broadening the study setting would give more impartial and representative results regarding utilization of preventive measures and barriers to use. We did however with this study reach a population which to a large extent consisted

of low-income, and low-educated people, where knowledge about malaria transmission and prevention and access to malaria preventive measures could be expected to be limited.

Interviewing caregivers after their hospital visit allows exploration of how knowledge of malaria transmission and prevention is affected by the meeting with the health care staff. To bare in mind however, is that those who had children admitted to the hospital might not have had received information yet from the health staff, as this in some cases were provided prior to discharge.

Interviewing caregivers whose child is already ill in malaria about prevention is a sensitive matter, and the focus of the individuals' prevention routines and reasons for not using a net could have potentially resulted in less honest answers and less accurate data. Further, if the participant was someone other than the child's common caregiver, the details regarding the use of different preventive measures and reasons to not using them may be incorrectly reported. Recall bias is an issue that often affect studies based on interviews. The information about how many nights during the last two weeks the different preventive measures were used could therefore be somewhat inaccurate. The same applies to the caregivers' information about the time of buying or receiving the net, paying for it, if the net was impregnated when buying or receiving it, maintenance routines and reasons for not using the bed net every night or during specific parts the year. Given the cross-sectional design of the study, it was not possible to gain insight into how ownership and usage of malaria preventive measures may vary over time. Data regarding this was reliant on the information given by the participant. The time frame of two weeks was chosen in order to get a more accurate picture of the use of preventive measures in comparison to, for example, only asking about the night prior to coming to hospital, but still being an amount of time possible to remember accurately. Two weeks is also the standard incubation time for the type of malaria infection most common in the study area. To catch those participant whose child usually sleeps under a mosquito bed net every night, but for whatever reason did not do so the two weeks prior to the survey, questions regarding net use the last two weeks and during the year in general

were separated. This was combined with a question regarding, and clarifying, if the utilization of the bed net was different during certain periods of the year.

Gender bias, with almost all of the participants being women, further limits the conclusions that can be drawn from the study findings. Women are considered main caregivers in many Mozambican households and finding out their knowledge of malaria and view of prevention methods and their utilization are important in the work on reaching universal coverage of recommended malaria preventive measures. But to find out if concerns regarding malaria prevention differ between men and women, other studies including more male participants need to be conducted.

More cases of malaria could have been found if the study had been conducted during the peak season in January, but this was not possible due to the limited time frame of data collection during the winter semester of Gothenburg University. It would also have required more time set aside by a translator to conduct and translate the interviews.

Our findings are neither new nor significant. But they do however suggest, together with the evidence from other studies that there remain important barriers to the use of preventive measures for successful control of malaria, and that these requires further investigation along with potential solutions. All in all, a more focused purposive sample comprising more caregivers and a wider range of respondents may illuminate some further barriers for use of bed nets and other preventive measures, which have not been reported in this study. Further, since this study is based on interviews with caregivers of children already ill with malaria, living in a specific area of the country, it does not say anything about the practice of malaria preventive measures among the Mozambican people in general. Therefore a population based study including participants from all over the country would be useful in identifying those at risk of malaria due to no or poor practice of malaria prevention.

Despite the results of this study not being generalizable, they do highlight issues that are worthy of exploration to help further develop malaria prevention strategies. Further qualitative and quantitative research is needed to investigate the use of bed nets and other preventive measures as well as barriers related to sustained net use.

## **6.2 Limitations regarding the study conduction**

This study ended up smaller than intended due to issues regarding the approval from the ethical committee in Maputo, Mozambique. Waiting for the ethical approval delayed the start of the project, resulting in a shortened time for data collection.

## **7. Conclusion**

The findings in this study imply that there is a need for continued distribution of malaria preventive means in the areas of Maputo, and that distributions must be realized along with provision of adequate information, in order to encourage the use of available preventive means and secure effective malaria prevention in all households. However, the limited data of this study, and the general lack of significant results, causes the findings of this study to be unreliable.

## **8. Populärvetenskaplig sammanfattning – Användande av malariaförebyggande metoder bland barn diagnosticerade med malaria i Maputo, Mozambique**

Malaria är en infektionssjukdom som drabbar miljontals människor varje år, främst barn och gravida. Moçambique är hårt ansatt med nästan 3 miljoner fall årligen. Den i Moçambique vanligast förekommande typen av malaria kan dessutom snabbt utvecklas till ett livshotande tillstånd, varför malaria utgör den främsta orsaken till barnadödlighet i landet.

