MALARIA PREVENTION AND CONTROL IN ETHIOPIA

by

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ABSTRACT

This study investigated the implementation of the roll back malaria (RBM) programme at household and at health post levels and examined factors that negatively impact on malaria prevention and control activities. Quantitative, descriptive, analytic cross-sectional research, guided by the conceptual framework of the Health Belief Model, was conducted. Structured interviews were conducted with 857 women (for the household survey in phase 1) and 53 health extension workers (HEWs) in phase 2 of the study, in nine malaria endemic districts of Sidama Zone, southern Ethiopia. Data were analysed using SPSS version 20.

The study's findings indicate that 53.3% (n=457) of the household respondents and 24.5% (n=13) of the HEWs had low levels of overall malaria-related knowledge. Household respondents aged 25-34 years, ($p<0.01$); regularly received malaria-related information, ($p<0.001$) and the less poor women ($p<0.001$) had good levels of knowledge. Of the households, 38.9% (n=333) reported poor RBM practices. Wealth, knowledge, perceived threat of malaria and perceived benefits of implementing malaria preventive measures were positively associated with good RBM practices. Indoor residual spraying (63.6%; 422 out of 664), consistent use of insecticide treated bed nets (51.6%; 368 out of 713), and environmental sanitation (38.6%; 331 out of 857) were the most commonly implemented malaria prevention strategies in the study area. Out of the 252 reported malaria cases, 53.6% (n=135) occurred among children under five years of age who also comprised 50.0% (n=16) of 32 reported malaria-related deaths. The RBM practices were poorly implemented in the study area despite malaria prevention and control efforts. Slow progress in behavioural changes among household members, lack of transportation services for referring malaria patients, lack of support given to HEWs and lack of feedback and supervision from higher level health care facilities were identified as potential challenges facing RBM implementation in the study area. Future efforts need to focus on effective behavioural changes based on intervention studies and regular monitoring of the RBM programme. The workloads of the HEWs should also be reconsidered and lay health educators should be used more effectively. Health posts should always have sufficient anti-malaria drugs and other resource such as rapid diagnostic kits.

Key concepts

Health Belief Model, health extension worker, household survey, malaria in Ethiopia, plasmodium falciparum, roll back malaria programme

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LIST OF ACRONYMS USED IN THE THESIS

ACT	Artemisinin-based Combination Therapy
AL	Artemether-lumefantrine
ANC	Antenatal clinic
AOR	Adjusted odds ratio
BCC	Behavioural change and communication
COR	Crude odds ratio
BCM	Behaviour change model
CSA	Central Statistical Agency (of Ethiopia)
DALYs	Disability adjusted life years
DE	Designing effect
DHS	Demographic and Health Survey
EPHA	Ethiopian Public Health Association
ETB	Ethiopian birr
FMoH	Federal Ministry of Health (of Ethiopia)
HEWs	Health extension workers
HIV/AIDS	Human Immunodeficiency virus/Acquired Immunodeficiency Syndrome
HH	Households
HSDP	Health Sector Development Plan
IEC	Information, education and communication
IPT	Intermittent preventive treatment
IRB	Institutional review board
IRS	Indoor residual spraying (of houses with insecticides)
ITNs	Insecticide-treated nets
KAP	Knowledge, attitudes and practice
Kg	Kilogram
KPAs	knowledge, perceptions and attitudes
LLIN	Long-lasting insecticidal net
MDG	Millennium Development Goals
Mg	Milligram
MIS	Malaria Indicator Survey
MPH	Master of public health

NGO	Non-governmental organisation
PCR	Polymerase chain reaction
PHC	Primary health care
PhD	Philosophy of doctor
PMI	President‘s Malaria Initiative
RBM	Roll back malaria
RDTs	Rapid diagnostic tests
RIS	Residual insecticide spray
RO	Relative Odds
RR	Relative risk
SD	Standard deviation
SNNPR	Southern Nations, Nationalities and Peoples’ Region
SPSS	Statistical package for social Sciences
SSA	Sub-Saharan Africa
STDs	Sexually transmitted diseases
SZHD	Sidama zonal health department
TB	Tuberculosis
TPB	Theory of Planned Behaviour
TRB	Theory of Reasoned Behaviour
Unisa	University of South Africa
USA	United States of America
USD	United States (American) Dollar
WHO	World Health Organization

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Malaria is a parasitic disease resulting from infestation with single-cell protozoan haemo-parasites belonging to the four species of genus plasmodium (World Health Organization [WHO] 2003:5; WHO 2006:5; Sallares 2002:9). The word 'malaria' originated from the Italian term 'mal'aria' and denotes 'bad air' (Sallares 2002:7). The parasites are transmitted from person to person through the bite of the female Anopheles mosquito, which requires blood to nurture her eggs.

One fifth of the world's population is at risk of malaria in more than 99 malaria endemic countries, including Ethiopia, where two-thirds of the population are affected by malaria (WHO 2012:ix). This study aimed to investigate the malaria prevention and control situations in selected malaria endemic districts or *thea*, the second smallest administrative structure next to *kebele*, of Southern Ethiopia.

1.2 BACKGROUND INFORMATION

Malaria is a global problem. The global, national and regional context of malaria will be discussed in the following sections**.**

1.2.1 Global perspective of malaria

Malaria is one of the diseases that have seriously affected the world's population. Though significant reduction in its overall prevalence has been observed since 2003, malaria remains a major public health problem affecting more than 99 countries of the world (WHO 2012:28). Regions known to be free of malaria began to report cases of malaria indicating that the disease is expanding probably in response to global warming (Tesfaye, Belyhun,Teklu, Mengesha & Petros 2011:153) enabling the mosquitoes to live in areas where this had been impossible prior to global warming.

To control the trends of the expansion and the consequences of malaria, countries in malaria endemic areas have launched malaria prevention and control strategies that are believed to combat the disease. However, the occurrence of malaria is very complex and affected by multiple factors. The efficacy of the prevention and control strategies and their effects, especially in the reduction of malaria-related mortalities and morbidities among the most vulnerable segments of these populations, need to be monitored. Assessment of the effectiveness of malaria prevention programmes is either neglected or not planned due to limited resources. Health authorities in malaria endemic areas conduct indoor residual sprays (IRS) every year. But the outcomes and impacts of this service have not been regularly evaluated to improve the subsequent preventive activities in terms of the effectiveness of the programme and the wise use of scarce resources. Some countries with ongoing malaria transmission do not have proper documentation for tracking malaria control programmes (WHO 2012:v) hampering the efforts of roll back malaria (RBM) programmes.

1.2.2 The malaria situation in Sub-Saharan Africa

The WHO (2009) indicates that about 50% of the world's people are at risk of malaria, most of them living in resource-scarce countries. Malaria is responsible for 1.4% burden of diseases in the world and causes 10.8% disability adjusted life years (DALYs) in Africa. The disease affects about 300 million people every year, mainly hitting the most vulnerable populations (Oresanya, Hoshen & Sofola 2008:146). About 90% of deaths attributed to malaria occur in Sub-Saharan Africa (SSA) (Mengistu & Diro 2006:107). More than 75% of deaths due to malaria occur among children younger than five (henceforth called "under-fives") in SSA which accounts for 25% the mortality rate among SSA's children. According to Oresanya et al (2008), three out of four individuals presenting with fever at health facilities in SSA, suffer from malaria with significant variations between rainy and dry seasons. Malaria has devastated the economy and health of populations in resource-scarce SSA accounting for 10% of the total burden of diseases in the region (Castillo-Riquelme, McIntyre & Barnes 2008:111).

1.2.3 The malaria situation in Ethiopia

Ethiopia is one of SSA countries affected by malaria. The disease burden of malaria and its preventive and control strategies are discussed in this section.

1.2.3.1 Country profile

Ethiopia, a SSA country, has a total surface area of 1.1 million km^2 and an estimated population of 84 million (WHO 2012:126). The country has one of the poorest health profiles in the world. For instance, Ethiopia has an under-five child mortality rate of 88/1000, an infant mortality rate of 59/1000, a maternal mortality ratio of 676/100,000 (Central Statistical Agency [CSA] 2012:267), and a life expectancy at birth of 58.4 years for males and 60.4 years for females (Federal Ministry of Health [FMoH] 2011:11). Poor socio-economic development, poor environmental conditions and low levels of social services, and uncontrolled population growth are some of the factors contributing to the poor health status in Ethiopia. Communicable diseases are widely spread accounting for 75% of endemic diseases that are potentially preventable. Malaria occurs in about 75% of the total land area of Ethiopia where 68% of the people live (WHO 2012:126).

1.2.3.2 The magnitude of the malaria problem in Ethiopia

In Ethiopia, malaria is responsible for 9% of the outpatient visits, 8% of patient admissions and 10% of hospital deaths (FMoH 2011:29-31). Malaria transmission in Ethiopia is perennial, seasonal and occurs as an epidemic depending on the geographical location (FMoH 2012a:3). The seasons where the peak transmissions occur are the months following the rainy season, mainly from June to September (Midekisa, Senay,Henebry, Semuniguse & Wimberly 2012:165). Malaria transmission in Ethiopia is characterised by unstable and irregular occurrence of epidemics every 5-8 years (FMoH 2008:1). In the highlands of Ethiopia, a number of epidemics have been registered over the last 45 years.

During the first epidemic in 1958, about 150 000 people living in the highlands of Ethiopia died (FMoH 2008), where malaria historically occurred in areas up to 2 500 metres above sea levels (Adhanom, Deressa, Witten, Getachew & Seboxa 2005:557; FMoH 2012a:67). Since then, devastating epidemics were documented in the years 1988, 1991 to 1992, 1998, and 2003. About 2 million clinical cases and 3 000 deaths due to malaria were reported during the last epidemic in 2003 (FMoH 2008). In 2010, the FMoH (2011) reported malaria to be the leading cause of morbidity in several regions of the country. The annual average number of malaria cases reported by health facilities from 2001 to 2005 was estimated to be 9.4% of all patients presenting at the health facilities (FMoH 2008:2). The 2011 FMoH annual report revealed that 828 415 cases of confirmed malaria were treated during that year (FMoH 2011:33).The prevalence at the population level is expected to exceed this figure.

The Southern, Nations, Nationalities and Peoples' Region (SNNPR) is the third most populous regional state next to Oromia and Amhara in Ethiopia. Malaria occurs in almost all zones with over 8 million (65%) of the population being at risk, and it ranks top among the causes of morbidity and mortality in the region. For instance, 144 out of 261 (55%) malaria deaths reported by all hospitals in the country during 2011 were from the SNNPR (FMoH, 2011). According to a study by Ayele, Zewotir and Mwambi (2013:200), the population of the region is at increased risk of malaria infection compared to those in the Oromia and Amhara regions. Sidama Zone, where this study was conducted, is one of the 13 zones and 8 special districts found in the SNNPR (see figure 1.1). The zone has an area of 6 981.8 square kilometres of which 30%, 54% and 16% are lowland, middle land and highland, respectively (Sidama Zone Health Sector 2011:2). The altitude ranges from a minimum of 1 200 in Loka Abaya district to a maximum of 3 300 meters above sea level at the Geremba Mountain. Malaria is endemic in nine out of nineteen districts found in the zone. In 2011, 44 302 out of 88 187 (50%) people were diagnosed and tested positive for malaria in the Sidama Zone (Sidama Zonal Health Department 2011:8).

Figure 1.1: Location of Ethiopia in Africa
Source: World Atlas.

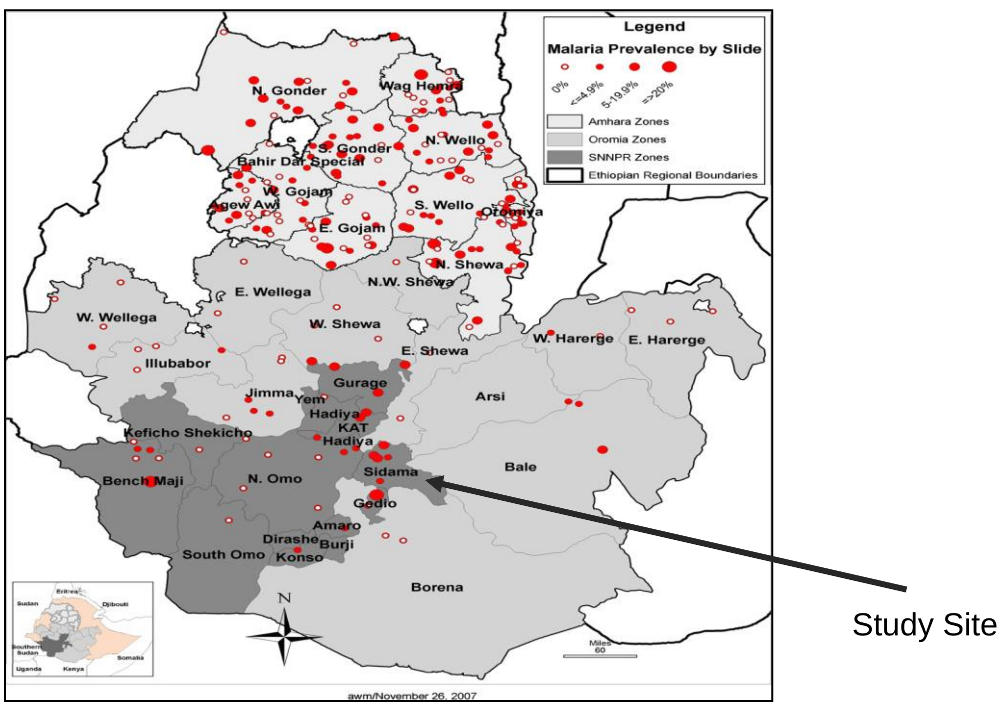

Figure 1.2: Prevalence of malaria in Ethiopia and the study site

According to the FMoH (2011:33), the insecticide treated net (ITN) coverage in the SNNPR was 63% in 2011. The proportion of children under five years of age who slept under ITNs in the region was 55.9% and 63.1% among pregnant women (FMoH 2007a). Astatkie and Feleke's (2009:210) study conducted in the Arbamich area indicated that ITN utilisation by vulnerable groups was less than the Abujan target. This rate of utilisation of ITNs is relatively low compared to Ethiopia's target of 100% ITN coverage (FMoH 2012a:19).

The WHO (2012:4) identified gaps in the area of maximising the utilisation of distributed ITNs, maximising the scaling up of indoor residual spraying (IRS) activities, increasing community knowledge of malaria manifestations, prevention and control, increasing access as well as effective malaria case management services. Having realised the problem, the FMoH in collaboration with the Roll Back Malaria (RBM) Programme, as partners, tried to implement effective preventive and control measures focusing on specific key targets to reduce mortality due to malaria by 50% by 2010. It was planned to achieve a 60% ITN coverage among under-fives and pregnant women, 60% of malaria cases to receive effective treatment within 24 hours of the onset of signs and symptoms, 60% of pregnant women to receive ITNs, and 60% of the epidemics to be detected within two weeks of onset, and then responded to within an additional two weeks (FMoH 2006:8; FMoH 2012a:ix).

The SNNPR Health Bureau planned a strategy for the prevention and control of malaria in order to achieve the stated RBM and FMoH targets. The main strategy to control malaria in the SNNPR stems from the national strategies. It includes the provision of early diagnosis and effective treatment, selective vector control measures (ITN, IRS and environmental management), scaling up epidemic prevention and control measures. The distribution of ITNs is an important integral part of selective vector control methods (SNNPR Health Bureau 2009).

The FMoH, with its partners, is also scaling up and intensifying the distribution of ITNs through a Global Fund Grant of about US$ 3.4 million. This involved distributing ITNs to areas with a high incidence of malaria, including the Southern Region. At the end of 2006, cumulatively a total of 7 million ITNs had been distributed throughout Ethiopia. Furthermore, the FMoH had distributed 19-20 million ITNs by the end of 2007 (Sidama Zone Health Department 2007). Overall, the total number of ITNs distributed in Ethiopia since 2005 was estimated to be 35 million (FMoH 2012a:22).

Even though the strategy has faced many challenges during the past six years, the SNNPR has gained significant experiences with ITN distribution and utilisation. The region requires information about the knowledge, perceptions, behaviours and practices of the community towards malaria prevention programmes. There appears to be inadequate information about the outcomes of malaria prevention measures such as IRS, appropriate utilisation of ITNs, and indigenous practices of malaria prevention and control methods. Despite the scaling up of malaria prevention and control efforts in the SNNPR, some districts reported malaria outbreaks during 2009 (Areka District Health Office 2009).

Though there is evidence that the prevalence of malaria is declining compared to the previous trends, it continues to affect large numbers of people in Ethiopia (FMoH 2011:33). The questions that arise are thus:

- Is this reduction due to the improvement in the quality of services?
- Does this reduction in the prevalence of malaria mean that there will not be any further devastating epidemics?
- Is there any other factor that contributed to the reduction of malaria?

In response to these questions, scholars have reflected on diverse views about the declining rates of incidence and prevalence of malaria. One of the views is that the current sign of decrease could be the result of strong international and national efforts (WHO 2011; WHO 2012). On the other hand, researchers argue that it is a premature decision for countries to declare victories as the nature of the occurrence of malaria is very complex, involving multiple factors.

On the other hand some countries still face high rates of malaria-related mortality and morbidity indicating that malaria has not yet been managed effectively. For instance, Sign, Dash and Thimasarn (2009:93) reported an increasing pattern of plasmodium falciparum in Madhya Pradesh (Central India). This evidence further justifies the argument that the occurrence of malaria epidemics has never had stable patterns. In some countries the epidemic occurred as two-yearly events but in others it might occur only every 10 years. The quality of malaria prevention and control services, including surveillance programmes, might be associated with the occurrence of malaria epidemics. Should there be well organised and consistent preventive and control programmes, the expected epidemic could be limited or managed with fewer undesirable health consequences.

1.2.3.3 The malaria prevention and control strategies in Ethiopia

In order to effectively curb the prevailing health problems arising from malaria, the Ethiopian government has designed and is implementing malaria prevention and control strategies. These include:

- distribution of ITNs to all households in malaria endemic areas;
- selective indoor insecticide spraying;
- larval control; and
- proper case management (diagnosis and treatment) and identification and control of epidemics within two weeks' time (FMoH 2006:8).

These strategies have been launched since 2001 in different regions where malaria is endemic. The extent of the implementation of these nationally set strategies is expected to vary from one region to another due to differences in socio-economic, infrastructure, human resources, and environmental factors. These factors affect the effectiveness of malaria prevention and control programmes and their impact. In order to understand to what extent the implemented strategies are on the right track to meet the set targets, they need to be assessed periodically. To this end, this study tried to achieve two major goals. Firstly, it intended to identify the main factors that negatively impact on malaria prevention and control strategies of the SNNPR at household level. Secondly, this study tried to identify the malaria knowledge and implementation practices of the front line health professionals, known as health extension workers (HEWs) in Ethiopia.

As much as 75% of the total area of Ethiopia is malarious. About 52 million people (68%) live in these malaria endemic areas (FMoH 2012a:ix). Improvements in the level of awareness and health seeking behaviours of such large communities at risk are therefore of paramount importance. This is a pre-requisite to actively involving the community in preventive and control strategies designed at national or local levels.

1.2.3.4 Awareness and utilisation of malaria prevention and control services

One study (Gobena, Berhane & Worku 2012:914) assessed the level of knowledge of women about malaria and indicated that only 56% out of 2 867 respondents had appropriate knowledge regarding the cause of malaria and 33% out of 789 respondents reported the consistent use of ITNs. Such misconceptions and lack of desirable behaviours, particularly in countries with large populations, could challenge the malaria prevention and control efforts of the African continent. In Nigeria, utilisation rates of 11.5% for any net and 1.7% for ITN by the under-fives were reported (Oresanya et al 2008:52). Evidence regarding low rates of utilisation of ITNs, generally shows that there are still gaps to reach the targets set by many developing countries to eradicate malaria. By improving the communities' level of awareness, their involvement in malaria prevention and control activities could be enhanced and sustained, reducing the prevalence and incidence of malaria, and thus also reducing malaria-related morbidity and mortality rates.

1.2.3.5 Case Management

Proper management of malaria cases is one component of malaria prevention and control strategies and programmes. Ethiopia introduced the use of artemether-lumefantrine (with the trade name Coartem) as first line treatment for falciparum malaria as early as July 2004, and full implementation at all health facilities was started in 2005 (FMoH 2012a:39-41; President's Malaria Initiative [PMI] 2009:37). This treatment implies that the malaria patient only needs to take one pill to cure the malaria attack. Malaria diagnosis in health facilities is based on clinical, rapid diagnostic tests (RDTs) and microscopy. RDTs are available at the health posts while microscopy is available at higher level healthcare institutions like health centres, hospitals or private clinics. Management of malaria cases at health institutions continues to face many challenges to implement the strategy of early diagnosis, treatment and prevention of malaria in Ethiopia.

Similarly, it was reported that fewer than 10% of patients in Mali had access to laboratory malaria confirmation services. In the same country, studies have indicated that only 31.4% of under-fives, suspected to suffer from malaria, had received any anti-malarial drugs and only 15.1% of these had been treated within 24 hours of the onset of fever attacks (PMI 2008). Moreover, Lettenmaier (2003) has reported that anti-malarial drug sellers in many developing countries sell anti-malaria drugs under different brands with varying levels of efficacy. Some of these drugs do not meet the quality standards, which could contribute to anti-malaria drug resistance, another blow to the RBM strategy.

Poor quality of diagnosis of malaria cases hinders the effectiveness of the clinical services at health institutions. In Ethiopia, there is no effective national and systematic evaluation of the quality of microscopy for diagnosis of malaria except one attempt in the Amhara region (PMI 2009:32).