Malaria sprids via myggor, varför en viktig del i att minska sjukligheten i malaria är att använda olika skydd mot myggbett, såsom myggnät, myggmedel eller myggdödande spray. Under senare årtionden har stora projekt med utdelning av myggnät genomförts i Afrika. Trots detta sover långt ifrån alla barn i malariadrabbade områden under ett myggnät varje natt.

Detta projekt syftade till att undersöka den generella kunskapen kring malaria och dess spridning, användandet av malariaförebyggande åtgärder, samt orsaker till att skyddsåtgärder inte används bland vårdnadshavare till barn som diagnosticerats med malaria på sjukhuset José Macamo i Maputo, Moçambique.

En betydande del av de vårdnadshavare som intervjuades hade fel, eller ingen, kunskap om hur malariainfektion sprids respektive förebyggs. En majoritet av deltagarna angav att de någon gång fått information om malaria, framför allt från skola eller sjukvård. De som fått information visste i högre grad att myggor orsakade malaria, samt någon korrekt skydds metod. Däremot angav de i högre utsträckning även inkorrekta spridningssätt och felaktiga malariaförebyggande åtgärder.

Innehavet av myggnät bland deltagarna var högre än förväntat, då hela 24 av 28 ägde ett myggnät. Användandet av andra skyddsåtgärder var lågt. Den mest frekvent angivna orsaken till att inte äga ett myggnät eller använda skyddsåtgärder var oförmåga att betala för dem. Av de som ägde ett myggnät var det en betydande del vars barn inte sov under nätet varje natt. De vanligaste anledningarna till detta var att barnet inte sov hemma eller tron att det inte fanns mycket mygg.

De vårdnadshavare som angav korrekt spridningssätt för malaria eller korrekta sätt att förebygga malariainfektion, hade i högre utsträckning ett barn som sov under ett myggnät varje natt än vårdnadshavare som hade felaktig eller ingen kunskap.



På grund av den begränsade studiepopulationen bör inga slutsatser dras av resultaten i detta projekt. Däremot antyder resultaten att kunskapen kring malaria bland deltagarna var otillräcklig, såväl som att de ansträngningar som görs för att informera i skola och sjukvård inte har enbart positiva effekter. Detta eftersom att de som fått information oftare angav inkorrekta uppfattningar kring spridning respektive förebyggande av malariainfektion, vilket kan innebära att fokus läggs felaktiga och ineffektiva skyddsmetoder.

De flesta anledningar som angavs till att inte använda ett tillgängligt nät kan undvikas genom att informera, exempelvis om att ett myggnät måste användas även då man inte tror att det finns mycket mygg. Dessutom pekar resultaten på att kunskap kring malaria positivt påverkar användandet av myggnät. Detta i kombination med att den mest frekvent angivna orsaken till att inte använda malariaförebyggande åtgärder var kostnad, tyder på att det finns ett behov av fortsatt distribution av material för förebyggande av malaria, men att distributionen bör ske i samband med tillhandahållande av adekvat information för att uppmuntra korrekt och konsekvent användande av materialet.

## **9. Acknowledgements**

Elisabet Lönnermark (MD, PhD)

Maria de Fatima Cuembelo (MD, MPH)

Vasco Muchanga (Assistant trainee at Faculty of Medicine)

The staff at José Macamo Hospital

SIDA

Carl Erik Levins stiftelse

## 10. References

1. Landguiden. *Moçambique*. 2012 [cited 2014 October]; Available from: <https://www.landguiden.se/Lander/Afrika/Moambique>.
2. National Institute of Statistics of Mozambique. [cited 2014 October]; Available from: <http://www.ine.gov.mz>.
3. Globalis. *Moçambique*. 2013 [cited 2014 September]; Available from: <http://www.globalis.se/Laender/Mocambique>.
4. Republic of Mozambique. *Poverty Reduction Action Plan*. 2011-2014 [cited 2014 October]; Available from: <http://www.imf.org/external/pubs/ft/scr/2011/cr11132.pdf>.
5. Briggs P, *Mozambique, 5th: The Bradt Travel Guide*. 2011.
6. The World Bank. [cited 2014 September]; Available from: <http://data.worldbank.org/country/mozambique>.
7. The World Bank. *Poverty in Mozambique: Unraveling Changes and Determinants*. 2005; Available from: <http://www.worldbank.org/afr/wps/wp87.pdf>.
8. United Nations Development Programme. *Human Development Index Data*. 2014 [cited 2015 January]; Available from: <http://hdr.undp.org/en/content/human-development-index-hdi>.
9. World Health Organization. *World Malaria Report*. 2014 [cited 2015 January]; Available from: [http://apps.who.int/iris/bitstream/10665/144852/2/9789241564830\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/144852/2/9789241564830_eng.pdf?ua=1).
10. World Health Organization. *World Malaria Report*. 2012 [cited 2014 January]; Available from: [http://www.who.int/malaria/publications/world\\_malaria\\_report\\_2012/en/](http://www.who.int/malaria/publications/world_malaria_report_2012/en/).
11. UNICEF. *Mozambique Child Survival*. 2014 [cited 2014 October]; Available from: [http://www.unicef.org/mozambique/child\\_survival\\_4923.html](http://www.unicef.org/mozambique/child_survival_4923.html).
12. National Institute of Statistics of Mozambique. *Mocambique Inquérito Demográfico e de Saúde*. 2011 [cited 2014 October]; Available from: <http://dhsprogram.com/publications/publication-FR266-DHS-Final-Reports.cfm>.
13. Swedish National Institute of Public Health. 2013 [cited 2014 January]; Available from: <http://www.folkhalsomyndigheten.se/annesomraden/smittskydd-och-sjukdomar/smittsamma-sjukdomar/malaria/>.
14. Killeen G. F, *Characterizing, controlling and eliminating residual malaria transmission*. *Malaria Journal*, 2014. **13**(330).
15. Iwarson-Norrby S, *Infektionsmedicin*. Vol. 4. 2007: Säve Förlag. 447 pages.
16. World Health Organization. *Malaria Fact Sheet*. 2014 [cited 2015 January]; Available from: <http://www.who.int/mediacentre/factsheets/fs094/en/>.
17. World Health Organization. *Regional Office for Africa, Mozambique*,. [cited 2014 October]; Available from: <http://www.afro.who.int/en/mozambique/country-programmes/disease-prevention-and-control/malaria.html>
18. Davidson R, Brent A, and Seale A, *Oxford Handbook of Tropical Medicine*. Vol. 3. 2008: Oxford University Press.
19. World Health Organization. *Management of severe malaria: a practical handbook - 3rd ed*. 2012 [cited 2014 September]; Available from: [http://apps.who.int/iris/bitstream/10665/79317/1/9789241548526\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/79317/1/9789241548526_eng.pdf).
20. Castillo-Riquelme M, McIntyre D, and Barnes K, *Household burden of malaria in South Africa and Mozambique: is there a catastrophic impact?* *Tropical Medicine and International Health*, 2008. **13**(1): p. 108-122.
21. Information handed out by José Macamo Hospital.