1.2.3.6 Epidemic surveillance

Despite malaria being one of the diseases under public health surveillance in Ethiopia, the existing surveillance has not been very effective for prevention, detection and response to the epidemic (PMI 2009:41). However, the FMoH (2012a:71), in response to the weak surveillance system, has strengthened its integrated disease surveillance system. It has instituted an epidemic forecasting and early warning system in place in order to detect and contain any malaria epidemic outbreak (FMoH 2012a:86). It established a well organised structure at different levels extending from the FMoH down to the village level. At each level, specific roles and responsibilities were assigned and effective channels of communication were established.

1.2.3.7 Capacity building

In Ethiopia, there is no training of health professions specific for malaria and other vector-related diseases. The lack of human resources with appropriate knowledge and skills to combat malaria has been a major challenge in Ethiopia (PMI 2009:28). The problem in the remote areas is further compounded by poor infrastructure (PMI 2009:37). Building capacity of the health system, as a component of malaria prevention and control strategies, therefore, should be implemented in a co-ordinated way involving all stakeholders. Skilled health workers are required to provide effective preventive and control services (FMoH 2010:46). This necessitates periodic in-service training for health professionals at all levels on guidelines and policies and on the management of malaria cases. Motivation and guidance of workers through regular supervision is critically important for the successful implementation of the RBM programme.

1.2.3.8 Communication and co-ordination

The level of awareness of the population living in malaria endemic areas varies through different regions of Ethiopia depending on socio-economic and demographic factors. Yewhalaw, Kassahun, Woldemichael, Tushune, Sudaker, Kaba, Duchateau, Bortel and Speybroeck (2010b:47) reported a fairly good level of awareness regarding malaria while Gobena et al (2013) reported a low level of malaria awareness in Ethiopian communities. This suggests that the malaria prevention programmes in the country still need to further improve and expand knowledge through the dissemination of health education, and also through community sensitisation meetings, in connection with the distribution of ITNs. For further achievements of good levels of malaria knowledge, attitudes, and practices, related to the prevention of malaria, targeted and pre-tested health education messages, developed within the context of cultures and social conditions of the target communities, should be emphasised. To enhance compliance with malaria preventive and control measures among the community, effective communication between the population at risk and the healthcare service providers should also be emphasised consistently. Hence, malaria communication strategies should be developed based on the national health communication strategy.

1.2.3.9 Monitoring and evaluation

Monitoring and evaluation of malaria prevention and control strategies are critical aspects influencing the success of malaria programmes. It helps not only for the purpose of reducing the burden of malaria but also for tracking appropriate and timely malaria commodities. Such activities are important to wisely allocate resources as well as to evaluate the extent to which malaria preventive and control activities are effective (PMI 2009). Evaluation and monitoring make visible the impact of malaria prevention and control strategies on mortality and morbidity rates of vulnerable population groups, such as under-fives and pregnant women. However, why many countries lack valid ways of evaluating the investment of resources to fight malaria is not understood (Rowe, Steketee & Arnold 2007:1524). These authors further suggested that many malaria prevention and control initiatives, that financially and technically support malaria endemic countries, need to use the same evaluation plan in different countries, making these efforts more efficient. Evaluation methods for malaria prevention and control programmes need to be comprehensive and must adequately address validity, feasibility, cost, malaria epidemiology and inherent limitations of methods of measurements. Collection of data of such information enables cross-country comparisons and evaluations of the RBM programme at continental or regional level.

1.3 OVERARCHING ELEMENTS OF THE RESEARCH

Malaria affects a large proportion of the population in Ethiopia. Evidence regarding its magnitude of the problem and the extent of implementation of RBM therefore, needs to be provided to guide decisions. Cognisant to this, the following sections provide background about the research and its objectives.

1.3.1 Statement of the problem

Ethiopia is one of the countries that have implemented the revised strategies to curb malaria. Despite the massive efforts to implement these strategies, malaria continues to cause significant morbidities and mortalities in the endemic areas of Ethiopia. This causes much damage to the health and socio-economic development of the country. Hence, this study attempted to examine factors contributing to this problem at the household level, as well as at the Health Extension Workers' (HEWs') level, where the malaria prevention and control strategies are implemented at grassroots level.

1.3.2 Purpose of the study

Malaria remains a major public health problem in Ethiopia. This study, therefore, intended to identify factors adversely affecting malaria prevention and control at the household level. To comply with this purpose two populations and two phases for the research were required, namely:

- To illuminate the understanding of the situation and examine the modern and indigenous malaria knowledge systems of preventing and controlling the disease, the researcher used a household survey (Phase I).

- To identify challenges encountered by health extension workers (HEWs) in rendering malaria prevention and control actions at the health post level. Knowledge of the factors affecting malaria prevention and control, at health post level, will be useful to recommend ways to reduce the incidence and prevalence and severity of malaria in the study areas and in other similar contexts.

1.3.3 Research questions

The programme managers of the implementation of the malaria prevention and control strategies need to be aware of factors that might negatively impact on these strategies at household level. For instance, housing conditions such as the number of rooms in relation to household size and the suitability of physical housing structures might influence ITN utilisation. Knowledge of community members about the cause, transmission and prevention of malaria is another key component in the RBM programme. However, low levels of knowledge and wrong perceptions of the community about malaria are some of the challenges the RBM programme might face in different parts of Ethiopia (Legesse & Deressa 2009:43). The family's knowledge about the appropriate use of ITNs, destroying mosquito breeding sites, and the managing of malaria cases at household level are important components of the programme which might influence the effective implementation of the malaria programme in Ethiopia. This study intended to examine these situations, in the study area. The overarching research question for the research was: To what extent does the knowledge level of female household heads and the activities of HEWs complement or contradict the malaria preventive programmes in the research area? (A female household head, in this study, refers to the woman who was responsible for managing the household's malaria prevention and control activities, irrespective of whether or not there was a male household head).

Specific research questions were set for each of the two phases. Sections 1.4.1 and 1.5.1 respectively address phases 1 and 2. This information could help to enhance the implementation of effective anti-malaria-related strategies in Ethiopia.

1.3.4 Research objectives

Objectives were set for each of the two phases of the research. See sections 1.4.2 and 1.5.2 respectively for the objectives of phases 1 and 2.

1.3.5 The research paradigm: quantitative research

Both phases of the research were conducted within the quantitative research paradigm. The research approach employed was a positivist paradigm, using a quantitative design. This paradigm makes an assumption that there exists an observable reality that can be measured quantitatively independently of human observation (Bruce, Pope & Stanistreet 2008:3). A quantitative approach involves precise measurement and quantification, often within a rigorously controlled design (Polit & Beck 2008:763). This type of research is an appropriate choice for the collection of empirical data through the senses (Polit & Beck 2008:16). Since this design addresses a range of confirmatory questions which could lead to inferences enhancing the effective implementation of the RBM programme, it was the first choice for this study.

1.3.6 Theoretical foundation of the study (HBM)

The theory that is most appropriate to this research is the Health Belief Model (HBM). This theory was initially developed by Rosenstock in 1974. It was used to study the relationship between the behaviour of an individual and his/her risk of having a particular health problem and his/her health service utilisation behaviours such as accepting testing for tuberculosis. It indicated that if a person exhibited positive health behaviours, then he/she was more likely to prevent or avoid any condition that increased the likelihood of contracting diseases/conditions (Glanz, Rimer & Viswanath 2008:45-62). As applied to this study, the HBM holds that the independent variables (socio-economic and demographic, knowledge/indigenous, beliefs, the environment) should influence or explain the dependent variables (current practices of preventing and treating malaria). Because if a person has a good level of knowledge, has positive attitudes towards malaria prevention strategies, then he/she is more likely to practise preventive measures and can thus reduce his/her risk of getting malaria, and of treating patients with malaria effectively. The HBM will guide the researcher in establishing the relationship between the explanatory and the outcome variables. Section 2.6 of this thesis presents the details and conceptual framework used in this study.

Research reports (FMoH 2012a) indicate that malaria prevention and control strategies can be affected by several factors. Level of awareness and utilisation of services, quality of case management, capacity of implementers, epidemic surveillance, communication and coordination, monitoring and evaluation are the main malaria prevention and control strategies (Oresanya et al 2008; PMI 2008). The assessment of these aspects was the focus of this study.

1.3.7 Research design

A research design constitutes the plan for the collection, measurement and analysis of data and for reaching conclusions. Research designs are broadly classified as interventional and non-interventional (Aschengrau & Seage III 2008:139-140; Fathalla 2004:44; Rothman, Greenland & Lash 2008:87-88). Interventional research involves the development, implementation and testing of an intervention (Polit & Beck 2008:756). The non-intervention research design is also called observational and may be analytical or descriptive and is more appropriate when the researcher does not intend to assign interventions, but is rather, an observer of the problem.

The analytical design describes associations in terms of possible cause-and-effect relationships. A descriptive design, on the other hand, provides a detailed presentation of the characteristics of persons, groups, situations or the frequency with which certain events occur (Bruce et al 2008:422-425, Polit & Beck 2008:752). A cross-sectional design is a descriptive study in which data are collected at one point in time (Polit & Beck 2008:751). This study aimed to measure the practices of households and the implementation of RBM practices at health post level. A non-experimental descriptive cross-sectional design was used to address the research objectives while an analytical component was also employed to examine potential factors that could explain the behaviours of the respondents regarding malaria prevention and control.

1.4 PHASE I: HOUSEHOLD SURVEY

It is at household level where malaria prevention and control strategies should be implemented to have an impact on reducing the malaria incidence and prevalence in Ethiopia. Consequently phase 1 of this study focussed on the knowledge, attitudes and perceptions of households pertaining to malaria prevention and control. The second and third research questions address the households' malaria prevention and control practices.

1.4.1 Research questions

The research questions for the household survey serve to clarify the knowledge, perceptions and attitudes (KPAs) of women towards the prevention of malaria in a specific household. The questions were:

- How do knowledge, attitudes, and perceptions of households in malaria-endemic areas (about the malaria prevention and control strategies) impact on the effective utilisation of these services?
- What factors affect the implementation of malaria prevention and control strategies at the household level?
- What preventive measures are implemented at the household level?
- Which household members were most likely to suffer from malaria during the three months preceding the interview?

1.4.2 Research objectives

The objectives set for the household surveys were to:

- assess the knowledge, attitudes and perceptions of households in the study area about the prevention and control methods of malaria;
- identify factors that could adversely affect the effectiveness of malaria prevention and control strategies in the study areas;
- identify the malaria preventive measures implemented at household level;
- identify persons most affected by malaria at household level in the study areas.

1.4.3 Research design

A quantitative descriptive cross-sectional survey was conducted during phases 1 and 2 of this study. Structured interviews were conducted with selected households in phase 1 and with all HEWs in phase 2 of this study. This study was conducted in all nine malaria endemic districts of Sidama Zone in southern Ethiopia.

1.4.4 Population and sampling

This research relied on primary data to address the research objectives. Sources of these data are presented in sections 1.4.4.1 and 1.4.4.2.

1.4.4.1 Research population and sample

Mothers or caregivers from the selected households were targeted as respondents since they are the prominent caregivers in the family and implementers of malaria prevention and control measures at this level. These family members shoulder the major responsibilities of malaria prevention and control activities in and around the households and thus, were eligible for this study. The sample selection and sample size determinations are discussed in sections 3.2.3.2; 3.2.3.3 and 3.2.3.4.

1.4.4.2 Selection of respondents

Respondents for the household survey were randomly selected from nine malaria endemic districts in Sidama Zone, Southern Ethiopia. At the first stage, kebeles (smallest administrative units) were selected using a simple random sampling technique. Finally, clusters of households (locally named ‘gots’) were randomly picked from a list of all gots in each kebele and all households in the selected gots were assessed. (Details are presented in section 3.2.3.4). Proportions of urban and rural dwellers were represented based on DHS findings (CSA 2012:3).

1.4.5 Research tool and data collection

Structured interviews were used to collect data as discussed in the following sections of the thesis.

1.4.5.1 Research tool/Interview guide

Interview schedules (WHO 2001:171) with a list of structured questions were used to collect data. The researcher utilised purposively constructed, translated and pre-tested structured interview schedules that were prepared based on the research objectives and on the review of the literature.

1.4.5.2 Data collection

Data were collected from the end of March to the second week of May 2013. Data on background variables such as socioeconomic aspects, demographics and housing conditions, were gathered with the intention of describing the characteristics of respondents and examining how this information could be correlated with malaria-related behaviours. Similarly, variables related to the level of awareness and knowledge about malaria, perceptions and practices relevant to the prevention, control and episodes of malaria and its treatment were measured. Ten trained and supervised female research assistants conducted the interviews. The training provided to the data collectors focussed on the objectives of the study and techniques of interview and on ethical aspects of research. The data collectors interviewed the mother/caregiver from all households in the selected clusters. The researcher was available and supervised the process (see section 3.2.5 of the thesis for a more detailed description of the data collection process).

1.4.6 Data analysis

The researcher first cleaned, coded and entered the data into computer software, SPSS version 20. Background variables such as socio-demographic and economic data were analysed by using descriptive statistics. Categorical or nominal data related to the study objectives were analysed using chi-square tests to examine statistical evidence for factors that might be associated with the likelihood of families reporting/not reporting malaria *infections. The data were further fitted into a multivariate regression model (*Elston & Johnson 2008:293-294; Kothari 2004:315-318) to analyse relationships between the explanatory and the criterion variables and to estimate the relative odds (OR) of malaria infection among the households.

1.4.7 Validity and reliability of the data

Validity is the degree of closeness of the measurement to the true value. It is the capacity of a test, instrument or question to give a true result (Bruce et al 2008:172) The sample size involved in this study was large ensuring the representativeness and thus, improving the validity.

Reliability measures the internal consistency of the measurement tools (Bruce et al 2008:174). In order to improve the reliability, all technical terms used in the interview schedule were defined and explained to each interviewee.

Pretesting of the data collection tool and training of the interviewers were done carefully. Completeness and consistency of information was checked on a daily basis during data collection. Data entry was done into the SPSS programme and audited to remove errors committed during data entry which further enhanced the reliability of the research instrument. The internal consistency of the measurements was evaluated by Cronbach's alpha coefficients, which ranged from a minimum of 0.73 to 0.87 for different constructs of the HBM (see section 3.2.7.2).

1.5 PHASE II: HEALTH POST LEVEL SURVEY

The health post is the first line of treatment for malaria treatment and HEWs provide health education in their communities. Consequently, it was deemed essential to identify the knowledge, attitudes and perceptions of HEWs at health posts because these aspects could influence the prevention and treatment of malaria at community level.

1.5.1 Research questions

Research questions that guided the second phase included the following:

- How do the health extension workers (HEWs) implement malaria prevention and control strategies?
- What challenges do the HEWs encounter in rendering malaria prevention services?
- What challenges do the HEWs encounter in treating patients suffering from malaria?

1.5.2 Research objectives

The objectives set for the health post surveys were to:

- assess the HEWs' knowledge, attitudes and perceptions concerning the prevention and control of malaria;
- assess the challenges related to malaria prevention and control at health post level;
- assess the challenges related to treating patients suffering from malaria at health post level.

1.5.3 Research design

Most of the methodological approaches used in this section were similar to those used in phase I. All HEWs providing basic PHC services at the health posts comprised the target respondents for the second phase of this research. A health post represents the smallest unit of the current health structure in Ethiopia. Every kebele has one health post with two HEWs, and hence all health posts in the kebeles that were targeted for the household survey, and all these HEWs were included. The second phase of the research was required to examine the practices of RBM from the health service providers' perspectives and to identify challenges they might be encountering. The second phase was also informed by data collected from the first phase. The researcher used a cross-sectional quantitative approach to assess the knowledge, perceptions and practices of health services providers (HEWs) and problems they faced at the health posts and in the community while implementing the RBM strategies. It provided information regarding how RBM strategies were implemented at the PHC units and could provide evidence about potential gaps existing between policies and practices.

1.5.4 Research population and sampling

Sources of data for phase II included health service providers working in the health posts. These are presented in sections 1.5.4.1 and 1.5.4.2.

1.5.4.1 Population and Sample

HEWs in all 18 rural and 9 urban kebeles that participated in phase I of this study, were included in this study. HEWs are expected to implement a total of 16 health service packages in the community (see section 1.8. of this thesis). As front line implementers of the health strategies, the HEWs could provide information to help identify gaps in the RBM programme at grassroots level.

1.5.4.2 Selection of respondents for phase II

There are 54 HEWs working for the selected 27 kebeles (two per kebele). All HEWs, who had worked in the study areas for at least three months were interviewed, implying that no sampling took place. HEWs with less than three months' experiences were considered to lack experience and were thus not interviewed.

1.5.5 Research instrument and data collection procedure

The researcher used a structured interview schedule to collect data relevant to the objectives of the second phase.

1.5.5.1 The structured interview schedule

The structured interview schedule, used for the second phase of the study, were informed by the results from phase I. The tools were pretested by interviewing five HEWs who were not included in the actual study (see section 3.3.2.3 for more details).

1.5.5.2 Data collection

Data pertinent to the second phase were collected in July 2013. The range of data included the background information, variables related to KAP of HEWs about malaria, level of satisfaction, challenges related to the implementation of RBM. Details of data collection procedures are presented in section 3.3.2.4.

1.5.6 Data analysis

The data analysis for the second phase followed the same procedures as were adopted during the first phase, as explained in section 1.4.6.

1.5.7 Validity and reliability

Validity and reliability for the second phase were achieved in similar ways discussed in section 1.4.7.

1.6 ETHICAL CONSIDERATIONS

The researcher honoured the ethical aspects related to procedures used in this study. The details are discussed in section 3.2.8.

1.7 DEFINITIONS OF KEY CONCEPTS

The important concepts central to this study are defined and operationalised as follows:

Malaria prevention and control

Malaria prevention and control refer to the strategies Ethiopia currently implements and the direction it follows pertaining to the RBM programme. These include early diagnosis and treatment, selective vector control, prevention and control of malaria epidemics, providing supporting information, education and communication (IEC) strategies that include social mobilisation, human resources development, health management and information systems, monitoring and operational studies (FMoH 2012b).

Early diagnosis and effective treatment:

Early diagnosis and treatment comprise the strategy that aims to improve accessibility to diagnostic facilities. Ethiopia has introduced Rapid Diagnostic Tests (RDTs) in 2005 to offer opportunities to expand diagnostic services at peripheral levels. The use of Artemisinin-based combination therapy, as the first line treatment for falciparum malaria, has also been implemented since 2004 (FMoH 2012b)

Selective vector control

There are two important vector control efforts in place. These include indoor residual spraying (IRS) for households in endemic areas and the distribution of insecticide treated nets (ITNs). Environmental management to destroy breeding sites of mosquitoes and larvaciding are also widely implemented (FMoH 2012a:6).

Epidemic prevention and control

The prevention and control target of malaria epidemics aims to detect and contain 60% of each malaria epidemic within two weeks from its onset (FMoH 2012b).

Information, communication, and education (ICE)/Behavioural change communication (BCC)

Behavioural Change and Communication (BCC) is a form of intervention that focuses on the importance of possessing the necessary information or education useful to develop and sustain the desirable behaviours. More specifically, BCC refers to the health-seeking behaviours of the community. It encompasses any communication activities and approaches that focus on individual, community and environmental factors that influence behaviour. The ultimate goal of BCC is helping an individual or the community to accept and implement behaviours that positively impact on their health. This approach is one of the strategies in place to curb malaria in Ethiopia. Therefore, examining its role in the efforts of malaria prevention and control is of paramount importance.

Health extension worker (HEW)

A HEW is a health professional trained for a minimum of one year, who has obtained a certificate (10+1; implying the successful completion of 11 years of schooling) and functions at the front line of the health care system in Ethiopia. All HEWs, within the context of the Ethiopian government's specifications, are expected to execute 16 packages of basic health services, mostly focussing on health promotion and disease prevention. These packages are: prevention of HIV/AIDS, STDs, and TB; malaria prevention and control; first aid emergency measures; maternal, newborn and child health; family planning; immunisation, nutrition, adolescent reproductive health; excreta disposal; solid and liquid waste disposal, water supply; food hygiene and safety measures; healthy home environment; control of insects and rodents; personal hygiene; health education and communication (Berhanu, Gudesso, Kebede & Gerbaba 2013:74).

Incidence and prevalence of malaria

Incidence is the occurrence of new cases of malaria among the population at risk during a specified period of time, usually one calendar year (Bonita, Beaglehole & Kjellstrom 2006:18). These authors define prevalence as the proportion of individuals suffering from confirmed clinical malaria among the total population at a specific point in time, combining all newly diagnosed and all previously diagnosed patients suffering from malaria.

Modifying Factors

These are demographic variables such as age, gender, ethnicity, personality and socio-economic status that affect one's perception.

Knowledge

The Oxford English Dictionary (1995:656) defines knowledge as expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject. In the context of this study, knowledge refers to the level of awareness of a person or a community about malaria. Respondents who correctly respond to 75%+ of the items, between 50%-74% of questions, and those scoring 49% or lower will be considered as having high, medium and low levels of malaria knowledge.

Attitudes

Eckman and Walker (2008:1) define attitudes as hypothetical constructs that represent an individual's mindset or degree of belief in an item. It refers to a person's feelings towards the subject, as well as any preconceived ideas he/she may have towards it. A similar meaning of attitudes is maintained in this study. It is an evaluative response of a person about malaria and its prevention and control activities. A respondent's attitudes influence her perceptions about and practices of malaria prevention and control, and as such no specific questions were asked about respondents' attitudes per se.

Perceptions

The Oxford English Dictionary (1995:859) defines perception as "one's ability to understand things". Perception in this study refers to the respondents' opinions or beliefs about malaria in terms of susceptibility, severity, benefits of implementing preventive measures, and barriers that could hinder people from taking appropriate actions.