22. African Summit on Roll Back Malaria. *The Abuja Declaration on Roll Back Malaria in Africa* 2000 [cited 2014 October]; Available from: <http://www.usaid.gov/sites/default/files/documents/1864/abuja.pdf>.
23. Gilson L, *Understanding health service access: concepts and experience*. Global Forum Update on Reserach for Health, 2007. **4**(028-032).
24. Chaise C, et al., *Determinants of household demand for bed nets in a rural area of southern Mozambique*. Malaria Journal, 2009. **8**(132).
25. Centers for Disease Control and Prevention. *CDC Malaria*. 2012 [cited 2014 September]; Available from: <http://www.cdc.gov/malaria/>.
26. Phillips-Howard P. A et al., *Efficacy of permethrine-treated bed nets in the prevention of mortality in young children in an area of high perennial malaria transmission in western >Kenya*. American Journal of Tropical Medicine and Hygiene, 2003. **68**: p. 23-29.
27. Gambler C, *Insecticide-treated nets for the prevention: a systematic review of randomised controlled trials*. PLoS Med, 2007. **4**(107).
28. Geneva: Roll Back Malaria Partnership. *RBM: Global Strategic Plan: Roll Back Malaria 2005-2015*. 2015 [cited 2014 October].
29. Hunter G. C et al., *"We are supposed to take care of it": a qualitative examination of care and repair behaviour of long-lasting, insecticide-treated nets in Nasarawa State, Nigeria*. Malaria Journal, 2014. **13**(320).
30. World Health Organization. *World Malaria report 2010*. 2010 [cited 2015 January]; Available from: [http://www.who.int/malaria/world\\_malaria\\_report\\_2010/en/](http://www.who.int/malaria/world_malaria_report_2010/en/).
31. Lengeler C, *Insecticide-treated bed nets and curtains for preventing malaria*. Cochrane Database Systematic Review, 2004.
32. Murray C. J et al., *Global malaria mortality between 1980 and 2010: a systematic analysis*. Lancet, 2012. **379**(413-431).
33. Eisele T. P et al., *Estimates of child deaths prevented from malaria prevention scale-up in Africa 2001–2010*. Malaria Journal, 2012. **11**(93).
34. Pulford J et al., *Reported reasons for not using a mosquito net when one is available*. Malaria Journal, 2011. **10**(83).
35. Galvin K. T et al., *An explanatory qualitative study on perceptions about mosquito bed nets in the Niger Delta: what are the barriers to sustained use?* Journal of Multidisciplinary Healthcare, 2011. **4**(73-83).
36. Alaii J. A et al., *Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya*. American Journal of Tropical Medicine and Hygiene, 2003. **68**(4): p. 137-41.
37. Tsuyuoka R et al., *The acceptability of insecticide treated mosquito nets among community members in Zimbabwe*. Central African Journal of Medicine, 2002. **48**(7-8): p. 87-91.
38. Temu E. A et al., *High Prevalence of Malaria in Zambezia, Mozambique: The Protective Effect of IRS versus Increased Risks Due to Pig-Keeping and House Construction*. PloS One, 2012. **7**(2).
39. Strickman D et al., *Prevention of Bug bites, Stings and Disease*. New York: Oxford University Press, 2009: p. Page 117.
40. Mozambique Ministry of Health. *Programa Nacional de Controlo da Malaria*. 2005 [cited 2014 October]; Available from: <http://www.misau.gov.mz/pt/programas/malaria>.

41. Maslove D. M, et al., *Barriers to the effective treatment and prevention of malaria in Africa: A systematic review of qualitative studies*. BMC International Health and Human Rights, 2009. **9**(26).
42. Macedo de Oliveira A, *Ownership and usage of insecticide bed nets after free distribution via a voucher*. Malaria Journal, 2010. **9**(222).
43. Renggli S et al., *Design, implementation and evaluation of a national campaign to deliver 18 million free long-lasting insecticidal nets to uncovered sleeping spaces in Tanzania*. Malaria Journal, 2013. **12**(85).
44. Mbachu C. O, *Examining equity in access to long-lasting insecticide treated nets and artemisin-based combination therapy in Anambra state, Nigeria*. BMC Public Health, 2012. **12**(315).
45. Nganda R. Y et al., *Knowledge of malaria influences the use of insecticide treated nets but not intermittent presumptive treatment by pregnant women in Tanzania*. Malaria Journal, 2004. **3**(42).
46. Salaudeen G. A et al., *Awareness and use of insecticide treated nets among women attending ante-natal clinic in a Northern state of Nigeria*. Journal of Pakistan Medical Association, 2009. **Issue of June 2009**.

## **Appendix 1. Informed consent sheet**

### INFORMATION SHEET

Hello,

My name is \_\_\_\_\_, I am a medical student at the University of Gothenburg in Sweden. Together with a fellow medical student and the medical staff at José Macamo Hospital, I am conducting a survey on what factors might prevent children from getting malaria care. You are being invited to participate in this study since your child has been diagnosed with malaria at this hospital.

If you wish to participate, you will be interviewed and asked questions from a questionnaire. The questions cover general household information, your thoughts about malaria and malaria prevention, as well as your experiences when seeking health care. An assistant who speaks Portuguese will hold the interview, which will take about 40 min to complete. I will be present during the interview to answer any questions, but if you'd rather wish that I do not attend, just let me or the interviewer know and I will step out.

There are no risks involved with participating in the survey. The interview will be held in privacy, and I want to assure you that all your of answers will be kept strictly confidential. There are no right or wrong answers. No values will be put into the answers you give, and we will not in any way judge you or your actions. If you experience any discomfort answering some questions, you have the right to skip questions that you don't want to answer. You have also the right to interrupt the interview at any time. Your participation is completely voluntary, and refusal to participate will not affect your child's treatment in any way. No information regarding the identity of you or your child will be documented during the interview. Thus, it will not be possible to link any of the survey results to you or your child.

If you have any concerns after the interview is finished, please let us know. We will try to help you in the best possible way. If you wish to speak to someone else, we will introduce you to a counsellor who works at the hospital who has agreed to take care of you.

If you have any further questions, please contact the researcher Helena Thiman or Petronella Pettersson at 840386420. If you have any remarks regarding the survey, please contact the committee of the Faculty of Medicine at 21428076.

The results of the survey will be presented at the Sahlgrenska Academy at the University of Gothenburg in Sweden, and shared with the Faculty of Medicine at the Eduardo Mondlane University in Mozambique.

Thank you for your cooperation!

## CONSENT FORM

I have understood the information provided to me and agree to be interviewed. If yes, please sign below:

\_\_\_\_\_  
Participant signature

\_\_\_\_\_  
Date (DD/MM/YY)

\_\_\_\_\_  
Study staff name

\_\_\_\_\_  
Study staff signature

\_\_\_\_\_  
Date (DD/MM/YY)

Contact information:

Petronella Pettersson, Medical student  
the Sahlgrenska Academy, University of Gothenburg  
E-mail: [guspetrpe@student.gu.se](mailto:guspetrpe@student.gu.se)  
Tel: 840386420

Helena Thiman, Medical student  
the Sahlgrenska Academy, University of Gothenburg  
E-mail: [gusthimhe@student.gu.se](mailto:gusthimhe@student.gu.se)  
Tel: 840386420

## Appendix 2. Questionnaire

**Study title:** *Barriers to care for children diagnosed with malaria at José Macamo Hospital in Maputo, Mozambique*

- Study number: \_\_\_\_\_

- Date and time of interview: \_\_\_\_\_

- Local of attendance:

Paediatric department

Triage, outpatient department

- Sex of participant:

Female

Male

1. How old are you?

Answer: \_\_\_\_\_ years old

2. What is the sex of your child?

Male

Female

3. How old is the child?

Answer: \_\_\_\_\_ old

4. How are you related to the child?

Mother

Father

Grandparent

Sibling

Aunt / uncle

Guardian

Other: \_\_\_\_\_

5. How many persons live in your household (your family including others if there are any)?

Answer: \_\_\_\_\_

6. How many children under the age of 15 live in your household?

Answer: \_\_\_\_\_

7. What level of education have you reached?

- No education
- Literacy school (school where you learn basic writing and reading)
- Primary level, 1<sup>st</sup> grade (year 1-5)
- Primary level, 2<sup>nd</sup> grade (year 6-7)
- Secondary, general of 1<sup>st</sup> circle (year 8-10)
- Secondary, general of 2<sup>nd</sup> circle (year 11-12)
- Technicho Elementar
- Technicho Basico
- Technicho Medio
- Superior, University level
- Do not know

8. How do you earn your living?

- Salary from full time paid employment
- Salary from irregular employment
- Salary from seasonal employment
- Income from year round self-dependent business
- Income from irregular self-dependent business
- Income from seasonal self-dependent business
- Pension
- I receive governmental grants (E.g. maintenance grant, disability grant)
- I am supported economically by my family/relatives
- I do not earn an income
- Other: \_\_\_\_\_

9. What kind of work do you do?

- I am a student
- I work as a non-skilled worker (shop-keeper, farmer, agriculture, guard, etc.)
- I work as a skilled worker (clerk, hairdresser, dressmaker, pharmacist, carpenter, plumber, bus driver, assistant nurse, etc.)
- I work as a civil servant (teacher, nurse, medical doctor, law, company/business sector, banking, etc.)
- I do not work (including housewife)
- Other: \_\_\_\_\_

10. How high is your monthly income on average?

- 0-500 MZN per month
- 500-1.000 MZN per month



- 1.000-3.000 MZN per month
- 3.000-5.000 MZN per month
- 5.000 – 10.000 MZN per month
- 10.000-15.000 MZN per month
- More than 15.000 MZN per month
- No income

11. Is your husband/wife employed and earn an income?

- Salary from full time paid employment
- Salary from irregular employment
- Salary from seasonal employment
- Income from year round self-dependent business
- Income from irregular self-dependent business
- Income from seasonal self-dependent business
- No, my partner does not earn an income
- I am not married
- I am separated/widow
- Comment: \_\_\_\_\_