Practices

It is defined as the ways in which people demonstrate their knowledge and attitudes through their actions (Eckman & Walker 2008:1). In the current study, this has to do with actions people take to prevent and treat malaria. Respondents scoring 50%+ of combined scores of all items measuring malaria prevention and control practices (items 107-124 on the structured interview schedule (see annexure 2) are considered as implementing good practices and those scoring below 50% as implementing poor practices.

Monitoring

An ongoing process of tracking progress towards set objectives of malaria prevention and control of 100% ITN coverage and realising a 50% reduction in malaria mortalities is known as monitoring.

Malaria mortality

Malaria mortality refers to any death in which malaria was the identified cause.

Environmental factors

Environmental factors in the present study are limited to encompass: the presence of mosquitoes' breeding sites and the proximity of households to these sites, suitable temperature for mosquitoes and the plasmodia parasites, ambient air humidity, frequency and intensity of rainfall.

Resources

Resources in this study refer to the availability and adequacy of infrastructure (roads, health facilities, medications and vehicles), trained human resources and budgets.

Traditional medicine

According to the WHO (2002:1), traditional medicine includes "the diverse health practices, approaches, knowledge and beliefs incorporating plants, animal, and/or mineral- based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness". In this study, this definition is used as it applies to the practices of the respondents to prevent, diagnose and/or treat malaria by resorting to these means.

1.8 SIGNIFICANCE OF THE STUDY

This study's findings could identify challenges encountered during the implementation of the malaria control and treatment strategies at grassroots level. Based on these findings, recommendations could be made to address shortcomings in Ethiopia's malaria prevention and control (diagnosis, treatment and referral) efforts at household and at HEWs' levels. This knowledge could contribute to the improvement of the malaria prevention, control and treatment activities in the region, and thereby help to reduce malaria-related mortality and morbidity rates. This information, and subsequent actions based on the research findings, could assist Ethiopia to achieve the objectives stated by the Millennium Development Goals (MDGs) numbers 5 and 6 of reducing maternal and child morbidity and mortality rates and eventually to reduce the transmission of malaria by 50% by 2015 (FMoH 2012b:x). Hence, the study would be of interest to the FMoH, Regional Health Bureaus, non-governmental organisation (NGOs) and researchers working in the malaria field.

1.9 STRUCTURE OF THE DISSSERTATION

Table 1.1 Format of the dissertation

Chapter 1	Orientation to the study
Chapter 2	Review of literature
Chapter 3	Research methodology
Chapter 4	Presentation and discussion of the household survey(phase I)
Chapter 5	Presentation and discussion of phase II (HEWs' data)
Chapter 6	Limitations, conclusions and recommendations.

1.10 SUMMARY

This chapter provided a general overview of the study. It addressed the background of the problem, research questions and objectives, provided definitions of key concepts and a brief account of the research design and methodology. Specific techniques of data collection, and analysis and precautions taken to maintain the quality of data were briefly described. An overview of the reviewed literature will be presented in the next chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRUDUCTION

The first chapter provided a general overview of the research. The background, statement of the problem, objectives, research questions and summary of the methodology section were discussed. This section intends to guide the research topic and further inform the researcher about the existing body of scientific knowledge regarding malaria and its prevention and control strategies. Examining methodologies used by previous researchers could be useful to establish the foundation of this study. To this end, details of existing theoretical and empirical research perspectives regarding malaria prevention and control are presented. Specifically, the chapter focuses on the global burden of malaria, the global and local malaria prevention and control strategies, achievements and challenges. Factors affecting malaria prevention and control and the theoretical concepts of the HBM that guided the study are also discussed.

The researcher used various sources of literature in order to compile information relevant to the study. These include international and local journals, WHO and Ministry of Health reports and policies, guidelines, data from the Central Statistical Agency (CSA) of Ethiopia and regional offices were consulted. In addition, the following web-based sources were used:

- http://www.google.com
- http://www.googlescholar.com
- http://www.malariajournal.com
- http://www.pubmedcentral.com
- http:/:who.int/hinari
- http://www.biomedcentral.com

- http//:www.ncbi.nlm.nih.gov/Pubmed
- www.unisa.ac.za/library

The search engines were run by using key words related to malaria such as malaria prevalence, ITN or LLIN utilisation, malaria treatment, malaria prevention and control and each of the HBM constructs, including:

- perceived susceptibility
- perceived threat
- perceived benefit
- perceived barriers
- cues to action
- self-efficacy

2.2 THE GLOBAL BURDEN OF MALARIA

The burden of malaria declined following the implementation of LLITNs and ACT. In Uganda, the prevalence of malaria had declined from 43% in 2004 to 23% in 2010 in rural communities and to 3% in urban areas (De Beaudrap, Nabasumba, Grandesso, Turyakira, Schramm, Boum II & Etard 2011:132). Similarly, the malaria deaths and cases in Rwanda fell by 67% and 55%, respectively among under-fives (Otten, Aregawi, Were, Karema, Medin, Bekele, Jima, Gausi, Komatsu, Korenromp, Low-Beer & Grabowsky 2009). A study conducted in Zimbabwe reported similar progress. The utilisation of ITNs & LLINs among the community members improved significantly and most health facilities provided diagnostic services with RDT in Zimbabwe (Mharakurwa, Mutambu, Mberikunashe,Thuma, Moss & Mason 2013:223).

Consequently, the prevalence of malaria in the community decreased by 39% from 2008 to 2010 in the Mutasa district of Zimbabwe, except that it remained high among specific age groups (under-fives and older persons). These findings have provided evidence that the efforts of RBM in some countries have started showing promising results. The rate of decline is significant when compared with the situation of malaria before 2005. For instance, some eight to nine years ago in Ethiopia and eleven to twelve years ago in Burundi, malaria accounted for 52% to 78% of total deaths in the epidemic sites of these two countries (Guthmann, Bonnet, Ahoua, Dantoine, Balkan, Herp, Tamirat, Leggros, Brown & Checchi 2007:140-143).

The tremendous efforts Ethiopia had exerted on malaria control since 2005 resulted in the decrease of 73% cases and 63% deaths attributable to malaria in 2007 (Otten et al. 2009:14). A low prevalence of malaria, varying with season and altitude zones in highland-fringe areas of Ethiopia, was documented (Woyessa, Deressa, Ali & Lindtjørn 2012:84). The WHO (2010: xi) World Malaria Report also indicated that many countries have shown remarkable improvements in their RBM efforts. According to this report, a total of eleven malaria-endemic countries showed a decline of malaria prevalence and hospital admissions by more than 50% from 2000 to 2010 (WHO 2010:xv). In 32 out of 56 malaria endemic countries outside the African continent, more than 50% overall decrease in malaria cases was achieved between 2000 and 2009. Malaria was eradicated in Morocco and Turkmenistan (a country located in Central Asia) during 2010. The successful achievement in these countries further highlighted a window of hope for other African nations where malaria is known to be a major public health problem (De Beaudrap et al 2011:132; WHO 2010).

Despite these successful achievements in the fight against malaria, there is evidence that malaria remains a major public health problem. In 2009, malaria cases increased in a few African countries such as Rwanda and Zambia, indicating a fragile situation of the malaria control programme (WHO 2010: xii). Globally, malaria caused 8% of deaths among under-fives, of which 25% occurred on the African continent during 2008 (WHO 2010:3). During the same year, 1 298 cases of malaria were reported in the USA with an incidence rate of 0.4 cases per 100 000 population (Hickey, Cape, Masuoka, Campos, Pastor, Wong & Singh 2011:153).

A population-based survey conducted in Bangladesh also reported an overall malaria prevalence of 11.7% which is very high compared to most malaria endemic regions (Haque, Magalhães, Mitra, Kolivras, Schmidt, Haque & Glass 2011:367). Malaria affects 35 million pregnant women per year (Dhiman, Yadav, Goswawi, Das, Baruah & Singh 2012:1-8) leading to an increased risk of low birth weight, intra-uterine growth retardation, preterm delivery, stillbirth and anaemia in developing countries. Houmsou, Amuta and Sar (2010:36-38) have looked at the association between practices of pregnant women and the rate of malaria infection in the Benue State of Nigeria.

According to this report, the non-utilisation of ITNs, and window screens, disposal of the household refuse in the open field near or around the compound were associated with a high risk of malaria infections. Pregnant women who stayed outside during the evening and those who did not use ITNs effectively had an increased risk of malaria infection.

Researchers continue to report that the burden of malaria still prevails in some African countries. Of 109 malaria endemic countries, 45 are from Africa, a continent where malaria kills a child every 30 seconds (Kokwaro 2009:S2). In Uganda, a country where a substantial decline in prevalence of malaria was reported in 2010, the universal coverage of effective RBM activities have not been accomplished yet (Okiro, Bitira, Mbabazi, Mpimbaza, Alegana, Talisuna & Snow 2011:37). These authors reported that the prevalence of malaria remained high in Uganda, especially in the areas with high intensities of disease transmission. The source of the contradicting findings within the same country (De Beaudrap et al 2011; Okiro et al 2011) is associated with the complex nature of the disease. The observed decline might result from the efforts of RBM, but be influenced by the role of environmental factors (such as air temperature and humidity) both on the malaria parasite (plasmodium) and the mosquito vector. This suggests that the occurrence of malaria is influenced by a number of social and environmental factors.

2.3 THE BURDEN OF MALARIA IN ETHIOPIA

As observed in Uganda, studies conducted in Ethiopia also reported discrepant findings regarding progress made in the fight against malaria. For instance, high prevalence was recorded among under-fives (Alemu, Tsegaye, Golassa & Abebe 2011b:173) and any age group where there were insufficient interventions (Alemu, Abebe, Tsegaye & Golassa 2011a:30; Deribew, Alemseged, Tessema, Sena, Birhanu, Zeynudin, Sudhakar, Abdo, Derib & Biadgilign 2010:e10775). Similar findings were reported by another study conducted in three regional states of Ethiopia (Shargie, Ngondi, Graves, Getachew, Hwang, Gebre, Mosher, Ceccato, Ceccato, Endeshaw, Jimma, Tadesse, Tenaw, Reithinger, Emmerson, Richards & Ghereyesus 2010:1-12). According to this report, a significant decline of malaria prevalence was observed following the rapid increase of LLITNs' ownership. Shargie et al (2010:8) indicated that the average prevalence of malaria in the three regions of Ethiopia (Oromia, Amhara & SNNPR) declined from 4.1% in 2006 to 0.4% in 2007.

This rate of decrease in the prevalence of malaria in Ethiopia varied from one community to another. Out of 425 people diagnosed with malaria in Shewa Robit town in central Ethiopia (Abate, Degarege & Erko 2013:312), 85% associated the cause of malaria with mosquito bites, and correctly identified malaria prevention and control methods such as ITNs, IRS, and environmental management. On the other hand, 20% of the respondents had misconceptions regarding the transmission of malaria such as the lack of personal hygiene, cold weather, hunger and body contact with malaria patients. These findings imply that Ethiopia still needs to prioritise the scaling up of interventions targeting behavioural changes to prevent and treat malaria effectively in Ethiopia.

Prevalence of malaria among school children, compared to the general population, was very low. In a survey that involved 20 899 school children from 40 schools in the Oromia region of Ethiopia, 46% reportedly slept under ITNs and only 0.56% tested positive for malaria (Ashton, Kefyalew, Tesfaye, Pullan,Yadeta, Reithinger, Kolaczinski & Brooker 2011:25) and 17.6% of the infected children were anaemic.

An observational study that followed a cohort of 8 121 people for 101 weeks in the southern region of Ethiopia also reported an incidence of 3.6/10 000 person-weeks of observation (Loha & Lindtjørn 2012b:450). According to Loha and Lindtjørn (2012b:450), 29.3% of the confirmed malaria cases occurred among temporary residents. A high rate of malaria infection was observed among males, children aged 5-14 years of age, those who did not use ITNs and households living close to mosquito breeding sites.

Despite its declining trend, malaria still affects a considerable number of people in Ethiopia. A health facility-based study conducted in the northern part of Ethiopia reported that 11.5% of 384 febrile individuals who visited the health centre tested positive for malaria (Alemu, Shiferaw, Ambachew & Hamid 2012b:803-9). According to Alemu et al (2012b:803), the infection was more prevalent among women and 54% of the participants had been infected more than once. These findings imply that social, economic and health factors might impact on repeated infections. Pregnant women are among the high risk groups for malaria infection, probably because pregnant women have lowered levels of resistance so that their bodies do not reject their foetuses.

Similarly, a study that assessed local perceptions and practices of 2 087 women with children under five years of age in central Ethiopia reported important findings related to women's practices of malaria prevention (Deressa & Ali 2009). The study population had a relatively good level of knowledge regarding signs and symptoms of mild malaria. Despite the observed high level of knowledge, only 5.6% of the households possessed at least one ITN and preventive measures were infrequently applied. In the Afar region of Ethiopia, 70% out of 147 pregnant women slept under ITNs (Negash, Haileselassie, Tasew, Ahmed & Getachew 2012:9).

Another health centre-based study, conducted in the Arbaminch town in Southern Ethiopia, reported a malaria prevalence of 22% among the patients who visited the outpatient department of the health centre. A hospital-based longitudinal study, conducted in the same region of Ethiopia, confirmed that malaria cases constituted 34.7% of all patients who had visited the outpatient department of the hospital during 2010. Male patients comprised 60% of the total malaria cases (Asnake 2010).

These findings provide evidence that most of the health facilities in malaria endemic regions of Ethiopia continue to receive large numbers of malaria cases. Though the large scale epidemics have been halted in most endemic areas, the proportion of people affected remain high. Reports from health facilities in malaria endemic regions indicated that malaria infections varied. A ten year (2002-2011) trend analysis of the prevalence of malaria, conducted in the northern part of Ethiopia, showed that malaria infection reached a peak in 2010. Out of 59 208 cases microscopically diagnosed, 39.6% tested positive for malaria (Alemu et al 2012:173).

An analysis of national malaria surveillance data from 2005 to 2008 showed that the average reported annual incidence rate of malaria cases was 23.4 per 1 000 persons (Jima, Wondabeku, Alemu, Teferra, Awel, Deressa, Adissie, Tadesse, Gebre, Mosher, Richards & Graves 2012:330). The incidence rate of malaria was confirmed to be 7.6 per 1 000, while the reported malaria cases among the in-patient admissions and death rate was 6.4 per 1 000 and 2.3 per 100 000 per year, respectively (Jima et al 2012:330). In another health facility-based study conducted in the northwest of Ethiopia during 2002-2011, 40% of 59 208 patients were diagnosed with malaria. These reports reveal that the burden of malaria is generally slightly declining in the country compared to the period preceding 2004. However, the situation in some regions fluctuates with pockets of outbreaks, suggesting that malaria is still a major public health problem in Ethiopia (Alemu, Muluye, Mihret, Adugna & Gebeyaw 2012:173).

In a community-based cross sectional study conducted in a central rural part of Ethiopia, a total prevalence of 8.6% was reported (Bekele, Belayhun, Petros & Deressa 2012:127). Although all persons are susceptible to malaria, evidence shows that the vulnerability varies by some socio-demographic variables such as age and gender. According to a study conducted in a rural hospital in Ethiopia, malaria affected more adolescents younger than 15 years of age (Santana-Morales, Afonso-Lehmann, Quispe, Reyes, Berzosa, Benito, Valladares & Martinez-Carretero 2012:199). Similarly, Ayele, Zewotir and Mwambi (2012:195), conducted a malaria indicator survey in three regions of Ethiopia (Amhara, Oromia, and SNNPRS) and reported that women and children were most affected by malaria ($p<0.05$). A finding reported by Kokwaro (2009:S2) supported the same findings that malaria affects more children under five years of age. This same source indicated that 85% of malaria deaths occurred among children.

Contrary to this finding, a longitudinal study conducted in the southern highland fringes of Ethiopia reported that people over the age of 15 years were more affected by malaria with the highest prevalence rate of 3.6% (Asnake 2010; Tesfaye et al 2011: 153). This study indicated that the pattern of the prevalence decreased from 5.3% at altitudes of 2 100 meters above sea level to 2.7% at altitudes of 2 280 above sea level. These studies did not, however, provide explanations as to why the prevalence of malaria increased faster among the adult population than among the children.

The immune status of the individual is one of the factors determining the rate of malaria infection. People living with HIV in malaria endemic regions might be subject to repeated malaria infections. There is growing evidence that in areas with unstable malaria, HIV-infected persons are at increased risk of developing complicated malaria among adults compared to those without HIV infections (WHO 2005:6). There is also a tendency that fevers, associated with opportunistic infections among HIV-infected individuals, are treated for malaria leading to inappropriate care for HIV patients.

Malaria in HIV co-infected patients can also lead to increased viral load by stimulating the HIV-1 replication through the production of cytokines (Tagoe & Boachie Jr. 2011:662). A study conducted in three SSA countries (Kenya, Tanzania and Malawi) reported the effect of malaria on HIV infection (Cuadros, Branscum & Crowley 2011). These authors reported that people living in high plasmodium falciparum parasite areas are twice more likely to be HIV positive compared to those who live in areas with low plasmodium falciparum parasite areas. Both HIV and malaria contribute to the high burden of disease in SSA, the co-infection of these diseases impose serious burdens on the health systems of these countries.

The variation in prevalence of malaria was also observed with altitude, climate and ecological zones (Deribew et al 2010; Alemu et al 2011:173; Yewhalaw, Bortel, Denis, Coosemans, Duchateau, & Speybroeck 2010a:122). The prevalence, the instability and seasonal variation of malaria transmission depends on altitude and climate change (Alemu et al 2011; Loha & Lindtjørn 2010:166; Tesfaye et al 2011:153). This has brought about the change in modification of behaviour and geographical distribution of the anopheles mosquitoes (and thus also of the plasmodium parasite species) (Alemu et al 2011:173). One of the major concerns about the climatic change is that the condition will increase the transmission seasons of important vector borne diseases, such as malaria, and alter their geographical range. The geographical distribution of malaria is sensitive to temperature and rainfall (EPHA 2011:75-102). This implies that high altitude areas like Addis Ababa, the capital city of Ethiopia, where malaria seldom occurred, also became prone to malaria as the temperature increased.

Plasmodium falciparum and plasmodium vivax, represent approximately 60% and 40% of the national malaria burden, respectively. The other species of plasmodium-plasmodium malarae and plasmodium ovalae contribute less than 1% and are very rare occurrences. According to researchers, these four species of plasmodium - human haemo-parasites are biologically transmitted from one person through the bite of a female anopheles mosquito to the next person.Tesfaye et al (2011:153) noted that 42 species of Anopheles mosquitoes have been identified.

2.4 MALARIA PREVENTION AND CONTROL STRATEGIES

The RBM programme involves a set of integrated strategies such as selective vector control environmental management, diagnosis and treatment, promotion of behavioural changes, and human resources development. These strategies and the level of their implementation are discussed.

2.4.1 Control of mosquitoes (malaria vectors)

According to the WHO (2010:4), the control of malaria vectors aims at protecting people against mosquito bites (through the use of LLINs, ITNs, and IRS) and thereby to reduce malaria incidence and prevalence. In addition to these strategies, researchers continue to identify and evaluate new tools for vector control that could be integrated with existing biomedical strategies within national malaria control programmes (Beier, Keating, Githure, Macdonald, Impoinvil & Novak 2008).

The use of LLINs and ITNs aims at preventing contact between the infective mosquitoes and persons, to repel and incapacitate or kill mosquitoes. Their use, however, varies among different countries. In Nigeria, the use of ITNs for the prevention of malaria is low among the Nigerian youths (Amoran,Senbanjo & Asaqwara 2011:728). These authors identified that perceptions about the effectiveness of ITNs for preventing malaria and the frequency of malaria infections were major factors determining the adoption of ITNs among the youths.

In another survey that involved 811 household heads in the River State of Nigeria,, only 245 (30.2%) households owned LLINs and only 37.2% of those who owned ITNs slept under them the night preceding the survey (Tobin-West & Alex-Hart 2011:133). Consistent trends of low level of ownership and utilisation of ITNs were reported from Asia. Researchers in Vietnam (Grietens, Xuan, Bortel, Duc, Ribera, Nhat, Van, Xuan, D'Alessandro & Erhart 2010:23) reported that half of the local population of the country remained largely unprotected when sleeping in their forest plot huts. These research findings suggest that despite the progress made in several countries, further efforts in countries with a high burden of malaria remain essential.

Malaria prevention, through vector control, becomes effective and sustainable only when ITNs, LLINs and IRS coverage is steadily increased. The WHO (2010) recommends one LLIN for every two persons in the family. Prevention of malaria through the control of vectors is largely influenced by the behaviour of the households in terms of consistently implementing the strategies at the village level. Because of this, many researchers around the world are interested in assessing knowledge and perceptions and practices related to malaria prevention and control. The practices differ vastly even in the same district.

Continuous assessments of behaviour of the households could therefore, provide useful information to inform the decisions about the prevention and control of malaria in specific regions. The number of people who do not associate mosquitoes with malaria is still high in parts of Ethiopia. For instance, 51.2% out of 1 781 respondents interviewed in the Tigray region of Ethiopia did not associate mosquitoes with malaria, though 85.9% owned ITNs (Paulander, Olsson, Lemma, Getachew & Sebastian 2009). Literacy and receiving malaria-related health education and possessing a radio increased a person's likelihood of having good knowledge about malaria. Living in a low lying area, owning a radio and living close to the health post improved the use of ITNs.

An improved level of malaria prevention and control at household level could be achieved more effectively when ITNs and IRS are complemented with different insecticides with highly toxic properties (Okumu & Moore 2011:208). The problem of insecticide resistance can be effectively tackled if the ITN is impregnated with a chemical different from that used for the IRS. However, these combinations might be affected by other factors such as the proportion of the community covered by the interventions and the behaviour of the anopheles mosquitoes (Okumu & Moore 2011:208).

In Ethiopia, LLINs are freely distributed to all households in malaria endemic areas (areas below an altitude of 2 000 metres above sea level). About 489 districts have been targeted for 100% LLIN coverage with at least one net per sleeping place (FMoH 2012:31). Between 2005 and 2007, more than 20 million LLINs were distributed to ten million households. Furthermore, an additional 15 million LLINs were distributed during 2010 and 2011 to replace old ones and maintain the consistency of net utilisation. The country indicated in its national malaria guidelines that the worn-out nets should be replaced every 3-5 years (FMoH 2012:34).

Despite the massive distribution of LLINs in Ethiopia, studies that assessed the possession and utilisation rate of ITNs reported inconsistent results. A national malaria indicator survey conducted in 2011 indicated that 55.2% of the households had at least one mosquito net. According to the survey, net ownership declined from 68.9% in 2007 to 55.2% in 2011 (FMoH 2012:4), while residual insecticide spray (RIS) coverage increased from 20% in 2007 to 46.6% in 2011. Reportedly 64.5% of the under-fives slept under any net among the households who had at least one bed net. This figure was 63.8% for pregnant women.

One-fifth of the under-fives, from households possessing at least one net, suffered from fever during two weeks preceding the national survey of which 51% sought medical care. Similar findings were reported by a study conducted in the southern region of Ethiopia (Batisso, Habte, Tesfaye, Getachew, Tekaligne, Kilian, Mpeka & Lynch 2012:183). Sixty-seven per cent of the 750 households owned at least one net and 60% of those who owned the nets used them. These researchers further reported that 31% of the households discarded nets they had used during the previous three years, considering these nets to be too old (dirty and torn) to use.

In the eastern regions of Ethiopia, two-thirds of 2 867 households had at least one LLIN and only 33.5% of these had used at least one LLIN the night preceding the survey (Gobena, Berhane, Worku 2012:914). Despite the continued supply of LLINs in malaria endemic regions over the last ten years, its coverage has never significantly increased in the country probably due to wastage and misuse of the nets.

Another survey conducted in the eastern part of the country revealed that possession of at least one LLIN and the utilisation rate among the households that participated in the study was 62.4% and 21.5% respectively (Biadgilign, Reda & Kedir 2012). Those who received the nets within the six months preceding the survey were three times more likely to report utilisation of the nets than those who had received their LLNs earlier. Farmers and housewives were less likely to use ITNs compared to merchants while households who reportedly possessed radios were more likely to report consistent use of ITNs (Biadgiligh et al 2012). Similarly, those aged 60 or older, compared to those aged 15-30; daily labourers compared to government employees and those who possessed radios were some of the characteristics of the respondents that explained net utilisation in the Afar region of Ethiopia (Negash et al 2012:9). Furthermore, LLIN non-utilisation was associated with a low level of education, limited awareness about malaria prevention and control methods, inadequate number of separate sleeping rooms and preference of colour of the LLINs (Gobena et al 2012:914).

On the other hand, risk perceptions, sleeping comforts obtained by avoiding mosquito bites, recognition and acceptance of malaria preventive interventions by the community were identified as strong predictors of ITN usage (Koenker, Loll, Reweyemamu & Ali 2013:203). According to these researchers, feeling trapped and experiencing difficult breathing under the ITN were mentioned as reasons for not using ITNs consistently.

A longitudinal study carried out to examine a spatio-temporal pattern of malaria in the south-western part of Ethiopia, did not find any effect of mass distribution of ITNs on the spatio-temporal clustering of malaria (Loha, Lunde & Lindtjørn 2012:e47354). However, malaria infection was affected by IRS. Thus although the malaria prevention and control strategies rely mainly on the ITN distribution, this might not achieve the desired results in the expected reduction of prevalence of malaria, unless different preventive methods are combined such as using both ITNs and IRS.

2.4.2 Environmental management

Environmental management, as a means of preventing malaria, involves the modification of the physical environment with the purpose of making it not conducive for the breeding and resting of mosquitoes. The effective implementation of environmental management strategies of malaria control could sustainably reduce the risk of malaria infection among the population concerned.

A study conducted in the Jimma zone of Ethiopia reported that children living within three kilometres from a man-made water reservoir were at increased risk of malaria infection compared to those living at least five kilometres from such mosquito breeding sites (Yewhalaw, Legesse, Bortel, Gebre-Selassie, Kloos, Duchateau & Speybroeck 2009:21). This means efforts to eliminate malaria in localities near dams and other water sources face practical challenges of combating mosquito breeding sites at the water surfaces. The health impact of the intervention strategies, therefore, needs to be periodically assessed through potential vector surveys and medical screening.

Construction and operational phases of future water resource development and management projects must be integrated with malaria prevention programmes (Yewhalaw et al 2009:22; FMoH 2012:18). This should ensure that water storage facilities are not within dangerous distances from people's dwellings and/or that these water sources are adequately covered and controlled to prevent mosquitoes from breeding at these sites. In areas where environmental management is impossible, larvicides are used to control the breeding of mosquitoes. Similar to environmental control measures, the success of larvicides depends on the identification of all mosquito breeding sites and their distribution in the entire target area, followed by sustained weekly spraying of chemicals. Larvicide control measures should be applied in conjunction with environmental control measures.

The most common water-soluble chemical used to kill mosquito larvae in Ethiopia is Temephos, also known as Abate (FMoH 2012:19). It is a water-soluble chemical used to kill mosquito larvae in stagnant waters difficult to drain. Larval control through the use of Temephos is effective and preferable in areas where agricultural activities rely on irrigation. Considering its high cost and requirement for repeated spraying, Temephos is recommended for use in relatively small areas. The chemical is safe to humans when used in the recommended doses (FMoH 2012:19).

2.4.3 Chemoprophylaxis

Chemoprophylaxis is one of the malaria control methods designed especially for non-immune individuals travelling from non-endemic to malaria endemic regions. At present, health workers advise all persons travelling to such areas to avoid mosquito bites, specifically by using mosquito repellents and sleeping under LLINs at night. Chemoprophylaxis is an option and mefloquine and atovaquone-proguanil are used as anti-malarial chemoprophylaxis recommended for travellers to Ethiopia (FMoH 2012:74; Wiltz, Crawford & Nichols 2008:53).

The FMoH of Ethiopia (2012a:135) recommends that any person travelling from non-malaria endemic regions to Ethiopia to take 5mg/kg of mefloquine hydrochloride (larium) once weekly beginning two weeks before the visit and continuing for four weeks after leaving the country. Though many people can take larium without any problem, it might cause side effects such as feeling restless or anxious, being confused or frightened, hallucinations, vomiting, allergic reactions and/or fever.

Atovaquone-proguanil (malarone) is also taken based on the weight of a person (FMoH 2012:135). A 62.5mg/25gm (1 paediatric tablet daily); 125mg/50mg (2 paediatric tablets daily); 187.5mg/75mg (3 paediatric tablets daily); and 250mg/100gm (1 adult-strength tablet as a single daily dose) is recommended for 11-20kg, 21-30kg, 31-40kg, for more than 40kg, respectively. Malarone might cause side effects such as skin rashes, tiredness, increased sensitivity to the sun, seeing, hearing, or feeling things that are not there (hallucinating) and liver failure. Chemoprophylaxis is not recommended for persons living in malaria endemic regions in order to prevent the development of resistance to pharmacological treatments.

In Ethiopia, the antenatal care (ANC) coverage remains low. Only 34% of the pregnant women make the first (ANC) visits attended by skilled health professionals such as doctors, nurses and midwives (CSA 2012:14; PMI 2012:31). Because of the low coverage of ANC services, intermittent preventive treatment (IPT) for pregnant women is not part of the malaria prevention and control strategies in Ethiopia. Malaria prevention and control among pregnant women, rather follows scaling up of the universal LLIN coverage and their utilisation and prompt diagnosis and treatment of clinical cases among pregnant women. The President’s Malaria Initiative (PMI)-Ethiopia, however, is trying to address malaria prevention and control among pregnant women through safe motherhood and focused ANC initiatives.

Immunisation of the population at risk of malaria is another growing prospect as part of preventive strategies in the future. Global efforts have continued for more than 40 years to develop immunisation and provide additional tools for the prevention of malaria. So far more than 20 different vaccines have been researched at stages I or II (Targett, Murphy & Brown 2013:362). However, one of the vaccines (RTS,S/AS01) has reached stage III of the clinical trial showing a window of opportunity (WHO 2012:33) for possible prevention of malaria. The immunisation programme targets mainly children in malaria endemic regions aged 6-14 weeks and 5-17 months. According to the WHO, RTS,S/AS01 is expected to become available to the WHO during 2014. The success of the vaccine is expected to provide another landmark step towards the goal of eradicating malaria.

Although there is no currently licensed malaria immunisation (WHO 2013:34), some researchers have begun to assess the perception of the community and their intention to use immunisations. A study conducted in the Kintampo district of Ghana, did not find any cultural barriers that might hinder the acceptance of malaria immunisation (Febir, Asante, Dzorgbo, Senah, Letsa & Owusu-Agyei 2013:156). About 77.6% of the respondents said that they would spontaneously accept the immunisation while one-sixth expressed their willingness to promote it. Although more similar studies are required in different cultural settings, these findings are encouraging.

2.4.4 Diagnosis and treatment

Proper management of a person suffering from malaria enhances the cure of the patient within a reasonably short period of time, promoting malaria control activities. If fewer people suffer from malaria within any community at a specific time, mosquitoes will bite fewer infected people and therefore infect fewer people. The WHO (2010:25) recommends that all persons in endemic areas, with suspected malaria infection, should receive a parasitological confirmation of diagnosis by either microscopy or RDT. In 2009, a total of 16 African countries started distributing RDTs at community level. The number of RDTs distributed has increased rapidly from less than 200 000 in 2005 to about 30 million in 2009, with most RDTs (44%) being used in SSA. The number of patients tested, using microscopic examinations, fell from a peak of 165 million in 2005 to 151 million in 2009.

The sensitivity and specificity of the RDTs is an important factor that determines the success of the management of malaria at health facilities. The techniques widely used to diagnose malaria such as RDT and microscopy were reported to have low specificity and sensitivity for low parasitaemia levels compared to the polymerase chain reaction (PCR) (Golassa, Enweji, Erko, Aseffa & Swedberg 2013:352). Despite its high sensitivity, the latter is not widely used in routine patient management in resource scarce countries, including Ethiopia (FMoH 2012:57), as the technique requires skilled personnel and is unavailable in most health facilities such as health posts and health centres.

In Ethiopia, diagnostic testing for malaria has been expanded to all public health sectors, with the goal of achieving universal diagnostic testing for all cases of suspected malaria (PMI 2012:32). HEWs have been trained to use RDTs in order to provide both diagnostic and curative services at the village level during the patient's first visit to the healthcare services with malaria symptoms. The FMoH of Ethiopia has managed to reach the most affected populations over the past five years. The recent diagnostic shifts from presumptive to RDT/microscopy confirmed diagnoses, and prescription of anti-malaria treatment to patients has improved the case management success rate. However, this shift should be supported by a comprehensive technical support system, including training opportunities and regular clinical supervision, to support and sustain the improved outcomes (Pulford, Mueller, Siba & Hetzel 2012:157).

At the end of 2009, 89% of the countries with P. falciparum, including Ethiopia, had adopted Artemisinin-based combination therapy (ACT) as a national policy for first-line treatment. Globally, the number of ACT treatment courses increased from 76 million in 2006 to 158 million in 2009 (WHO 2010:28).

In Ethiopia, P falciparum and P vivax species are responsible for 60% and 40% of the malaria infections respectively (FMoH 2012:48). The country has adopted Artemether-lumefantrine (AL) as a first line treatment policy for uncomplicated, unconfirmed and confirmed P falciparum malaria. An AL tablet containing 120 mg artemether plus 20 mg lumefantrine is used in the treatment of malaria in Ethiopia. A dose of 1, 2, and 3 tablets in the morning and in the evening (twice a day) for 3 days is administered for age ranges of 4 months to 2 years (5-14 kgs), 3-7 years(15-24 kgs), and 8-10 years (25-34 kgs), respectively. Four tables are administered twice a day for three days to persons suffering from malaria if they are older than 10 years of age and weigh at least 35 kgs (FMoH 2012:110).

Chloroquine remains the first alternative for the treatment of P vivax malaria in Ethiopia. For infants <5 kg of body weight, pregnant women in the first trimester, and severe malaria cases, oral quinine is administered (PMI 2012:35; WHO: 2010:168). An oral quinine sulfate dosage of 600 mg three times a day for seven days is given for adults 14 years of age and over, while the dosage for children aged between two months to 13 years varies based on the body weight (FMoH 2012:112).

Ethiopia established the health extension package to provide universal health coverage to the population through the construction of community health posts staffed by two paid front line HEWs. By the end of 2009, 15 000 health posts had been built and staffed with 30 000 HEWs who confirmed suspected malaria cases using RDTs. Depending on the RDT results, cases are then treated with either AL or chloroquine depending on the type of the species. However, RDTs were commonly out of stock at the health posts, and a substantial proportion of malaria cases had to be clinically diagnosed and presumptively treated by the HEWs. Referral systems were weak and pre-referral treatment was not available till the middle of 2011 (PMI 2012:36). The FMoH has made available the multi-species RDTs in all health posts located in malaria endemic areas and instituted a system for referral of complicated malaria cases from health posts to health centres (FMoH 2012:44-45).

Malaria at the health facility level is suspected when a patient presents with a fever or history of fever during the last 24 hours and lives in or has travelled to an area with malaria endemic sites, within the last two weeks. Laboratory results guide clinical management given that microscopy (at health centres and hospitals) or RDTs (at health posts) are available. The HEWs provide the diagnostic and treatment services for all types of malaria species at the health post level. The HEWs use multi-species RDTs (available at most health posts) to diagnose and identify the species of plasmodia. In the absence of diagnostic facilities at the health facilities, health workers assess for signs and symptoms of severe malaria. When danger signs are observed, the guidelines recommend treatment with AL.

If danger signs are present, current Ethiopian national guidelines instruct the health worker to administer rectal artesunate (at 10 mg/kg body weight), a first dose of intramuscular artemether (3.2 kg/kg body weight for the first day and 1.6 mg/kg body weight for the second and third day), or injectable quinine intra-muscular (20 mg salt/kg body weight divided into 2 sites - one in each thigh; rest for next 4 hours and 10 mg salt/kg body weight IM into thigh) or artemether, and refer the patient to a health centre (FMoH 2012:117; PMI 2012).

In order to further boost the effectiveness of malaria case management, researchers suggest that any drug administration programmes need to be linked with vector control (Gosling, Okell, Mosha & Chandramohan 2011:1617). In order to eliminate malaria, programmes should sustain the gains, through the administration of drugs combined with vector control and the use of ACT (Gosling et al 2011:1617).

Reduction in mortality was achieved by using ACT for the treatment of uncomplicated malaria and the effective case management such as parenteral quinine for the treatment of severe P falciparum malaria among under-fives (Thwing, Eisele & Steketee 2011:S14). These authors suggest the development of standardised indicators, to measure population coverage of the interventions, correctly estimated the reduction of mortality in children due to the scale-up of these interventions.

2.4.5 Information, education communication (IEC) and behaviour change communication (BCC)

An individual's behaviour is one of the factors that determine his/her health conditions. For instance, substance use, smoking, unsafe sexual intercourse are risky behaviours that increase the risk of illness. Such undesirable behaviours need to be modified through the adoption of the appropriate health-related behaviour. BCC and IEC are the approaches increasingly used in health promotion strategies to bring about positive behavioural changes enabling individuals to implement and sustain health-related actions.

Health behaviour change is a process of abandoning health-compromising behaviours in favour of adopting and maintaining health-enhancing behaviours. BCC is a process of working with individuals, families and communities through different communication channels to promote positive health behaviours and support an environment that enables the community to maintain adopted positive health behaviours (Garman, Teske & Crider 2010:171). IEC is a technique of working with individuals or communities with the aim of spreading knowledge and information throughout the community.

The Behaviour Change Model (BCM) is useful for understanding how an individual's health behaviour is influenced (Garman et al 2010:171) and it has five consecutive stages:

- The first or 'pre-contemplation' stage is where a person or a community is unaware of the existence of any health-related problem and never thought of change. At this stage a person is not interested in change and may deny that a need exists. Creation and increasing the level of awareness is applicable at this stage as the first stepping stone up the ladder of the behaviour change communication.
- The second stage is the 'contemplation' stage where a person recognises a need for change and begins to think about the possibility of behavioural change in the near future. Individuals at this stage require encouragement and motivation to make specific plans.
- Decision making or preparation is the third stage when a person exhibits commitment and readiness for behavioural change. Individuals at this stage need some assistance to enable them to make concrete action plans with clear goals.
- The fourth stage is the' action' stage in which the person initiates the target behaviour. At this level, a person should be assisted with positive feedback and encouragement from his/her significant others to increase his/her likelihood of proceeding to the behavioural change.
- The fifth stage is the 'maintenance' of the achieved behavioural change avoiding the possibility of defaulting. At this stage the person develops coping mechanisms and could be guided towards alternatives to sustain the desirable behavioural change.

Success of the RBM programme requires positive behaviour changes at individual, household and community levels for preventing and controlling malaria. Because of this, the BCC/IEC is one of the malaria prevention and control strategies implemented by the RBM programme in Ethiopia's malaria endemic regions (WHO 2012:4). Researchers recommend and strengthen this strategy to create more awareness about the risk of malaria. The BCC/IEC could play a pivotal role in clearing misconceptions and in improving the effectiveness of public health messages in malaria endemic areas.

The effect of household heads' training in the use of ITNs by the households was evaluated. The finding indicated remarkable outcomes.

The prevalence of malaria among children from household heads who had received training was 0.42 times less likely compared to those from household heads who had no training (Deribew, Berhanu, Sena, Dejene, Reda, Sudhakar, Alemseged, Tessema, Zeynudin, Biadgilign Deribe 2012:8). Children from the intervention group were 0.84 times less likely to be anaemeic. This evidence indicates that targeted training can lead to achievements in the fight against malaria, especially in regions with wide ranging misconceptions about malaria. Thus, conventional and context-sensitive health education messages and prevention strategies need to be considered. Therefore, carefully designed BCC/IEC is required to make malaria prevention efforts more effective (Grietens et al 2010:23).

2.4.6 Human resources/capacity building

Human resource development is vital for the success of organisational goals. All the malaria prevention and control strategies implemented by RBM programmes require persons with the necessary skills. On-the-job training and career development opportunities, coupled with a pleasant working environment, are some of the factors that motivate workers involved with malaria prevention activities. Lack of these opportunities might have negative implications for the programme.

A study was conducted in Tanzania to assess the level of satisfaction of health workers assigned to malaria prevention programmes among pregnant women (Mubyazi, Bloch, Byskov, Magnussen, Bygbjerg & Hansen 2012:48). The respondents expressed dissatisfaction with their work settings (mainly due to a lack of motivating factors, poor infrastructure, unfriendly supervisors and poor relationships), which in turn affected their work performance negatively. Lack of motivation through training, lack of technical support, and incentives paid to malaria workers could have undesirable consequences such as inappropriate prescriptions and recommendations of curative or prophylactic drugs (Thiam, Kimotho & Gatogna 2013:353).

In a study conducted in India, 80% of health workers providing curative services, had the necessary knowledge they needed to use RDT and only 51% had been trained in the case management of malaria. The study revealed that 71% of the malaria patients were referred because of lack of malaria drugs (Hussain, Dondona & Schellenberg 2013:351). Such a lack of resources at the health facilities poses unnecessary delays, and unnecessary costs, in the treatment of malaria.

In most malaria endemic countries, village malaria workers contribute to the fight against malaria. In this regard, Hasegawa, Yasuoka, Ly, Nguon and Jimba (2013:292) reported that Cambodia provided a good example. They indicated that the duration of experiences of village malaria workers and the quality of services they provided influenced household caregivers to use these services during any child's illnesses. This suggests that RBM programmes should maintain good quality health workers and employ staff development and motivation strategies in order to enable the RBM programme to attain its objectives (Mubyazi et al 2012:48).

Malaria endemic regions should therefore, give due emphasis to the human development plan as one strategy of fighting malaria. A human resource development plan not only speeds up the achievements of the set goal, but also ensures the sustainability of the programme. RBM partners, stakeholders and local authorities have to encourage and facilitate the development of career opportunities for persons working in malaria prevention and control sectors (Kokwaro 2009:S2; Shiff, Thuma, Sullivan & Mharakurwa 2011:220).

Healthcare workers' levels of knowledge and expertise about malaria prevention strategies also affect the programme's success rates. A study conducted in Laos in Nigeria, and three African countries (Ghana, Senegal and Tanzania) revealed that only 13% of the healthcare providers, who participated in the assessment of knowledge and practices related to ITN utilisation, correctly answered all five knowledge-related questions (Hoffman, Guindon, Lavis, Ndossi, Osei, Sidibe & Boupha 2011:364). Similarly, only 2% of the health care providers (general practitioners, specialist physicians, registered nurses and other health care workers) performed all five clinical malaria practices according to established evidence. Training and the ability to read English were associated with observed good knowledge and practices.

Participation in prevention activities and the level of awareness of the local community about malaria is an important factor that should never be neglected. Interactions between the community and its leadership, and health care providers are important for successful malaria diagnosis, treatment and case management (Tynan, Atkinson, Toaliu, Taleo, Fitzgerald, Whittaker, Riley, Schubert & Vallely 2011:204). These authors further recommend that as malaria continues to become less common, unique motivators should be used to encourage communities to seek early diagnosis and treatment, particularly as other fever-related health conditions become increasingly more common.

2.5 CHALLENGES IMPACTING ON MALARIA PREVENTION AND CONTROL ACTIVITIES

Numerous challenges can impact negatively on the success of the RBM programme. Socio-demographic, economic, health service-related, environmental factors will be addressed in this section. The development of resistance by P falciparum and of mosquitoes to insecticides is also addressed.