12. What is your husband/wife's occupation?

- Student
- Works as a non-skilled worker (shop-keeper, farmer, agriculture, guard, etc.)
- Works as a skilled worker (clerk, hairdresser, dressmaker, pharmacist, carpenter, plumber, bus driver, assistant nurse, etc.)
- Works as a civil servant (teacher, nurse, medical doctor, law, company/business sector, banking, etc.)
- Not employed (including housewife)
- Retired
- I am not married

13. What is your husband/wife income per month on average?

- 0-500 MZN per month
- 500-1.000 MZN per month
- 1.000-3.000 MZN per month
- 3.000-5.000 MZN per month
- 5.000 – 10.000 MZN per month
- 10.000-15.000 MZN per month
- More than 15.000 MZN per month
- Do not know

14. What type of housing do you live in? (Remember to clarify if several of the alternatives below applies)

- Conventional house
- Flat, apartment
- Hut
- Makeshift home (improvised home) / Shack
- Mixed house
- Basic house
- Room
- Living in the home of relatives/friends
- No stable place to live
- Other: \_\_\_\_\_

15. How many separate sleeping rooms are there in your home/where you live?

- Answer: \_\_\_\_\_

16. What is the main source of drinking water for members of your household?

- Piped water into the house
- Piped water into yard/plot
- Water from neighbour
- Public tap
- Water from well or borehole
- Surface water (Spring/River/Stream/Pond/Lake/Dam/Rainwater)
- Tanker truck

17. What kind of toilet facility does your household have?

- Flush toilet inside
- Improved latrine, chemical toilet or flush toilet outside
- Latrine
- No toilet

18. What type of fuel does your household mainly use for cooking?

- Firewood
- Charcoal
- Paraffin, kerosene
- Gas from bottle, LPG (liquefied petroleum gas)
- Electricity from grid, town gas

19. Does your household have any of the following:

- Electricity
- Radio
- Television
- Telephone
- Mobile phone
- Refrigerator
- Computer
- Internet
- Car
- Bicycle

20. Before you arrived at the hospital, had you heard about malaria?

- Yes
- No
- Comment: \_\_\_\_\_

21. Before you arrived at the hospital, had you received any kind of formal education/information about malaria?

- Yes
  - If Yes, what and from where?  
\_\_\_\_\_  
\_\_\_\_\_
- No

22. Is it easy to find information about malaria?

- Yes
- No
- I do not know

23. What is your main source of information about malaria?

- Friends/family
- Television
- Radio
- Internet
- School
- Health care facility
- Other: \_\_\_\_\_
- None

24. What do you think is the most effective way to spread knowledge about malaria?

Answer: \_\_\_\_\_  
\_\_\_\_\_

25. How is malaria transmitted?

Answer: \_\_\_\_\_

26. What symptoms do you associate to malaria?

Answer: \_\_\_\_\_

27. Have you received any education/information about malaria prevention?

Yes, what? \_\_\_\_\_

No

28. What methods of protecting oneself from malaria do you know of?

Answer: \_\_\_\_\_  
\_\_\_\_\_

29. Do you use any malaria prevention methods at home?

Yes

No

o If No, what is/are the reasons(s)? \_\_\_\_\_  
\_\_\_\_\_

a) If Yes, do you use any of the following:

- Indoor residual spraying?  Yes  No

• If yes, when was your home last sprayed? \_\_\_\_\_ ago

- Window mosquito nets?  Yes  No

• If Yes, are the window nets intact?  Yes  No

- Skin repellent?  Yes  No

• If Yes, how many nights during the last two weeks did your child use repellent: \_\_\_\_\_ nights

- If your child did not use this protection every night, what is/are the reasons(s)? \_\_\_\_\_  
\_\_\_\_\_

- Coils?  Yes  No

- If Yes, how many nights during the last two weeks have you used this? \_\_\_\_\_

- If you did not use this protection every night/day, what is/are the reasons(s)? \_\_\_\_\_  
\_\_\_\_\_

- "Baigon" (short time working indoor spraying agent)  Yes  No

- If Yes, how many nights during the last two weeks have you used this? \_\_\_\_\_

- If you did not use this protection every night/day, what is/are the reasons(s)? \_\_\_\_\_  
\_\_\_\_\_

- Burning of herbs?  Yes  No

- If Yes, how many nights during the last two weeks have you used this? \_\_\_\_\_

- Mosquito bed nets?  Yes  No

- Others, what type and how often: \_\_\_\_\_  
\_\_\_\_\_

30. Does your household own any mosquito nets?

Yes

- If Yes, does your child have access to a mosquito net?