2.5.1 Socio-demographic and economic factors

Despite the achievements in the prevention and control of malaria in reducing mortality and morbidity, the campaign faces several challenges that may affect the programme, especially in low income countries. Malaria has caused serious damage to the growing economies of developing nations. For instance, the disease costs more than 12 billion USD for Africa every year which is equivalent to 40% of the budget allotted for health services for the entire continent (Kokwaro 2009:S2).

In Ghana, Tanzania, and Kenya, malaria causes significant nation-wide annual economic losses estimated at 37.8, 131.9 and 109 million USD, respectively (Sicuri, Vieta, Lindner, Costenla & Sauboin 2013:307). At the household level, it costs one-quarter of the total household income including loss of earnings and treatment of the disease. Overall, malaria alone causes an average loss of 1.3% of economic growth per year in Africa (Kokwaro 2009:s2). The household level cost significantly increases for complicated forms of malaria compared to uncomplicated episodes among the children (Sicuri et al 2013:307). In South Africa and Mozambique, households on average spend 2.30 and 6.50 USD per malaria episode respectively (Castillo-

Riquelme et al 2008:108). Half of the cases in Mozambique temporarily stopped their activities for an average of 4.4 to 7 days per episode and labour of 24% of the cases was substituted (Castillo-Riquelme et al 2008:109), implying that many people lost their jobs due to their job absence as a result of malaria episodes.

De Beaudrap et al (2011:132) reported that malaria affects more rural than urban communities. Urban populations have a 47% low risk of malaria infection compared to 13% low malaria risk for the rural people. The figure for no risk was 34% and 3% respectively for urban and rural people, according to Cairns, Asante, Owusu-Agyei, Chandramohan, Greenwood and Milligan (2013:355). Research evidence from Uganda shows that only 48.6% of the respondents had demonstrated a good level of knowledge about IRS and 74.4% perceived IRS to be beneficial while 66.4% perceived that it might have negative effects (Ediau, Babirye, Tumwesigye, Matovu, Machingaidze, Okui, Wanyenze & Waiswa 2013:170). Urban residents were 1.92 times more likely to have a good level of knowledge about IRS compared to rural residents. The odds of having better knowledge about IRS were 4.8 times higher among those who completed at least secondary education compared to those who completed primary education (Ediau, et al 2013: 176). This shows the important role of education in the fight against malaria. Urban people are more informed about malaria and enjoy better socio demographic advantages (in terms of income, access to education, and access to basic health services) than their rural counterparts and thus, seem to put malaria preventive strategies into practice. These reports further show the important role of poverty as a risk factor for malaria infection and highlights unexplained heterogeneity in spatial structures as related to the prevalence of malaria.

Communities with poor socio-economic status are at risk of having a high incidence of malaria. According to West, et al (2013), poor people are at increased risk of malaria, because of less access to preventive measures and health care, poor housing conditions that increase entry of mosquitoes, and high susceptibility due to poor health and diet. Similarly, Ayele, Zewotir and Mwambi (2012:207) reported a positive association between individuals with poor socio-economic conditions and malaria infection.

Children and women, who are more affected by poverty, are therefore, the most susceptible group to malaria. For most SSA countries with low economic status the association of malaria with poverty could pose a huge challenge to efforts of eliminating malaria. The evidence of the relation between malaria and poverty imply that poor people are more likely to spend their limited resources on priority needs such as food rather than on malaria prevention materials like ITNs or mosquito repellents. Families with low socio-economic status might find it more difficult to reach healthcare facilities because of transportation and treatment costs.

2.5.2 Health services and infrastructure

Health service coverage in many resource scarce countries remains limited, further compounding malaria prevention and clinical intervention programmes. The rapid development of severe malaria was also associated with blood group 'B' (Panda, Panda, Sahu, Tripathy, Ravindran & Das 2011:309), though it requires further investigations in Ethiopia. A survey conducted in Bangladesh reported that the proximity of households to health facilities, that offer malaria treatment services. and the availability of the drug vendors were associated with the choice of the inhabitants for malaria treatment at health posts (Haque, Hashizume, Sunahara, Hossain, Ahmed, Haque, Yamamoto & Glass 2010:156; Panda et al 2011:309; Thiam et al 2013). This suggests that households residing closer to health facilities could be better informed about treatment options than those living far from health facilities.

Many pregnant women in developing countries commence antenatal care (ANC) services late during their pregnancies, limiting the effectiveness of IPT. In addition to that, lack of adequate supervision of health facilities at peripheral areas limit the feedback from which the health workers, functioning at the grass roots levels, could benefit. Evidence from Tanzania shows that health workers in these facilities lack motivation and adequate technical support (Mubyazi, Bygbjerg, Magnussen, Olsen, Byskov, Hanson, & Bloch 2008:135). Shortage and disproportional distribution of qualified health professionals, particularly in urban versus rural health services, is another factor that may affect the programme's successful implementation (Mubyazi et al 2008:135).

Inadequate supplies of drugs, diagnostic tests, insecticides, equipment and infrastructure, as well as weak technical guidance have been recognised as providing bottle necks limiting the successful implementation of malaria prevention and control strategies (Mills, Lubell, & Hanson 2008:S11). Especially drug vendors, who supply anti-malaria drugs without appropriate malaria diagnostic facilities, could lead to drug resistance which has already been the case in some Asian countries such as Bangladesh (Haque et al 2010:157). Insufficient resources such as a lack of finances and infrastructure might decelerate the pace of scaling up the RBM programme (Thiam et al 2013). This discourages the health seeking behaviour of especially the rural communities who live far away from the health facilities. Lack of good organisational leadership and governance in the health facilities are important factors determining the success of the management of malaria cases.

2.5.3 Environmental factors

Environmental conditions play a significant role in the occurrence of health and health-related conditions. It affects the breeding, growth, survival and longevity of the vectors and disease agents. Distribution of malaria is affected by altitude, climate, and humidity of the air, vegetation and the availability of water (EPHA 2011:98; Kloos & Woldu 2006:10;25). Ethiopia has an environment with a complex ecological diversity which may affect the malaria prevention and control strategies. Sheffield and Landrigan's (2011:291) findings confirm the importance of considering the nature of the physical environment while planning malaria prevention and control activities. This evidence shows that the expanding occurrence of diseases transmitted by vectors, including malaria, is linked to the changes in weather conditions. This implies that malaria prevention and control programmes in the regions where malaria expands, in reaction to climatic changes, require more resources which might be unaffordable in poor countries in the absence of additional donor support.

To address this challenge, these authors recommend that the disease prevention strategies, aiming at reducing health impacts of climatic change, need to consider the means of overcoming these undesirable environmental factors through integrated and diverse public health intervention plans (Sheffield & Landrigan 2011:292).

The condition of households is one of the factors determining the consistency of ITN use by specific individuals, especially pregnant women and under-fives. In resource-limited countries, the sleeping places are not suitable for hanging the nets appropriately over the beds. Poor rural households reportedly spend significantly less on all forms of malaria prevention strategies compared to their richer urban counterparts. In these settings, the number of rooms per household is limited and in some cases, shared with domestic animals. Prevention of malaria in such communities is one of the challenges facing the malaria control programmes in Africa (McElroy, Wiseman, Matovu & Mwengee 2009:95).

The changing vector behaviour influencing the expansion of malaria to previously non-endemic regions (mostly high altitude areas like Addis Ababa in Ethiopia) impose new challenges on strategies to eliminate malaria. This necessitates focus not only on the known main vector species. Furthermore, preventive mechanisms of malaria transmission in the early evening and in the early morning, when the treated bed net cannot be used, might need to be developed for areas where people cannot afford insecticides and/or insect repellents (Bortel, Trung, Hoi, Ham, Chut, Luu, Roelants, Denis, Speybroeck, D'Alessandro & Coosemans 2010:373).

2.5.4 Resistance of falciparum species to anti-malaria drugs and of mosquitoes to insecticides

According to Kokwaro (2009), the inappropriate administration of the anti-malaria drugs could be one of the potential challenges facing the programme. Resistance of P falciparum to many drugs such as chloroquine, sulphadoxine-pyrimethamine, modiaquine, mefloquine and quinine (Kokwaro 2009; WHO 2010:4-35) presents major challenges affecting successful case management. In Ethiopia, the indiscriminate distribution of anti-malarial drugs in communities, by illegal drug dealers and individuals' habits of self-treatment for malaria with drugs of unknown quality, compounds the problem of drug resistant malaria in Ethiopia. Many Ethiopians seem to prefer drug vendors but they cannot perform proper malaria diagnostic tests. However, many Ethiopians are unable to afford diagnostic costs at private health facilities and might encounter non-functional RDTs at public health facilities. Indiscriminate use of anti-malaria drugs could result in incomplete treatment, contributing to drug resistance and jeopardising malaria control efforts (Haque et al 2010). The continuous development of mosquitoes' resistance to insecticides, especially to ACT, poses a huge challenge to malaria preventive efforts (Yewhalaw, Wassie, Steurbaut, Spanoghe, Bortel, Denis, Tessema, Getachew, Coosemans, Dichateau & Speybroeck 2011:e16066).

2.6 THE THEORETICAL ORIENTATION

A theoretical orientation provides direction to the study. Prior to presenting the theoretical perspectives of this study, a brief account of the relevant theoretical grounds will be discussed.

2.6.1 Introduction

Many researchers have used different models to learn about behavioural aspects of health and disease among the human population. For instance, the Theory of Reasoned Behaviour (TRB), Theory of Planned Behaviour (TPB) and the Health Belief Model (HBM) are the most common ones. The former two theories emphasise theoretical concepts concerned with the likelihood that an individual exhibits a particular health-related behaviour (Montano & Kasprzyk 2008:68).

The TRA and the TPB are based on the assumption that the intention to perform a particular behaviour is the best predictor of an individual's behaviour. Montano and Kasprzyk (2008:68) further explain that these theories focus on the three behavioural components. These include attitudes, subjective norms (a person's opinion about whether significant others believe she/he should perform the behaviour) and perceived control. Human attitudes, in turn, are determined by a person's beliefs about the consequences of performing certain behaviours and subjective norms determined by beliefs about the opinions of specific others. These constructs explain the large variability in behavioural intentions such as performing positive health-related behaviours. TPB is an extended form of the TRA and includes one additional behavioural component - namely perceived control.

The TPB indicates that not only attitudes and subjective norms determine behaviour, but also perceived behavioural control, implying one's perception that the behaviour is difficult to perform might cause the person not to implement the required behaviours (Gorin 2006:42). Therefore, Gorin and Arnold (2006), conclude, human intentions generally are determined by attitudes, subjective norms and perceived behavioural control. Behaviour is thus the outcome of the complex interactions of these determining factors. Measurement of these factors, regarding the HIV/AIDS epidemic, appears to be very important in the light of designing effective intervention programmes.

2.6.2 The Health Belief Model

The HBM was developed during the 1950s, initially to assess health service utilisation rates and later applied to health and health-related human behaviours particularly about TB testing. It is one of the most frequently used health behaviour models (Gorin 2006:56). The model provides a checklist used to choose points that need emphasis in conveying health messages and in designing health interventions. The messages communicated by the HBM aim at convincing people to carry out health actions. The application of the HBM reportedly successfully changed behaviours increasing the use of preventive health services such as the utilisation of screening and immunisation services (Day, Dort & Tay-Teo 2010:60). Since its early application, researchers have used the HBM to predict and explain health behaviours and design interventions for infectious and chronic health problems (Farsi, Jabari-Moroui, Ebabi & Asad Zandi, A. 2009:61; Mohammed, Ali & Rouhani Tonekaboni 2009:29).

Hazavehei, Taghdisi and Saidi (2007) used the HBM for the prevention of osteoporosis among middle school girls in Iran. The HBM provided a useful framework for understanding individual differences in health behaviour, and for designing interventions to change behaviour. According to Day et al (2010), the HBM effectively guides one to get sufficient insight into how an individual takes actions related to disease prevention. Day et al (2010:60), however, criticised the model for its difficult application. Day et al (2010:60) argued that the model focuses only on four domains of threat and shallowly addresses the rest of the behavioural components which are equally important in behavioural studies. Despite these views, the HBM still has wide health-related applications and contains the following six interrelated domains:

perceived susceptibility, perceived threat, perceived benefit, perceived barriers, cues to action and self-efficacy.

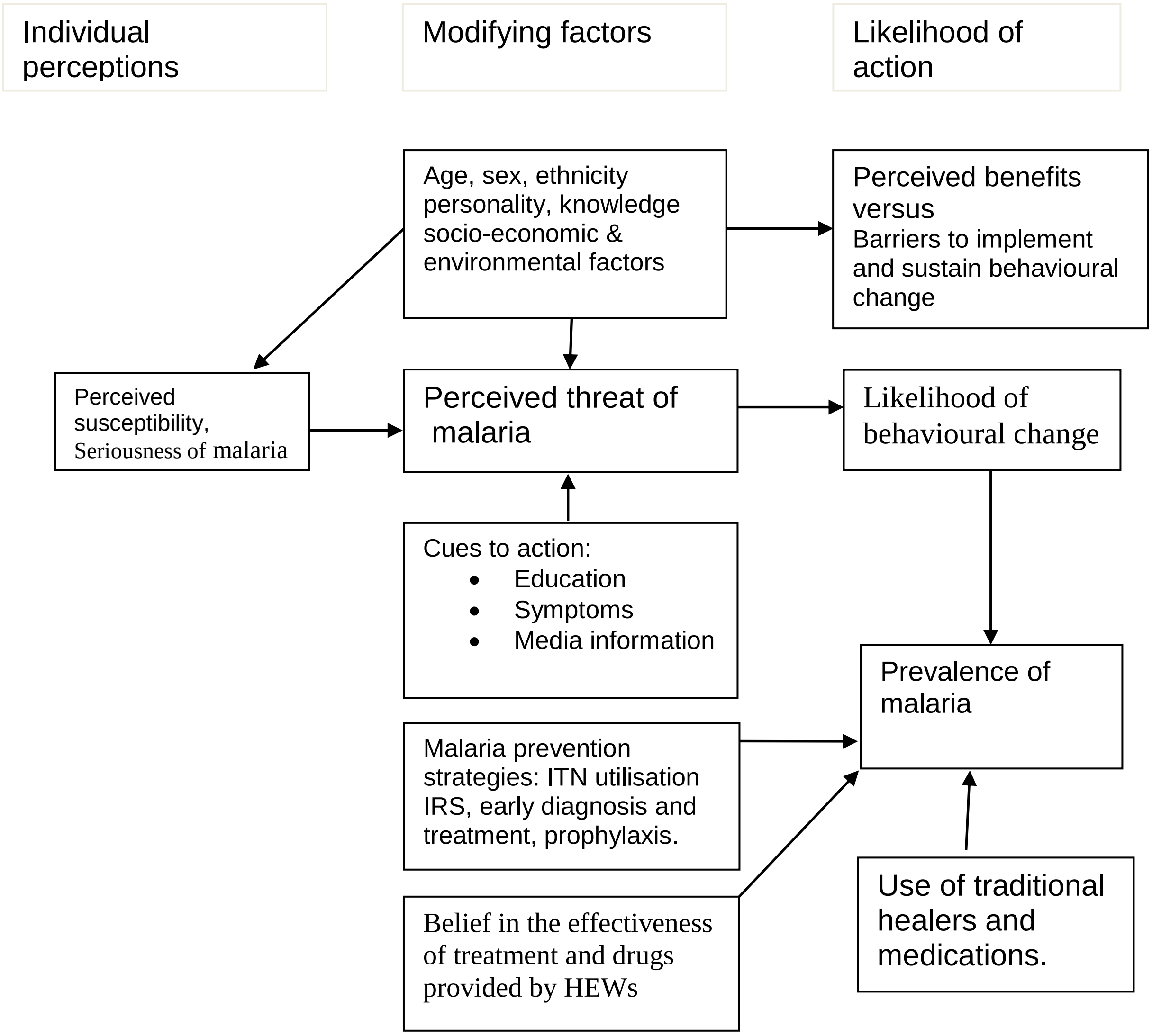

Figure 2.1 Conceptual framework adapted from the Health Belief Model

Source: (Glanz, Rimer and Lewis 2002:52; Glanz, Rimer and Viswanath 2008:45-62)

2.6.1.2 Socio-demographic, economic, and environmental factors affecting malaria prevention and control

Demographic characteristics like age, sex, level of awareness and behaviour of a person are some of the factors affecting his or her health status. A case-control study conducted in Yemen provided sufficient evidence regarding factors affecting the occurrence of malaria and its severity (Al-Taiar, Jaffar, Assabri, Al-Habori, Azazy, Al-Gabri, Al-Ganadi, Attal & Whitty 2008:762). Under-fives were found to be more likely to develop severe forms of malaria. As the age of children increased from 1-7 years, the risk of developing severe malaria dropped from 0.90-0.37 compared to those who were 6-12 months old (Al-Taiar et al 2008:768). Environmental factors such as physical accessibility of the households to a nearby health facility, presence of dams or pools and any other man-made water collections in the settlement areas were associated with episodes of malaria in a given community.

Knowledge of malaria is another factor that influences the extent to which a person is involved in the preventive measures. Ahmed, Haque, Haque, and Hossain (2009:173) have found that there are significant numbers of inhabitants in malaria endemic areas who have insufficient knowledge about the transmission of malaria, its prevention and treatment. Such insufficient levels of knowledge about malaria determine the practices of the person about measures he/she takes to prevent infections. According to Al-Taiar et al (2008:768), involvement of the household members in malaria prevention activities, like burning mosquito coils, were inversely associated with the risk of severe malaria which is affected by the knowledge of a person regarding decision making and actions taken when one is infected.

2.6.1.3 Perceived susceptibility

Perceived susceptibility is defined as the level of an individual's belief regarding his or her risk of having a particular disease or it is one's opinion of one's chances of getting a condition (Hazavehei et al 2007; Day et al 2010). The underlying principle in this domain is that if a person believes that his or her chance of getting the problem is low, the probability that such a person will take part in the prevention of the exposure is low. Therefore, perceived susceptibility is one of the important determinants of whether or not a person believes that the problem could happen to him or her (Ali & Tonekaboni 2009:29-36). Malaria infection exists almost during all seasons of the year in endemic areas. Household members in these areas, therefore, actively and consistently engage themselves in prevention activities only if they think that they can possibly be infected by malaria. The level of one's perceived susceptibility to malaria is affected by his/her knowledge about how malaria is transmitted. In the current study, this construct will be used to assess the extent to which households in malaria endemic districts perform malaria prevention and control activities such as ITN utilisation, IRS, environmental management and timeous visits to healthcare facilities.

2.6.1.4 Perceived threat

Perceived threat is one's opinion of how serious a condition and its sequelae are. It is another domain of the HBM that determines whether or not an individual believes that the problem or disease is very serious. The term is used interchangeably with "perceived severity." If people do not think that a problem or disease is serious or annoying, they might not take action to prevent it. Several researchers have assessed this behaviour in relation to the risk of malaria infection (Hailesellasie, Hailu, Seifu, Nigatu & Deressa 2008:12; Farsi et al 2009:61; Ali & Tonekaboni 2009:29). According to Hailesellasie et al (2008), malaria was perceived as a threat by almost all respondents, but only one-third of the vulnerable family members used ITNs in Ethiopia. In that study, 'perceived threat' was not a powerful predictor of malaria preventive behaviours. Perceived severity was identified as a weak predictor of the health behaviour as compared to sick-role behaviour. In relation to malaria prevention and control, effectiveness of the programme not only depends on the current efforts of the service providers, but also on the belief that the community living in endemic areas consider malaria to be a serious and even life-threatening disease. This study attempts to assess this behaviour and its relation to the reported malaria-related illnesses.

2.6.1.5 Perceived benefit

Another determinant of health behaviour is whether or not the person believes that the preventive action actually works, that is, if the action indeed prevents the disease or problem. An individual also evaluates the benefit obtained from taking a particular health action. This is called perceived benefit or perceived action efficacy. If people believe that the preventive action being promoted does not work to prevent the problem or disease, then they probably will not adopt this behaviour. The perceived benefit of performing target behaviours was reported to be an important determinant of an individual's behaviour (Ali & Tonekaboni 2009:29-36). Similarly, Champion and Skinner (2008:50) reported that 'perceived benefits' were the most powerful predictors of patterns of individuals' health-related behaviours. This suggests that people practise malaria prevention and control strategies only if they believe that IRS or ITNs can effectively protect them against malaria. For instance, Belay and Deressa (2008:1302) in their study among pregnant women in northern Ethiopia, found that 27% of the women did not own ITNs. The main reason for not owning the nets was that the women believed that ITNs could not protect them against malaria. The same source indicated that the gap between the use and ownership of the ITNs was significant because some people could not see the benefit of ITNs and thus, were not motivated to use them.

On the other hand, people perform malaria preventive measures only when they believe it worthwhile. For example, Dye, Apondi, Lugada, Kahn, Smith and Othoro (2010:345) found study reports that support this view. According to these authors, household members will have positive views about ITNs' utilisation when they perceive that ITNs effectively protect them against malaria. However, people will only use ITNs to protect themselves from mosquito bites if they believe that mosquitoes spread malaria.

2.6.1.6 Perceived barriers

Another determinant is whether or not the person thinks the preventive action is easy for him or her to do. The domain is also called perceived self-efficacy. If a person thinks that an action is very difficult to do, he or she may not do it. This may include the skills required to exhibit the behaviour, accessibility to the services or resources necessary to perform the behaviour and whether he or she can afford the cost of the action.

Champion and Skinner (2008:50) said that 'perceived barriers' are the single most powerful overall predictors of individuals' behaviours, and 'perceived susceptibility' is the strongest predictor of one's preventive health behaviours. Linking this concept to malaria prevention, there could be many factors that might prevent the community from positive health behaviours such as using ITNs and IRS. These may include IRS smells or inconvenience of the housing condition (family size, sharing the house with domestic animals, high and stuffy temperature) to consistently use ITNs. Distance (in terms of transportation cost and time) of the house from a health facility might affect the action the individual takes when he or she or someone in the family manifests signs and symptoms of malaria.

2.6.1.7 Cues to action

Cues to action refer to the behavioural domain that indicates the readiness of a person targeted for a behavioural change. This stage comprises a diverse range of triggers that can activate health behaviour when appropriate beliefs are held. These include an individual's perceptions of symptoms, social influences, media and health education campaigns (Day et al 2010:7). Illness of other family members or relatives motivates a person to demonstrate disease preventive behaviours (Champion & Skinner 2008:49). According to these authors, the implications of the HBM have generally been stated as the fact that people are more likely to undertake a health action if the threat's evaluation is high and the behavioural evaluation is positive. In the current malaria prevention strategies of Ethiopia, household members receive health information through different ways including house to house visits by the HEWs, posters and the use of volunteers to disseminate malaria-related information (FMoH:2012b). The Ministry of Health of Ethiopia disseminates health information about malaria through the national TV and radio especially during malaria epidemic seasons (September to December) to raise people's level of malaria awareness. These efforts are expected to stimulate and sustain households' implementation of malaria preventive measures.

2.6.1.8 Self-efficacy

'Self- efficacy' is defined as one's confidence in performing a particular behaviour (Champion & Skinner 2008:49; Gorin & Arnold 2006:163). Self-efficacy, as an important domain of the HBM, was added only recently and was reported to have the strongest effect on diabetic patients' self care practices (Ali & Tonekaboni 2009:29.

2.6.1.9 Use of traditional healers and medications for the treatment of malaria.

The utilisation of traditional healers to treat several health problems has been a long standing practice in many societies. One most important value given to the traditional healers is that they are part and parcel of the commun ity and share common values with local community members. Traditional healers are easily accessible to villagers usually within short distances. Therefore, there is a possibility that people consult traditional healers first for malaria cases. In a study conducted in India to examine treatment seeking behaviour of people with malaria, 7.6% of the patients went to traditional healers for treatment (Borah & Sarma 2012:41). In Ethiopia, the use of traditional healers for different health problems is widely practiced (Kassaye, Amberbir, Getachew & Mussema 2006:127). Similarly, a finding from a study conducted in the eastern part of Ethiopia indicates that eight different medicinal plants were used for treating malaria and fever (Belayneh, Asfaw, Demissew & Bussa 2012:42). Traditional healers may play an important role in the fight against malaria if there is an established referral system between the local health facilities and the traditional healers. This could be facilitated especially, by training traditional healers about the signs and symptoms of malaria, the mode of malaria transmission and methods of prevention. However, in the absence of collaborative efforts between the traditional and the modern health systems, and if there is a knowledge gap among the traditional healers, the condition may pose a barrier to the rapid detection of cases and treatment before it becomes a complicated condition.

2.7 APPLICATION OF THE HEALTH BELIEF MODEL TO THE STUDY

Ethiopia has been intensively scaling up the RBM since 2005 in all malaria endemic regions. These unfolding government efforts are expected to promote malaria prevention activities through sustained behavioural changes. In addition to the government efforts, there might be some indigenous knowledge and experiences gained regarding malaria treatment and prevention. This study will assess these behaviours among communities in malaria endemic areas (various forms of perceptions, health seeking behaviour, knowledge level and reported prevalence of malaria).

The HBM provides a comprehensive set of constructs that enables the researcher to assess behaviours of households in endemic areas about malaria prevention and control measures. All domains of the model, individual perceptions (perceived susceptibility and severity), modifying factors (perceived threat and cues to action), and likelihood of action (perceived benefit, barriers and exhibiting positive health behaviours) will be assessed using a set of items based on literature reviews. This assessment will lead to the identification of HBM constructs that might serve as barriers among the community members to sustain the implementation of malaria preventive measures.

2.8 SUMMARY

This chapter discussed universal malaria prevention and control strategies and its associated factors and challenges as reported in several literature sources. An overview of the HBM was also provided. The model was selected as being appropriate for this study because the HBM includes comprehensive behavioural constructs which are useful to this study as malaria transmission is influenced by multiple individual and social factors, including belief systems. The details of the methodological procedures followed in the study are presented in chapter 3.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research experiences regarding malaria prevention and control and a theoretical model (HBM) that guided the study have been addressed in the second chapter. This chapter presents the research methodology used in this study. The research method employed data collection in two phases. The sources of data for phase I included households in malaria endemic districts of the Sidama Zone in Ethiopia. The second phase of data collection was accomplished at the health posts (the smallest grass roots level health service facilities in Ethiopia). In each phase, the study design and specific research objectives addressed by the study are subsequently presented. The study population, sample size estimation and procedures followed to select representative samples from the target populations are described. Furthermore, data collection instruments, ethical considerations, data analysis plans and efforts to minimise systematic and random errors are discussed.

3.2 PHASE I: HOUSEHOLD SURVEY

Phase I of this study aimed at examining the implementation of malaria prevention and control strategies at the household level. The research procedures pertinent to phase I are discussed in the following sections.

3.2.1 Research paradigm

Polit and Beck (2008:761) define a paradigm as a way of looking at a natural phenomenon that encompasses a set of philosophical assumptions that guide a researcher's approach to addressing research question(s). Paradigms for researchers involving humans are characterised by the ways in which they respond to philosophical research questions. One of these ways of epidemiological investigations is a positivist world view (Bruce, Pope & Stanistreet 2008:3). Positivism, as a philosophical view, was developed in the 18th century and initially dominated the scientific world views (Bruce et al 2008:6).

The current research approach applied a positivist paradigm, using a quantitative design. This paradigm assumes that there exists an observable reality that can be measured quantitatively independently of human observation (Bruce et al 2008). A quantitative approach is a precise measurement and quantification, often involving a rigorously controlled design (Polit & Beck 2008:763). This type of research is a more appropriate choice for collecting empirical data through the senses (Polit & Beck 2008:16). Since this design addressed a range of confirmatory questions which could lead to inferences enhancing the RBM programme, it is used in this study.

3.2.2 Research design

Elston and Johnson (2008:31) defined a research design as 'the conceptual structure within which research is conducted'. It can be classified in different ways. Among them are qualitative or quantitative studies, applied versus basic, deductive versus inductive, experimental and non-experimental categories, and process versus content research (Brink & Wood 1998:4). During the past decade, several scholars classified research designs into experimental and non-experimental (Aschengrau & Seage III 2008:139-140; Fathalla 2004:44; Rothman et al 2008:87-88). Regardless of the ways in which research designs are classified, all the designs generally, constitute the plan for the collection, measurement and analysis of data and for reaching conclusions based on the study's findings, in relation to the objectives stated for conducting the study. The latter design is also called observational and may be descriptive or analytical. It is more appropriate when the researcher does not intend to assign interventions, but is rather, an observer of the problem (Rothman et al 2008:87). A descriptive design provides a detailed description of the characteristics of interest while the analytical design describes associations in terms of possible cause and effect relationships (Bruce et al 2008:422-425).

Quantitative research is relevant, according to Zegeye, Worku, Tefera, Getu and Sileshi (2009:35), when:

- the investigator wants to answer a research question which is best addressed by a quantitative answer, describing the measurements numerically;
- the variable of interest changes and the rate of that change is accurately estimated by numerical evaluation;
- it is useful to quantify opinions, attitudes and behaviours and to find out how the whole population feels about a certain issue.

Furthermore, quantitative research is suitable for explaining some phenomena or identifying factors associated with the outcome event of interest. When the researcher intends to justify a hypothesis, it is possible by adopting the quantitative approach.

The objectives of phase I, aimed to:

- assess the knowledge, attitudes and practices of households in the study area about the prevention and control methods of malaria;
- identify factors that could be associated with malaria prevention and control activities in the study areas;
- describe the malaria preventive measures implemented at household level; and
- ascertain which persons are most affected by malaria at household levels in the study areas

Each research objective is addressed by a quantitative method. For instance, the three behaviour-related variables in the first objective were described by computing the proportion of respondents across each category used to measure knowledge, attitudes and practices of respondents regarding malaria prevention and control (details are discussed under section 3.2.5.). As Polit and Beck (2008:16) recommended, the remaining three research objectives are effectively measured in quantitative terms. As a result, the quantitative research design was selected as an appropriate approach for this study.

While the quantitative design was used, the researcher recognised and tried to minimise the effect of limitations arising from the quantitative design, such as a lack of representation of local constituencies due to the researcher's response categories. The possibility of missing contextual details and structural bias were recognised as a limitation of this method.

3.2.3 Research method

Research methodology is the overall approach to studying the research topic of interest including issues such as the constraints, dilemmas and ethical choices. They are the techniques an investigator uses to structure a study to collect data relevant to the research questions (Polit & Beck 2008:765).

3.2.3.1 Description of the study area

This study was conducted in one of the 13 zones found in the SNNPR. It is located in the north eastern part of the region and 275 kilometres south of Addis Ababa, the capital city of Ethiopia. It is bordered by Oromia regional state in the east and north, by Wolayta and Gedeo Zones in the west and south, respectively. The zone has a total area of 6 981.8 square kilometres and contains a total of 19 districts. Sidama Zone has three ecological zones namely the low land, middle land and highland constituting 30%, 54% and 16% of the geographical area, respectively. The zone is home to a population of 3 288 083 with a gender ratio of 1:1 and is one of the most densely populated zones in the region (471 persons per square kilometre). According to the zonal health department, 94.3% of the population lives in rural settings. There were a total of 597 public health facilities during the data collection period. These include three hospitals, 94 health centres and 500 health posts (Sidama Zonal Health Department 2011:2).

3.2.3.2 Research population

Bruce et al (2008:133) and Fathlla (2004:50) define a population as “group of people in whom the investigators are interested, and to whom the results of the study are applicable”. Polit and Beck (2008:761) also delineated a population (sometimes called a universe) as referring to the entire set of individuals or objects having some common characteristics which the researcher(s) wish to investigate. According to the Ethiopian Public Health Association (2009:40), the target population in a research context, is defined as a group of individuals who comply with the characteristics of the population from which the study sample is to be drawn.

In the context of these definitions, this study was conducted in nine malaria endemic districts of the Sidama zone in Southern Ethiopia. Many community-based studies (except those limited to reproductive issues) conducted in Ethiopia include household heads (which mostly include men) due to their decision making powers. However, the main disease prevention and health promotion activities at the household level, involve women, as active role players in the family. Although malaria prevention and control efforts are the responsibilities of all household members, the role of women is significant to prevent, diagnose and get treatment for malaria. Because of this, the research population for the first phase comprised households in the malaria endemic districts and mothers or caregivers from the selected households were the study units. In Ethiopia, mothers (housewives or employed women) are the prominent caregivers in the family and have experience related to sickness from malaria and its prevention and control at the household level. This includes knowledge of malaria transmission, signs and symptoms of malaria, breeding and resting sites of mosquitoes, utilisation of nets/ITNs, application of IRS, use of prophylaxes (IPT) and health seeking behaviours. Thus, households in the nine malaria endemic areas of the study zone were considered as the target population for phase 1 of the study to which the findings were generalised.

3.2.3.3 Sample size

According to Bruce et al (2008:133), a sample is a group of individuals taken from a larger population of interest. Sample size refers to the number of individuals or items to be selected from the universe to constitute a sample, which should neither be excessively large, nor excessively small (Kothari 2004:56; Polit & Beck 2008:348). The sample size must be optimum and fulfil the requirements of efficiency, representativeness, reliability and flexibility (Kothari 2004:56). In estimating the sample size for population proportion, Bruce et al (2008:158) suggested that researchers need to specify the value of the anticipated population proportion, level of error to accept and level of confidence. These principles were applied to estimate the optimum sample size required for this study. One of the objectives, this study aimed to address was to identify factors associated with malaria prevention and control, which requires a moderately large sample. Examination of the existing data indicates that 70% of the population at risk of malaria infection used ITNs nationally in Ethiopia (FMoH 2007a).

In another study that assessed factors associated with ITN use by individuals in households owning ITNs in Ethiopia, individuals with good (highest knowledge score of 5 and above in a scale categorised into 0-1, 2-4 and $\geq$5) level of knowledge about malaria were found to be 2.4 times more likely to use ITNs compared to those with less knowledge (Graves, Ngondi, Hwang, Getachew, Gebre, Mosher, Patterson, Shargie, Tadesse, Wolkon, Reithinger, Emerson & Richard 2011:356).The researcher, therefore, assumed that the rate of ITN utilisation was 70% and 55% among those with good and poor knowledge, respectively. That provided an estimated odds ratio (OR) of 2.0. Considering the odds ratio of 2.0 between individuals with good and poor knowledge about malaria, 95% level of confidence, a power of 80%, Epi-Info (version 3.2.2.) yielded a sample size of 201 for each category and 402 for both (those with good and poor level of knowledge about malaria). A ratio of 1:1 for those with good to poor malaria knowledge was considered. Allowing a designing effect of 2.0 for cluster sampling and non-response rate (10%) produced a total sample of 885 respondents. Sample estimated for the second objective, which provided the largest sample, was used as a minimum size for the study. Table 3.1 shows the summary of the sample calculated for each objective.

Table 3.1 sample size determination

Objectives	Assumptions considered						Sample (n)
	α	β	Prevalence	Margin of error (d)	(DE)	Non-response rate	
1&3	0.05	-	ITN utilisation 63%	0.05	2	10%	788
2	0.05	0.20	P1=70% OR=2.0	-	2	10%	885
4	0.05	-	P=0.50	0.05	2	10%	845

3.2.3.4 Selection of respondents

Respondents were mothers from randomly selected households permanently living in the nine participating malaria endemic districts in Sidama Zone, Southern Ethiopia. To be specific, a multistage sampling technique was employed. Multistage sampling is a sampling strategy that proceeds through a set of stages from larger to smaller sampling units (Polit & Beck 2008:758-759). This sampling approach is economical and practical, especially when the sampling unit involves clusters and is from a large population distributed over a wide geographical area (Polit & Beck 2008:347). In this study, the primary and secondary sampling units included districts and kebeles (smallest administrative units) respectively (figure 3.1). There was no sampling at the district level, because all nine malaria endemic districts were included. Selection of clusters (2 rural and 1 urban kebeles from each of the nine districts) was employed using a simple random sampling technique. This sampling technique provides a known chance of being selected for every kebele in the district (Bruce et al 2008:137). Finally, clusters of households (locally named ‘gots’) were randomly picked from a list of all ‘gots’ in each kebele and all households in the selected got were assessed. One cluster (got) usually contains 30-60 households. See figure 3.1 for details of sampling procedures.

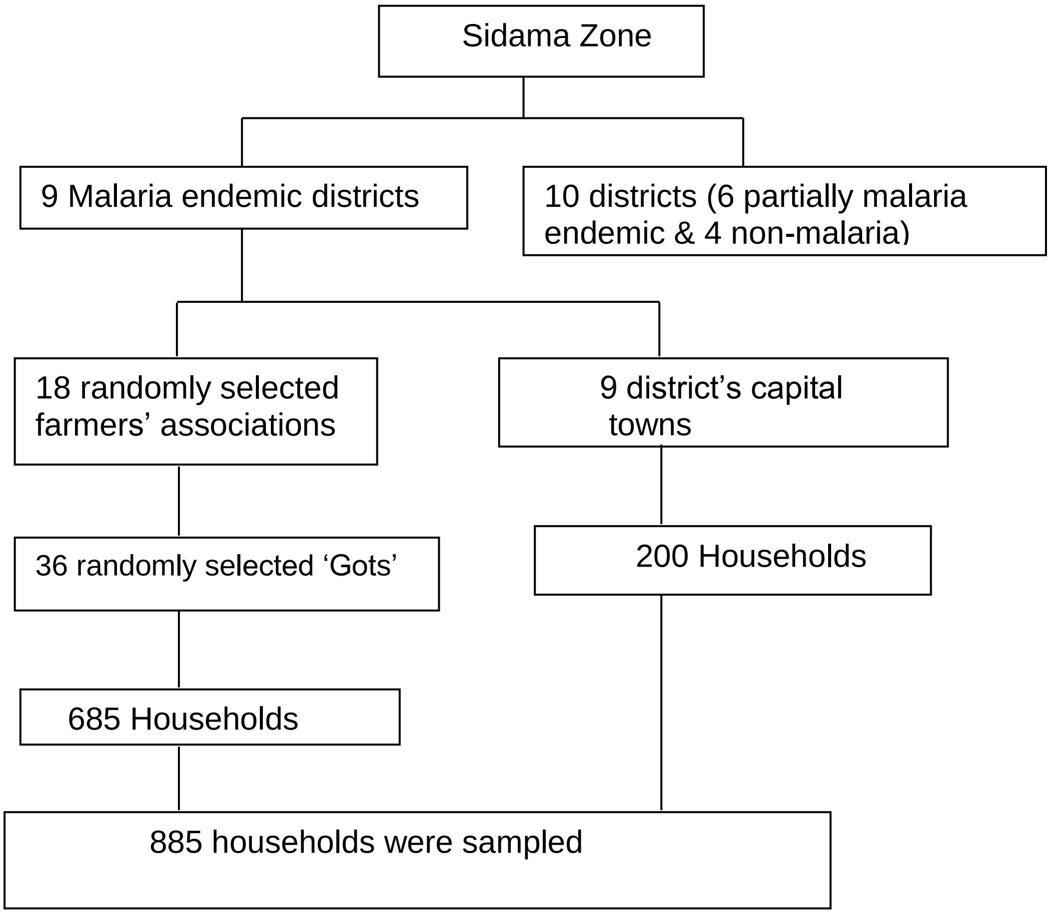

Figure 3.1: Sampling procedures of respondents

Once the kebeles and 'gots' were selected, the leaders of the respective kebeles and 'gots' were contacted in advance to inform them about the purpose of the study. They were asked for permission to enter their villages. Permission letters from the districts were also submitted to these leaders.

3.2.3.5 Exclusion and inclusion criteria

Exclusion criteria are defined as the characteristics that a defined population does not have (Polit &Beck 2008:753) whereas the inclusion criteria are the characteristics that the eligible population possesses. This study aimed to generalise the findings to the target population in the Sidama Zone. Therefore, respondents who were not permanent inhabitants of the selected ‘gots’ such as visitors at the time of data collection were excluded. Women with mental disorders, people who were ill, and those who could not properly communicate were excluded from participating in the study.

3.2 3.6 Research tool/Interview schedule

An interview schedule is a list of questions that are read out or verbalised by an interviewer to a respondent (WHO 2001:171). It is the instrument that specifies the wording of all questions to be asked of the respondents in structured self-reported studies (Polit & Beck 2008:756). Interview schedules are usually designed as unstructured with open-ended items, semi-structured or structured with close-ended items (Bruce et al 2008:167).

The structured interview is one in which the researcher specifies in advance all possible answers from which the respondents choose the most appropriate option. This type of tool ensures consistency in the range of answers and facilitates data analysis. Interviews and self-completion structured questionnaires are the most commonly used methods of collecting information during quantitative studies (Bowling & Ebrahim 2005:204). The questions were presented to the respondents in a similar way in terms of wording with responses presented in pre-coded response options. It enables the researcher to collect relatively unambiguous data collected from a large sample. The use of the structured interview schedule provides an opportunity of ensuring that the respondent has understood the questions.

Structured interviews might have some drawbacks. Pre-coded response choices might not accommodate all potential choices in a comprehensive manner (Bowling & Ebrahim 2005:204). Respondents might not always share the same perspectives and concepts that the researchers had when they compiled the response options. Questions might include behavioural attributes and, therefore, might lead to potential social desirability bias.

The population for this study comprised rural communities and the majority were expected to be uneducated. Because of this, the researcher utilised purposively constructed, translated into the local language (Sidama) and pre-tested structured interview schedules that were prepared based on the research objectives and the review of the literature. The tools were developed mainly using closed-ended questions with a list of possible responses and very few open-ended questions. Closed-ended questions ensure consistency in the range of responses provided and are suitable for coding and statistical analysis (Bruce et al 2008:165). The instrument was structured as follows (with the list of questions shown in parentheses as shown in annexure 1):

- Section I: geographical location (1-4)
- Section II: socio-economic and demographic variables (5-19)
- Section III: housing condition (20-28)
- Section IV: knowledge level of respondents (29-53)
- Section V: environmental factors (54-61)
- Section VI-X: domains of the HBM (62-106)
- Section XI: practices of the respondents regarding malaria prevention (107-124).
- Section XII: reported prevalence of malaria (125-130)
- Section XIII: observation checklist (131-138).

The interview schedules were prepared in English and translated into the local language, known as ‘Sidama’. That was retranslated back to English by another expert in the field and checked for consistency. A bilingual (English-Sidama) expert translator checked these translations (see annexure 12 for the translator’s letter approving the translations and specifying his qualifications). The instrument was pretested during the training of the data collectors to identify limitations, such as vague questions, phrases or terms and also the estimated average time required to complete each interview. Necessary adjustments and corrections were made accordingly to improve the reliability of the instrument. During the pre test of the tool, the following limitations were identified and corrected:

- typographic errors or missing words (Items:37,95,100,102,104,105, 109,123, and 136)

- multiple responses were not included for some questions (Items: 39, 40, 41, 109, 111 and 124)
- conducting the interview before 10:00 a.m. was inappropriate as most women were busy with several activities (cleaning rooms, cooking, fetching water).
- each interview took a long time to be completed.

Corrections were made to improve the reliability of the tool. The data collection time was revised and the starting time was set to be 10:00 a.m. At this time, most women finished their activities and were willing to be interviewed. In order to reduce the effect of the long duration of each interview, every interviewer became familiar with the questions. Every interviewee was also told the approximate time the interview would take so that she could decide whether to participate or not.