Yes

No

- If No, why does your child not have access to a mosquito net?

Answer: \_\_\_\_\_  
\_\_\_\_\_

- No
  - o If No, what is/are the reason(s)?
  - o Answer: \_\_\_\_\_  
\_\_\_\_\_

31. If your child has access to a mosquito bed net:

- a) How many nights during the last two weeks did your child sleep under a bed net?
  - Every night
  - Other: \_\_\_\_\_

- b) If your child does not sleep under the net every night, what is/are the reasons?
  - Answer: \_\_\_\_\_  
\_\_\_\_\_

- c) Does your child utilize the net bed net less frequently during any periods of the year?
  - Yes
    - o If Yes, when and why? \_\_\_\_\_  
\_\_\_\_\_
  - No

32. Questions regarding the net your child sleeps under:

- a) When did you get hold of the bed net?
  - Answer: \_\_\_\_\_ ago

- b) Where did you get hold of the bed net?
  - Answer: \_\_\_\_\_

- c) Did you pay for the bed net?
  - Yes
  - No
  - I do not know

- d) To your knowledge, was the bed net impregnated when you got it?
  - Yes
  - No
  - I do not know

- e) Have you impregnated or re-impregnated the bed net during the last year?
- Yes
- No
- f) Does the bed net have any holes?
- Yes
- No
- g) Is the bed net fixed around the bed while the child is sleeping?
- Yes
- No
- h) Have you washed the bed net any time since you bought it or re-impregnated it?
- Yes
- o If yes, how many times?
- o Answer: \_\_\_\_\_ times
- No
- i) What are the daily routines with the bed net (e.g. in the morning and in the night)?
- Answer: \_\_\_\_\_
- \_\_\_\_\_

33. After your arrival at the hospital:

- a) Have you received any information about malaria and its treatment from the health personell?
- Yes
- o If Yes, have you receive *sufficient information* about malaria and its treatment from the health personnel?
- Yes
- No
- No
- b) Is there anything you would have wanted to know more about? \_\_\_\_\_
- \_\_\_\_\_
- c) Have you gained greater knowledge of how malaria is transmitted?
- Yes, how? \_\_\_\_\_
- No

d) Have you gained greater knowledge of what main symptoms are associated with malaria?

Yes, what? \_\_\_\_\_

No

e) Have gained greater knowledge about malaria prevention?

Yes, what? \_\_\_\_\_

No

f) Are you planning on taking any new measures to prevent malaria?

Yes, what? \_\_\_\_\_

No

I do not know

34. Have your child received treatment for malaria before?

Yes

No

a) Was your child prescribed any medication/pills for (continued) administration/treatment at home?

Yes

No

b) Did you collect/buy all of the prescribed medication?

Yes

No

o If No, what was/were the reason(s)?

o Answer: \_\_\_\_\_

\_\_\_\_\_

c) Did you give your child the medication exactly as prescribed?

Yes

No

o If No, in what way was the prescription not followed? (Stopped early, lower dose, etc.)

\_\_\_\_\_

\_\_\_\_\_

o If No, what was/were the reason(s)?

\_\_\_\_\_

\_\_\_\_\_



35. Before arriving at the hospital, did your child have any of the following symptoms:

Fever  Yes, how many days?\_\_\_\_\_  No

Chills  Yes, how many days?\_\_\_\_\_  No

Trouble breathing  Yes, how many days?\_\_\_\_\_  No

Confusion  Yes, how many days?\_\_\_\_\_  No

Somnolence, drowsiness  Yes, how many days?\_\_\_\_\_  No

Convulsions (twitching arms or legs, eyes rolling back, froth from mouth)

Yes, how many days?\_\_\_\_\_  No

Jaundice (yellow eyes/skin)  Yes, how many days?\_\_\_\_\_  No

Sweating  Yes, how many days?\_\_\_\_\_  No

Head ache  Yes, how many days?\_\_\_\_\_  No

Muscle pain  Yes, how many days?\_\_\_\_\_  No

Nausea  Yes, how many days?\_\_\_\_\_  No

Vomiting  Yes, how many days?\_\_\_\_\_  No

Loss of appetite  Yes, how many days?\_\_\_\_\_  No

Other: \_\_\_\_\_

36. When your child became ill this time, did you suspect him or her to have malaria?

Yes

No

37. For how long did you suspect your child to have malaria before you sought care at José Macamo Hospital?

Less than 1 day

1-2 days

3-6 days

7-13 days

More than 14 days

38. When you decided to seek care at José Macamo Hospital, how serious did you think your child's illness was?

Very mild

Mild

Moderate

Serious

Very serious

39. Before seeking care, did you try to treat your child with anything at home?

Yes

o If Yes, with what and why: \_\_\_\_\_

No

40. Before you arrived at this hospital, did you seek care somewhere else?

Yes

No

41. If you went to another care provider before coming to José Macamo Hospital:

a) Where did you go?