3.2.4 Selection and training of interviewers

Eighteen data collectors were recruited from the selected respective kebeles. Kebele offices were contacted to identify potential female data collectors that satisfied the following set criteria:

- those who at least completed high school education
- had no permanent job (as the data collection was conducted during the regular working hours.
- those who knew the village
- had experiences of data collection (optional)

The use of the local persons as data collectors is useful in that they know the physical setup of the village and also understand the culture. Females who had completed grade 12 but who did not have permanent jobs were given priority. Data collectors with this level of education can easily understand concepts and terms used in the instrument during the training. Moreover, female data collectors were preferred for easy communication with female interviewees. Data collectors were contacted and selected during the preliminary visits to the study sites and they were approached through the kebele and ‘got’ leaders.

The training of the data collectors was conducted centrally at zone level for two days. During the training, emphasis was given to important points such as brief overviews of the study, study objectives, features of face-to-face interviews and techniques of interviewing were discussed and practised by means of role play sessions. Ethical aspects of research were also addressed. The interviewers signed an agreement with the researcher that they did not write any identifiers of the respondents such as the identification numbers and names on a questionnaire and also properly kept the filled questionnaires in a folder till they submitted to the researcher. The instruments were discussed item by item. That was followed by interviews conducted among the trainees during role play sessions facilitated by the researcher. The last day of the training was used for pretesting the tool in one of the rural kebeles (Alamura) around Hawassa town, which did not participate in the actual study. Every interviewer signed an agreement of confidentiality with the researcher that no information obtained during the interviews would be divulged to anybody except the researcher.

3.2.5 Data collection

Data collection for this study was carried out during March to May 2013. The range of data collected included geographical location of the respondents, background variables such as socioeconomic and demographic characteristics, and housing conditions. Moreover, the study assessed variables related to the level of awareness and knowledge about malaria, perceptions and practices relevant to the prevention and control of and episodes of malaria and its treatment measures. The interviews were conducted by trained female research assistants. The data collectors then interviewed the mothers/caregivers from all households in the selected clusters (gots) through house-to-house visits.

The procedures of the interview schedule included that:

- the data collector moved from house to house only during working hours but starting after 10am;

- the interviewer greeted the family and introduced herself to the household members;
- she explained the purpose of the study to the respondents as stated in the consent form (see Annexure 3);
- the interviewer asked whether the respondent was willing to participate in the study;
- those who were not willing were thanked and the household was skipped;
- once the respondent has expressed her willingness, the data collector asked the respondent to choose a convenient place for the interview;
- the data collector built rapport with the respondent and told her to ask any questions or clarifications at any time during the course of the interview;
- the data collector then read each question to the interviewee and properly recorded every response.

The investigator supervised the process of data collection to check that the interview schedules had been completed accurately and was available in case any queries or crises arose.

3.2.5.1 Socioeconomic and demographic variables

Fifteen items (questions 5-19) assessing the respondents' background information, using nominal variables, were developed considering previous similar studies. These included: gender, age, marital status, religion, ethnic group, level of education, household size, occupation and income.

3.2.5.2 Housing condition

Prevention of malaria is partly affected by the condition of the house such as type of the house and number of rooms, family size, whether the house is shared with domestic animals, the presence of a kitchen, toilet and window and door screens. The researcher designed nine items (questions 20-28) to assess these housing conditions. Besides the structured interview, an observation checklist was used to confirm some of the responses. Eight checklist items (questions 131-138) were used to observe the condition of the house's walls (smooth/roughness) presence of ITNs, window screens, mosquito breeding sites, openings in the upper wall parts that serve as entrances for mosquitoes. Data on distance of the house from health posts, availability of transportation services, and vector control activities such as IRS were recorded

3.2.5.3 Assessment of respondents' malaria knowledge levels

Twenty-five knowledge items (questions 29-53) concerning the modes of malaria transmission and possible misconceptions were assessed. Respondents replied to each statement with 'yes' if they believed that they knew the correct answer to the question, 'no' if they believed that the question did not apply to them and 'do not know' if they were unsure (missing scores were included to minimise guessing and the possible inflation of correct response scores).

3.2.5.4 Environmental factors

This section included questions related to environmental factors such as the availability of health infrastructures, transportation facilities and other enabling factors. A total of eight items (questions 54-61) assessed these variables.

3.2.5.5 Assessment of the HBM's domains

A set of 45 items (questions 62-106) was used to assess the domains of the HBM.

Perceived susceptibility to malaria

Seven items (questions 62-68) were included to assess respondents' perceptions about their susceptibility to malaria infection. These questions were formulated to examine whether the respondent perceived that the community in general and her household members in particular including herself, were at risk of being infected by malaria and therefore needed to take some preventive measures.

Perceived threat/severity of malaria

Four items (questions 69-72) were designed to assess whether the respondents perceived malaria as a dangerous or killer disease. This information enabled the researcher to understand how rapidly the respondent took actions when any household member manifested signs and symptoms of malaria.

Perceived benefits of implementing malaria preventive measures

Thirteen items (questions 73-85) assessed the perceptions of the respondents for practising malaria prevention and control measures like IRS, use of ITNs and prompt treatment of malaria cases. The items were structured based on the responses for level of agreement or disagreement on the scale ranging from "strongly agree=5" to "strongly disagree=1".

Perceived barriers to implementing malaria prevention and control measures

Fourteen items (86-99) were used to address the respondents' potential perceived barriers. The questions were designed to examine factors like lack of knowledge and skills to implement relevant malaria preventive methods, and to identify potential priorities other than malaria prevention, lack of support from the community or family members.

Cues to taking action of preventing malaria

'Cues to action' was assessed based on a four point Likert scale measurement ranging from 'not at all=1' to 'always=4'. Seven items (questions 100-106) assessed respondents' willingness to implement malaria prevention and control activities. These included the consistent support and encouragements received from health workers, relatives and family members, and information disseminated by the mass media.

3.2.5.6 Assessment of practice

The researcher developed eighteen items to record the pattern of ITN utilisation and the level of involvement of the respondents in other malaria prevention activities and health seeking behaviours. Questions 107-124 were used to assess the practices of the respondents regarding malaria prevention and control activities performed at the household level.

3.2.5.7 Assessment of reported malaria episodes

Six items (questions 125-130) assessed the occurrence and frequencies of malaria attack(s) among the family members. The researcher used this information to describe the burden of malaria as reported by the respondents.

3.2.6 Data management and analysis

Data management and analysis involve several steps including sorting, merging, recoding, and appending. Procedures followed in data processing and types of statistical tests used need to be described in order to understand and interpret the outputs.

Data processing refers to steps involved in the preparation of data for analysis in a manner that the data address the specified research objectives. Data analysis is defined as a systematic organisation and synthesis of research data. In a quantitative research design, data analysis also includes the use of data for testing hypothesis (Polit & Beck 2008: 751). The following sections discuss these aspects:

3.2.6.1 Data processing and preparation

The researcher first checked the numerical code of each variable and entered the data using IBM Statistics 20, statistical software for windows. The data were cleaned and checked for missing values by computing frequency distributions of nominal variables. Incomplete cases were excluded from the analysis.

For all categorical (nominal and ordinal) variables, a frequency distribution was run to examine the minimum and maximum values recorded for each variable. That was cross checked with the pre-coded values on a code book. Unusual observations were selected and checked against the respective interview schedules and corrections of wrongly recorded responses were done accordingly. For quantitative (discrete and continuous) variables, values were checked to identify unlikely values and the presence of potential outliers. The check was done for variables such as age, family size, household's monthly income, number of rooms, numbers of ITNs per household, travel time (in minutes) and number of months after IRS had been done of the house.

Explorative analysis is a type of analysis conducted not to address the research objective, but to inform the researcher about the nature of data (strengths and limitations of the data). This information benefited the researcher for making important decisions like the type of statistical tests to be used. Simple frequency distributions were run for categorical data. The distribution of quantitative and ordinal variables (measured on a 5-point Likert scales such as HBM constructs) were examined using histograms to get the fist visual impressions and tests of normality were done to ensure that the assumption required for parametric tests had been met. For quantitative data that satisfied the assumption of normal distributions, means and standard deviations were used to provide numerical summaries about the nature of the distribution (spread) of the variable concerned.

3.2.6.2 Data Analysis

Before the analysis of the data began, distribution of all variables measured on a quantitative scale were examined for checking whether the assumptions required for inferring the results had been met. At the first stage, explorative analysis (using histograms and/or box plots) was done to get the first impression about the nature and distribution of data. That was followed by testing the quantitative variables by using one sample Kolmogorov-Smirnov test to determine whether the data distribution approximated a normal distribution (Field 2009:144).

Background variables such as socio-demographic and economic data were treated using descriptive statistics.

A single variable denoting the economic status of the household was created, termed the ‘wealth index’. To do that, a principal component analysis was done to select variables that best explained the wealth variance. At the first step, eight variables that measure wealth were selected. These included monthly income, number of cattle, number of sheep or goats, number of donkeys or horses, total number of rooms, ownership of radio, type of house (roof made from thatch or corrugated iron sheets), and ownership of a separate kitchen. Responses for ownership of a radio and separate kitchen were scored as 0 if not available and 1= if available, while type of house was scored as: 1 = if the house was grass-roofed, 2 = if it was corrugated iron sheet-roofed, and 3 = if the household owned both types of houses). After the assumptions required for the principal component analysis (Field 2009:173) had been verified, scores of five factors were identified to describe 65% of the wealth variance. These included: type of house, number of cattle, number of goats or sheep, number of donkeys and/or horses and number of rooms. These characteristics were combined to produce a single variable of wealth quintiles and used for further analysis involving the calculated wealth of specific households.

Responses of several other variables were re-coded as required. Some of these variables included:

- age categorised into intervals of five years;
- monthly income categorised into five intervals;
- family size categorised into two intervals;
- educational level categorised into two intervals (never educated and educated)

The researcher used the following statistical tests to address the research questions/objectives:

- A chi-square test was used to examine the association between two categorical variables. The test compares the frequencies observed in some categories against those expected to happen by chance (Field 2009:668). Specifically, a Pearson chi-square test was used, since the sample size was large.

- The logistic regression model was applied to identify factors that might explain the observed binary variables such as good versus poor practices, occurrence versus non-occurrence of malaria cases and deaths. The logistic regression model enables the prediction of the probability of outcome variables' occurrence, given the value of predictor variables (Boslaugh & Watters 2008:266).
- In all the tests, it was considered significant when $p< 0.05$.

Analysis to address objective 1

✓ To assess the knowledge, attitudes and practices of households in the study area about the prevention and control methods of malaria.

. The researcher used descriptive statistics to address objective 1:

Knowledge of respondents about malaria

Responses for all items that assessed knowledge were coded such that, '1' was assigned for a 'correct' response and '0' for 'incorrect' and 'do not know' responses. A specific single knowledge item is less reliable than a combination of knowledge items. Therefore, a single knowledge factor was computed from 26 selected items used to assess the respondents' level of knowledge The minimum value was 0 (if no item was correctly answered) and the maximum was 46 (if all responses were correct) points including multiple responses.

Based on the operational definition provided in section 3.2.6, the computed single knowledge factor was then categorised into three ordinal response categories. The respondents who scored below 50^{th} percentiles, 50^{th} percentiles to 75^{th} percentiles, and above 75^{th} percentiles were classified as having low, medium, and good knowledge, respectively about malaria prevention and control measures. Proportions of responses across these three categories were computed and reported with the 95% CI. In addition to this, the knowledge level was cross tabulated with the categorical socio-demographic and practice variable and Pearson Chi-square with its corresponding p-value was reported, after checking that the theoretical assumptions required for the test had been met (Field 2009:691)

The Health Belief Model's constructs

The HBM constructs (perceived susceptibility, perceived severity about malaria, perceived benefit of implementing preventive malaria measures, barriers regarding malaria prevention and control were measured on a five point ordinal scale that ranged from 'strongly disagree=1' to 'strongly agree=5'. Cues for action were measured based on a four point ordinal scale (ranging from 'not at all =1 to 'always=4) regarding support (technical, encouragement, rewards) obtained from various groups including the family members and relatives.

Descriptive statistics were applied to these scores to report mean scores for each domain of the HBM measured quantitatively using scores. In addition to that, correlations of components of the HBM were examined. The reliability of items in each construct was checked and transformed into a single variable provided the Cronbach's alpha coefficient was in line with recommended values (Bowling & Ebrahim 2005:397) as displayed in table 3.2. These variables were then used for further analysis.

Table 3.2: Cronbach's coefficients for specific constructs of the Health Belief Model: malaria-related perceptions of the respondents

Number of items transformed	Scales	Cronbach's alpha	Name of the new variable
7	1-5*	0.833	Perceived susceptibility
4	1-5*	0.825	Perceived severity
13	1-5*	0.729	Perceived benefits
14	1-5*	0.872	Perceived barriers
7	1-4**	0.843	Cues to action

*1=strongly disagree, and 5=strongly agree; ** 1= not at all, and 4=always

This was a main outcome variable of the study. Measurements regarding the practices of the respondents were done based on the malaria prevention strategies implemented in Ethiopia. These included:

- ITNs' utilisation by:
    - under fives
    - children aged 5-10
    - household head
    - other members of the family
- Used ITNs the night preceding the interview
- Willingness of the household to support IRS
- Destruction of malaria breeding sites (draining stagnant water)
- Cleaning the yard and surrounding areas of the house
- Health seeking behaviour (going to health facilities when anyone has a fever).

Responses to eighteen items (questions 107-124) were developed to measure practices and were dichotomised into 'yes' if the respondents exhibited the desirable behaviour (preventive or control malaria-related actions) and 'no' if she did not or was unsure. The frequencies were tabulated and reported in numerical and percentage values. For further statistical analysis, a new variable representing an overall practice of the respondent was created. To do this all the ‘yes’ responses were scored=1 denoting that the respondent participated in the malaria preventive and control strategies or ‘no’ scored =0 indicating lack of participation. The values were then computed and scores equal to or above the median value were regarded as good practice while those below the median value were regarded as poor practice.

Analysis to address objective 2

- ✓ To identify factors that could adversely affect the effectiveness of malaria prevention and control strategies in the study areas.

The second objective of this study attempted to identify factors affecting malaria prevention and control activities at the household level in communities. This analysis required the examination of factors predicting the outcome variable (practice measured as a binary variable). The association of background variables, the domains of HBM and level of knowledge with the practices of the responder were tested. To do this, the data were fitted into a multivariate logistic regression model (Kothari 2004:315-318; Elston & Johnson 2008:293-294) to analyse relationships between the explanatory and the criterion-related variables and to estimate the relative risk (RR) (odds ratio) of malaria infection among the households and factors explaining practices of the households.

The binary logistic regression model was an appropriate test to study the nature of associations of such variables (Boslaugh & Watters 2008:284). In this study, the practice of the household was an outcome variable and classified into a binary variable (having good or poor practices about malaria prevention and control). A binary logistic regression model is the appropriate statistical test for such variables as recommended by Vittinghoff, Shiboski, Glidden and McCulloch (2005:193). This model tests the null hypothesis that there is no agreement between the estimated and observed frequencies. The insignificant test (not rejecting the null hypothesis at specified value of α) provides evidence of model fitness (Field 2009:273).

According to Vittinghoff et al (2005:194), the Hosmer and Lemesho test has some limitations. The test is not sensitive to the lack of fitness like misclassification of the model. The outputs of the test depend on the number of groups specified and the distribution of explanatory variables within the groups. Therefore, the test is merely used as an indicator of a crude way of screening model fitness.

In calculating the statistics, the assumption for the model fitness, the Hosmer and Lemeshow test was checked and the output of the Hosmer Lemeshow test was insignificant at p=0.98. Both crude and adjusted odds ratios were reported at the 95% level of significance.

Analysis to address objective 3

- ✓ To identify the malaria preventive measures implemented at household level

Several malaria preventive and control measures are implemented by the members of the households. The extent of implementation of the recommended strategies, however, could differ from one community to another and from house to house. This objective intended to address the types of malaria prevention strategies easily implemented by the households. Descriptive statistics were applied to report the results in terms of proportions.

Analysis to address objective 4

- ✓ To identify persons most affected by malaria at household levels in the study areas

This objective attempted to describe self-reported prevalence of malaria infection among the respondents. The distribution of the disease was examined by different socio-demographic characteristics. The association of knowledge within the domains of the HBM with the rate of reported infection, as an outcome variable, was examined using a Chi- square test.

3.2.7 Validity and reliability

Measurements in this study were guided by the HBM's constructs. In order to minimise potential measurement errors, the researcher considered important measurement principles to enhance validity and reliability.

3.2.7.1 Validity

Validity refers to the degree to which inferences made in the study are accurate and well-founded; or the degree to which an instrument measures what it intended to measure (Polit & Beck 2008:768). Validity is classified as:

- face validity,
- content validity
- criterion-related validity and
- construct validity.

The first three types of validity were ensured in this study, while the last was not considered as there was no hypothesis to be tested.

Face validity refers to subjective assessment of the relevance of the instrument. This kind of validity answers questions such as "is the questionnaire relevant, unambiguous and clear to the respondents?" (Bowling & Ebrahim 2005:398; Bruce et al. 2008: 172-174). In order to ensure the face validity of the interview schedule, it was tested on five mothers from the Tilte kebele. This kebele was excluded from the actual study.

During the pre-test it was ensured that items included in the study were easily understood but comprehensible and an unambiguous (Bruce et al 2008:172). The HEW asked the mothers from households close to the health post in the Tilte kebele to participate in the pre-testing interviews.

Following the pre-test, minor modifications were made. Skipping possibilities were added to items 34, 37(3), and 47)3). Response options using Likert scales were not easy for some old women to differentiate. The research assistants were therefore, well oriented to slowly and clearly read each question to every respondents. The respondents were advised to feel free to ask for clarifications if anything was not clear to them.

Content validity is defined as the extent of completeness with which the items in the interview schedule cover the important areas of the domain it intends to measure (Brink & Wood 1988:271). The content validity of the interview schedule was determined by a review of literature reports about similar studies. In addition to that, the experts assessed whether the tool sufficiently measured aspects related to malaria prevention and control. Two research experts (one public health specialist [PhD] and one epidemiologist [MPH]) at the Hawassa University, School of Public and Environmental Health, evaluated the tool to ensure its content validity. The experts approved the contents of the tool to be sufficient to address the stated research question. However, both these experts suggested that the interview schedule should be complemented by some observations to cross check unnecessary inflation of some responses. For instance, the number of rooms and the presence of ITNs could be observed during the interview. One expert was of the opinion that some variables such as religion and ethnicity (section II) and the availability of latrines and kitchens (section III) had little relevance to the objectives of the study, but they were retained as these facilities might have influenced the number of mosquitoes inside the house.

Criterion validity is concerned with the correlations of the measure with another measure considered to be a gold standard (Bruce et al 2008:173). In order to ensure criterion validity, the tool was compared with instruments used in similar studies in order to be able to improve the criterion validity. Employing a random sample of 857 households in this study also increased the representativeness of the sample and, therefore, improved the external validity of the results.

3.2.7.2 Reliability

Bruce et al (2008:174) define reliability as the degree to which a measurement made on one occasion agrees with the same measurement made on another occasion. Kothari (2004:75) categorised reliability into two: stability and equivalence.

Stability refers to the consistent results with repeated measurements of the same variable using the same instruments under the same conditions and is determined by comparing the results of the repeated measurements. Equivalence is concerned with the amount of error that may be introduced by different investigators. Reliability is an important requirement to achieve consistency of the measurement. According to Bowling and Ebrahim (2005:396-397), reliability is assessed by different methods. In this study, Cronbach's alpha coefficients were used to assess the reliability of the instrument.

Cronbach's alpha coefficient is a measure of internal consistency based on all possible correlations between all the items within the scale. It is based on average correlation among the items and number of the items in the instrument, the values ranging from 0 to 1.0. There is no agreement regarding the minimum cut-off point. Many researchers consider a Cronbach's alpha of 0.70 as the minimally acceptable level for internal consistency (Field 2009:675). A reliability of 0.65 indicates that 65% of the measured variance is reliable and 35% is owing to random error. Generally, a low level of alpha shows that the items do not belong to the same conceptual domain (Bowling & Ebrahim 2005:397).

To evaluate the internal consistency of the measurements in this study, the inter-correlations among the items and correlations between each item and the total scores of responses (Cronbach's alpha) was computed (Boslaugh & Watters 2008:377; Polit & Beck 2008:455). Internal consistency of items, as elicited by Cronbach's alpha coefficients, assesses whether they co-varied with each other or belonged together and shared common sources (Viswanathan 2005:28).

Before the Cronbach's alpha was calculated, items that were reverse-phrased (items 86-99) on the original interview schedule were reverse-scored. Then, separate reliability analyses were run for each construct of the HBM. Consequently, the Cronbach's alpha (α) calculated for each HBM construct for this study were 0.73 (perceived benefit), 0.83 (perceived susceptibility), 0.825 (perceived severity), 0.87 (perceived barrier) and 0.84 (cues to action). These indicate good consistency between the response items (Field 2009:681).

Though Cronbach's alpha is a commonly used measure of internal consistency of a research tool, it has some drawbacks. The value of Cronbach's alpha depends on the number of items on the scale. As the number of items increases, the value tends to increase (Field 2009:675). Alpha may also be inflated by items containing similar wording (Polit & Beck 2008:492). These points need to be considered while interpreting the Cronbach alpha coefficients.

Reliability is affected by random errors. In order to improve the reliability, all technical terms used in the research instrument were defined and explained to each interviewee. Pretesting of the data collection tool and adequate training of the interviewers was done carefully. Completeness and consistency of information was checked on a daily basis. The data were entered twice into the SPSS programme and compared to identify and correct potential errors of data entry which further enhanced the reliability of the research instrument.