Health post

Health center

Another hospital

Traditional health practitioner/Traditional birth attendant/Community health worker

Other: \_\_\_\_\_

b) When did you go to that care facility?

Answer: \_\_\_\_\_

c) How did you travel to that care facility?

Bus, train or other public transportation

Car

Walking

Other: \_\_\_\_\_

d) How much time did you spend travelling to the care facility?

< 30 min

30-60 min

1-2 hours

> 2 hours

e) When you decided to go to this first provider of care, how serious did you think that your child's illness was?

Very mild

Mild

Moderate

Serious

Very serious

f) What care was your child provided at the care facility? (E.g. what did you ask for, was a blood test done, did your child get any treatment, what information did you get?)

Answer: \_\_\_\_\_

\_\_\_\_\_

g) Why did you go to this first provider of care, instead of Jose Macamo?

Answer: \_\_\_\_\_

\_\_\_\_\_

42. If you suspected your child to have malaria and waited more than 1 day to seek primary or hospital care, what was/were the reason(s)?

Answer: \_\_\_\_\_

\_\_\_\_\_

43. Why did you come to José Macamo Hospital?

Answer: \_\_\_\_\_

\_\_\_\_\_

44. For how long did you wait before seeing a doctor or a nurse at this hospital?

Less than 1 hour

1-2 hours

3-5 hours

6-10 hours

10-15 hours

More than 15 hours

45. How long time has your child spent so far at Jose Macamo Hospital?

Answer: \_\_\_\_\_

46. How satisfied are you with your overall experience at José Macamo Hospital?

Very satisfied

Satisfied

Neither nor

Dissatisfied

Very dissatisfied

No opinion

a) If not satisfied, why not?

Answer: \_\_\_\_\_  
\_\_\_\_\_

47. Do you feel that the health care personnel listen to you and answer your questions?

Yes

No

Comment: \_\_\_\_\_

48. Was a blood test done to test for malaria?

Yes

No

49. If a blood test was done:

a) After arriving to the hospital, for how long did you wait before the blood test to be performed?

0-59 min

1-2 hours

3-5 hours

More than 5 hours

b) When the blood test was done, after how long did you receive the result of the blood test?

0-59 min

1-2 hours

3-5 hour

More than 5 hours

I have not received information about the test result

50. How long after arriving at the hospital did your child receive treatment?

0-59 min hour

1-2 hours

3-5 hours

More than 5 hours

Have not yet received treatment

51. How did you travel to this hospital (Jose Macamo)?

- Bus, train or other public transportation
- Car
- Walking
- Other: \_\_\_\_\_

52. How much time did you spend travelling to the hospital?

- < 30 min
- 30-60 min
- 1-2 hours
- > 2 hours

53. Do you receive financial compensation for being at the hospital with your child? If Yes, in what form?

- Yes, how: \_\_\_\_\_
- No

54. If your child gets ill again in the future, what care provider will you preferably turn to? (Wait for participants own response before telling the alternatives)

- Health post
- Health center
- Local practitioner of traditional medicine
- Hospital
- Other: \_\_\_\_\_

55. Do you think it is easy to obtain information about where you can seek care?

- Yes
- No

56. How do you find information about where to seek care?

- Answer: \_\_\_\_\_

57. Before seeking care, did you tell anyone that you suspected your child to have malaria?

Yes

If Yes, what were the reactions from the people you told?

---

---

No

If No, what was/were your reason(s)?

---

---

58. Do you think it is socially accepted to have malaria?

Yes

No

Comment: \_\_\_\_\_

59. In your experience, what were the main barriers/difficulties when seeking care with your child this time?

Answer: \_\_\_\_\_

---

---

---

60. What are, in your opinion, the barriers to care for children with suspected malaria?

Answer: \_\_\_\_\_

---

---

---

Thank you very much for your participation!