3.2.8. Bias

Polit and Beck (2008:748) define bias as any influence that distorts the results of a study and undermines validity. It may be introduced into the study from a number of sources that need to be considered while planning a study. In order to minimise bias in this study:

- the researcher included all malaria endemic districts and clusters (kebeles) in the districts were randomly selected. This minimises selection bias;

- the research assistants used a translated and pretested tool to reduce instrument bias;
- morbidity related to malaria, not exceeding three months and mortality within 12 months prior to the interview, were considered in order to reduce recall bias;
- a comprehensive literature review was conducted;
- the sample size was calculated based on predetermined assumptions; and
- a conceptual (HBM) framework guided the study.

3.2.9 Ethical considerations

The ethical issues related to this research were taken care of in terms of the following aspects:

The respondents

This study required house-to-house visits by the research assistants (interviewers) during the data collection process. The study used non-stigmatising terms during the recruitment process and ensured that interview locations were confidential. Informed consent (see annexure 1) was obtained from each respondent prior to each interview and every potential respondent was given an opportunity of choosing whether or not she wanted to be interviewed.

The consent form covered issues pertaining to the autonomy of the participants, their right to participate voluntarily or to decline to participate or to stop the interview at any time, without incurring any adverse consequences whatsoever. Justice, benefit and risks associated with the research procedures were clearly stated in the language spoken by the respondent. The interviewers read the consent form aloud to each respondent and then asked whether she chose to participate in the study or not. Those who expressed their willingness signed (or put a Thumb print) on the consent form. The interviewer also told each respondent to ask any questions or raise any concerns about the study before, during or after the interview

The institution

All the relevant offices in the Sidama Zone approved the conduct of the data collection and provided permission letters prior to data collection. Permission and ethical clearance for this study was also obtained from the Higher Degrees Committee of the Department of Health Studies, University of South Africa (see Annexure 11), and from the Institutional Review Board (IRB) of the Hawassa University (see Annexure 10).

Scientific Integrity of the research

The professional background (Environmental Health) of the investigator was relevant to the selected research topic. Hence, the researcher understood the strategies of prevention and control of communicable diseases, including malaria. His speciality in the field of public health has further improved his level of understanding the dynamics of community health and research skills. With the combination of these experiences, the investigator realised the importance of maintaining scientific honesty and accuracy of data during the entire research process. All the sources of information used in this research were duly acknowledged.

In order to ensure the confidentiality of the information, the completed interview schedules were stored in locked cabinets and the soft copies were stored in the password protected personal computer of the researcher.

Domains specific ethical concerns

This study did not involve a vulnerable population as malaria is not a sensitive topic and can be discussed in public.

3.3 PHASE II: HEALTH POST LEVEL SURVEY

To complement the household survey with data from the health service providers' perspectives, primary data were collected from the grassroots level health facilities (health posts). Procedures followed and sources of data for phase II will be discussed.

3.3.1 Research design for phase II

The second phase of the study was conducted at the health posts (the smallest units of the health structure in Ethiopia at grassroots level). In the current health service structure of Ethiopia, there is one health post for every kebele/village. The objectives of the second phase of the study aimed to assess the:

- HEWs' knowledge, perceptions and practices concerning the prevention and control of malaria;
- challenges related to malaria prevention and control at the health post level;
- challenges related to treating malaria patients at the health post level.

The second phase of the study aimed to examine the practices of RBM from grass-roots level health service providers' perspectives. As explained in section 1.8 of this thesis, two HEWs are assigned to every health post with the responsibility of providing primary health care (PHC) services (Teklehaimanot & Teklehaimanot 2013:39).

A quantitative approach was used to assess the knowledge, perceptions and practices of HEWs and challenges they faced at the health posts and in their communities while implementing the RBM strategies. This provided information regarding how RBM strategies were implemented at the PHC units in Ethiopia and assessed the existing gaps. Evidence from these objectives were linked to those produced from the household survey at community level, and interpreted accordingly.

3.3.2 Research methodology

A similar methodological approach, as in section 3.2.1, was followed in the second phase. Hence, definitions and explanations of some technical terms, relevant to methodology, are not provided in this section to avoid redundancy. The methodological approaches for the second phase of this study were modified based on the information generated by the first phase.

3.3.2.1 Research population

The study population for phase 2 of this study involved all HEWs working in the nine malaria endemic districts selected for phase I. HEWs work closely with the households and also provide basic health services at the health posts, including malaria treatment. Thus these HEWs had experienced the implementation of malaria prevention strategies at the community level and could be the best source of empirical data related to challenges and successes related to RBM at PHC level in Ethiopia.

3.3.2.2 Sample size required and sampling for phase II

A total of 27 kebeles (18 rural and 9 urban) from the nine malaria endemic districts were involved in this study. There were 2 HEWs working in each kebele. Hence, the total number of HEWs working in all kebeles involved in the phase I during the data collection was 54. All of these HEWs working in the study areas were planned to be interviewed implying that no sampling took place. Although HEWs with less than three months' experience would be excluded (as they would have had limited experienced with the RBM programme), no such respondent was found during data collection. One of the 54 HEWs was on maternity leave and was thus not interviewed.

3.3.2.3 Research instrument and data collection

- Data collection instrument

The data collection tool was developed and pretested in other similar settings. Considering the findings of the first phase (household survey) the tool was further enriched to capture data more relevant to the objectives of the study. Because, HEWs were all educated, and could read and write Amharic (the national language of the country), the instrument was prepared in English and then translated into Amharic and back translated to English to check for consistency and approved by an English-Amharic translator (see Annexure 13). The contents of the instrument are categorised as follows:

Section A: Socio-economic and demographic variables (questions 1-12).

Section B: Knowledge of the respondents about malaria (questions 13-23).

Section C: Perceptions of respondents about malaria (questions 24-31). and level of job satisfaction (questions 32.1-32.10).

Section D: Implementation of malaria prevention and control strategies:

Strategy I: Early diagnosis and treatment (questions 33-44).
Strategy II: Selective vector control (questions 45-49).
Strategy III: Epidemic prevention and control (questions 50-55).
Strategy IV: IEC/BCC activities (questions 56-62).
Strategy V: Human resource development (questions 63.1-63.6 and questions 64.1-64.6).

Section E: Facility level malaria diagnosis and treatment services and availability of resources (questions 65.1-65.7, 66 and 67.1-67.8, 68.1.-68.8).

3.3.2.4 Data collection

Data collection was carried out in July 2013, after the data obtained during phase I at household level had been analysed. The major components of the data collected included socio-economic and demographic characteristics, malaria knowledge levels, perceptions about malaria, level of satisfaction of the respondents with their work milieu, practices related to malaria prevention and control strategies. Moreover, the study assessed variables related to human resource development, facility level availability of resources. The researcher and two research assistants conducted the interviews at all health posts.

The following steps were followed by the interviewers:

- the permission letter from the relevant district health office was submitted to each kebele's administration and to the health post;
- the interviewer explained the purpose of the study to each HEW as stated in the consent form;
- the interviewer asked if the respondent was willing to participate in the study;
- once the respondent had expressed her willingness, the data collector asked the respondent to choose a convenient time and place for the interview;
- the data collector built rapport with each respondent and informed her that she could ask for clarifications of any vague questions during the course of interview, and that she could refuse to answer specific questions or terminate the interview at any stage without incurring any negative consequences whatsoever;
- each HEW was requested to sign a consent form which was kept separately from the anonymously completed interview schedules so that no signed consent form could be matched with any anonymously completed interview schedule
- each interviewer then carefully read the questions to the interviewee and properly recorded the responses.

3.3.2.5 Data analysis

Socioeconomic and demographic variables

Twelve items (questions 1-12) assessed the respondents' socio-economic and demographic characteristics. Nominal and scale variables were developed considering previous similar studies. These include: gender, age, marital status, religion, ethnic group, level of education, household size, occupation and income.

Respondents' knowledge levels

Eleven items (questions 13-23) assessed awareness about strategies of malaria prevention and control, relationship between malaria epidemic and environmental factors, symptoms of uncomplicated and severe malaria, and treatment. Respondents replied to each statement by choosing the correct answer from the given option. The scale used ranged from 0 (no correct response) to 11 (all correct responses).

Health extension workers' (HEWs) perceptions about malaria

Eight items (questions 24-31) were used to assess 'perception of the respondents' level of agreement or disagreement on the scale ranging from "strongly agree=5" to "strongly disagree=1".

Health extension workers' levels of satisfaction with their work milieu

Ten items (questions 32.1-32.10) were used to assess HEWs' level of satisfaction with their work milieu. Responses were rated based on a five point scale ranging from 'very dissatisfied =1' to 'very satisfied=5'.

Health extension workers' malaria prevention and control practices

In order to assess the practice, the researcher developed 45 items to measure the level of involvement of the HEW in the five basic RBM strategies Ethiopia implements. The strategies included: early diagnosis and effective treatment of malaria cases, selective vector control, epidemic prevention and control, IEC/BCC and human resource development.

Observations

The availability of the infrastructure/medical supplies was observed using observation check lists (items 64.1 -66.8) and/or by asking questions (relating to specific items listed in the observation checklist) from the HEWs.

Health extension workers' challenges related to the implementation of malaria prevention and control strategies

The respondents were asked to mention three important challenges (items 67.1 -67.6) they faced during the implementation of malaria prevention and control activities in relation to:

- promoting behavioural changes among the community;
- examination of malaria patients;
- diagnosis and treatment of malaria patients;
- referral system of complicated malaria cases;
- getting feedback about patients suffering from malaria who had been transferred from the health post.

The method of data analysis for phase 2 of this study followed the same procedures as explained in section 3.2.6.2.

3.3 2.6 Validity and reliability

Validity and reliability measures for phase 2 were similar to those discussed in section 3.2.7 of this thesis.

3.3.2.7 Ethical considerations

Similar ethical procedures as in the first phase were followed during the second phase. The right of the interviewee to safeguard her integrity was always respected. Every precaution was taken to respect the privacy of the participant and to minimise the impact of the study on the respondent's physical and mental integrity and on her personality (see section 3.2.8 for more details).

3.4 SUMMARY

This chapter presented the research paradigm, the research design, and methodology used for collection of quantitative data. The positivist approach was used in this study, because, the researcher attempted to objectively measure the behaviours and practices of people in relation to malaria prevention and control. Methods of data collection and analysis were described. This chapter addressed measures the researcher took to achieve validity and reliability of the measurements. Steps taken to make data collection procedures ethically sound were also addressed.

Chapter 4 will present the analysis and discussion of the data obtained during phase I of this study when structured interviews were conducted with households at community level. Chapter 5 will present the findings obtained from the structured interviews conducted with the HEWs. Chapter 6 will compare and contrast the findings from the two phases of the study and present the conclusions, limitations and recommendations of the study.

CHAPTER 4

ANALYSIS AND DESCRIPTION OF THE STUDY'S FINDINGS

4.1 INTRODUCTION

This chapter presents and discusses the findings obtained from the structured interviews conducted during phase I of the study. The researcher and 18 research assistants collected data from randomly selected women residing in the nine malaria endemic districts of the Sidama Zone in the southern region of Ethiopia.

4.1.1 Guiding theoretical framework

The conceptual framework of the HBM (see section 2.6.1.1 and figure 2.1) guided the data analysis process. The first part of the results section describes the modifying factors of the respondents' behaviour related to malaria prevention and control. These include demographic and socio-economic characteristics, enabling environmental factors and malaria-related knowledge of the respondents. Socio-demographic characteristics of the respondents (as discussed in sections 4.2.1 and 4.2.2) present the economic status of the households and environmental factors such as housing conditions and available infrastructure. Sections 4.2.3 to 4.2.8 present the main findings that addressed the objectives of the study. The data are presented using tables, figures and numerical summaries such as measures of central tendency and dispersion or spread. Percentages and corresponding frequencies describe responses pertaining to categorical variables.

4.1.2 Response rate

The intended sample size was 885 (see section 3.2.3.3 and table 3.1*)*. Of these, 11 respondents refused to participate in the study (six sought permission from their husbands and five interrupted the interviews complaining that the interviews lasted too long). Seventeen questionnaires were excluded because of missing values for key research variables such as practices of respondents regarding malaria prevention and control. Hence, 857 completed structured interview schedules were eligible for analysis, providing an overall response rate of 96.8%. However, as a number of respondents failed to respond to specific questions, the total number of respondents does not add up to 857 in all instances. Some questions were relevant only to those respondents who had heard about malaria (n=790) and thus these items were analysed out of the subset of 790 completed interview schedules.

4.2 RESEARCH RESULTS

In this section, the results of the structured interviews' analyses will be discussed under sub-sections according to the research objectives, namely to:

- assess the knowledge, attitudes and practices of households in the study area about the prevention and control methods of malaria;
- identify factors that could be associated with malaria prevention and control activities in the study area;
- identify the malaria preventive measures implemented at household level; and
- identify persons most affected by malaria at household level in the study areas

4.2.1 Socio demographic characteristics of the respondents

Demographic characteristics of respondents such as age, marital status, religion, ethnicity, education, household size and occupational status provide information regarding the background of the respondents which might influence their behaviours regarding malaria prevention and control.

4.2.1.1 Age

The mean age of the respondents was 34.8 years (SD=9.0). The minimum age was 18 and the maximum was 70 years. The 25-34 age group dominated, accounting for 39.6% (n=332) of the total number of respondents. Thus these age groups might become active participants for malaria prevention and control activities implemented at household level (see table 4.1).

Table 4.1: Age distribution of respondents (n=838)

Age interval (years)	Frequency (f)	Percentage (%)	Cumulative percentage (%)
15-24	86	10.3	10.3
25-34	332	39.6	49.9
35-44	296	35.3	85.2
45-54	99	11.8	97.0
>=55	25	3.0	100.0
Total (n)	838	100.0	-

4.2.1.2 Gender

The current study targeted women although malaria prevention and control activities concern all household members. However, women are the main implementers of household activities in the study areas, including activities related to malaria prevention and control.

4.2.1.3 Marital status

Out of 852 respondents, 77.7% (n=662) were married, followed by 13.1% (n=112) who were single and 8.6% (n=73) who were widows. Only 0.6 % (n=5) of the respondents were divorced. This figure is lower than that reported by the Ethiopian Demographic Health Survey which was 7.4% (CSA 2012:36).

4.2.1.4 Religion

Out of this study's 857 respondents, 88.3% (n=757) were Christians (Orthodox Christians and Protestants), 10.4% (n=89) were Muslims while others (mainly traditional religious followers) comprised 1.3% (n=11) of the respondents. During 2012, Christians (Orthodox Christians, Catholics and Protestants) comprised 70% of the population in

Ethiopia (CSA 2012:36), agreeing with the current study's finding that the majority of Ethiopian citizens belong to the Christian faith.

4.2.1.5 Ethnicity

Sidamas comprised 82.5% (n=707) and Amharas comprised 6.5% (n=56) of the 957 respondents. Wolaytas, Oromos and Gurages combined represented the remaining 11.0% (n=94) of the respondents. SNNPRS is home to diverse and multi-ethnic cultures with 56 different nationalities living in the region (CSA 2008). Each zone and special district is, however, dominated by a specific local ethnic group, except in urban settings where the inhabitants live in groups/localities of mixed ethnic groups.

4.2.1.6 Educational status

The literacy rate among the respondents (N=857) of this study was 45.5% (n=390) while the figure reported for their male partners was 55.7% (n=477) as shown in table 4.2, implying that more male partners than female respondents were reportedly literate. Ethiopia has implemented different educational strategies since 1993 to increase the literacy rate, especially among girls (CSA 2012:4). Consequently, the proportion of women who attended schools increased from 33% in 2005 to 48% in 2011 (CSA 2012:26).

Table 4.2: Respondents' years of completed schooling compared to those of their male partners

Level of Education	Respondents		Male Partners	
	frequencies	%	frequencies	%
Never attended school	464	54.3	253	34.7
Completed primary school (six years)	302	35.4	332	45.5
Completed secondary school(8 years)	73	8.5	83	11.4
Completed high school (9-12 years)	14	1.6	55	7.5
Completed tertiary school (above12 years)	1	0.1	7	1.0
Total (n)	854	100	730	100.1

4.2.1.7 Respondents' occupations

Types of respondents' occupations are presented in figure 4.1. Respondents from households, whose livelihood depended on farming, were recorded as farmers. Out of the 795 respondents in the reproductive age of 15 to 49 years, 63.3% (n=503) were engaged in farming activities. The different occupational categories for all respondents (N=857) included the following:

- farmers (66.2%; n=567)
- traders (16.2%; n=139)
- government employees (11.7%; n=100)
- no job (4.1%; n=35)
- other unspecified jobs (1.5%; n=13)
- under/over employment age (0.4%; n=3)

As many as 63.3% (n=567) of this study's respondents in their reproductive ages were involved in agricultural practices compared to 46% reported by the Central Statistical Agency of Ethiopia (CSA 2012:48). As indicated in the Ethiopian demographic and health survey (CSA 2012:12), the rural respondents were twice as many as the urban dwellers while the current study's respondents from rural areas comprised 77.5% (n=664).

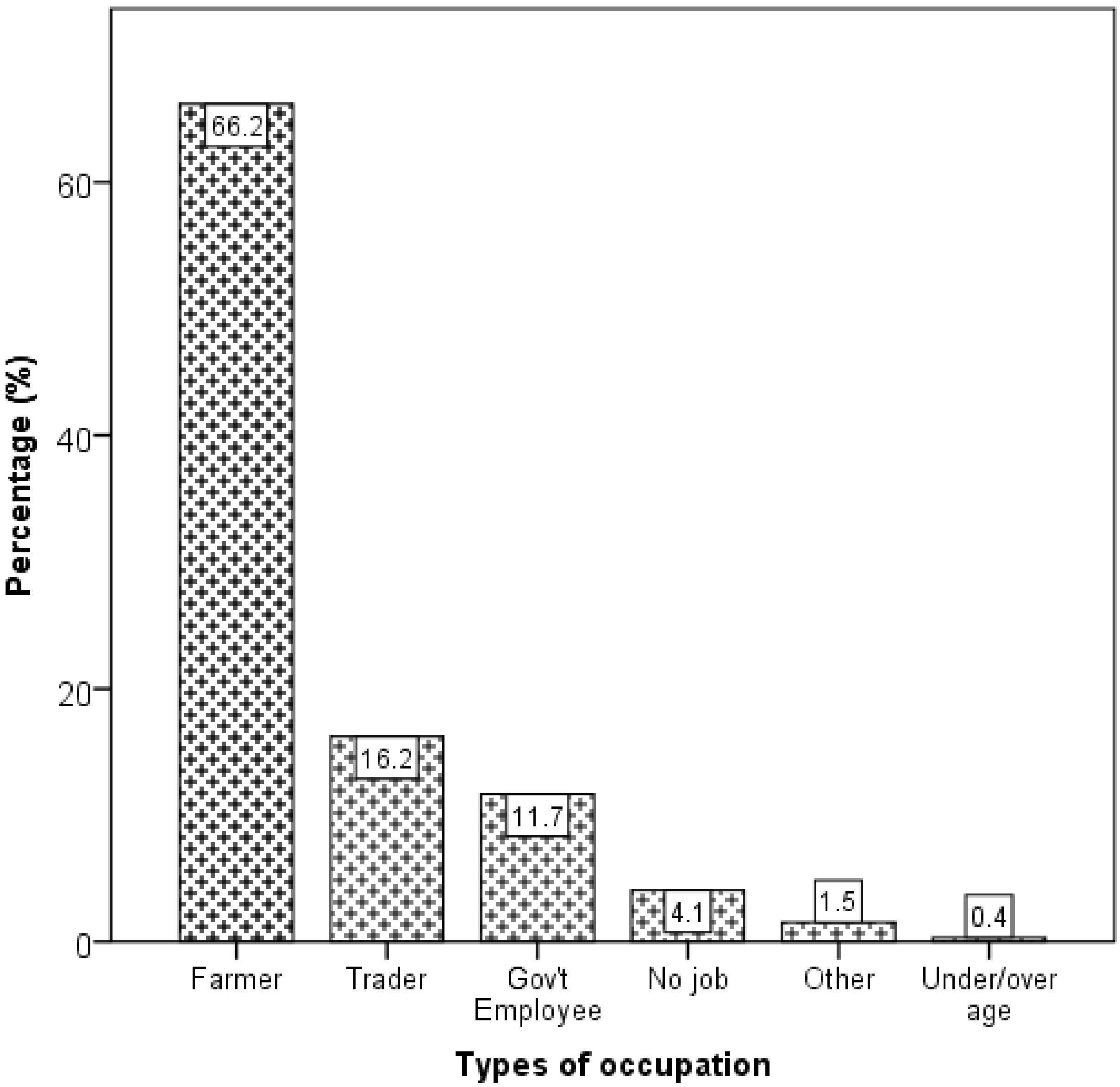

Figure 4.1: Respondents' occupations (n=857)

4.2.1.8 Number of persons in respondents' households

Household size was measured based on the total number of persons living in the house. Household size might affect some malaria prevention and control activities. For instance, the ratio of household size to number of ITNs owned and number of living and sleeping rooms might affect the utilisation of these nets. The mean (±SD) household size was 5.5 (±0.64) persons. The maximum household size had 13 persons. Out of 810 women who responded to the item, 46.5% (n=377) had a mean household size of 5 and more. This value is slightly higher than that reported in the Ethiopian demographic and health survey of 2011 which was 4.8. The difference could be attributed to the value reported in the demographic and health survey measuring the number of children (CSA 2012:21) while the current study considered all persons permanently living in a specific household.

4.2.1.9 Rural-urban distribution of the respondents

As many as 63.3% (n=567) of this study's respondents, in their reproductive ages, were involved in agricultural practices compared to 46% reported by the Central Statistical Agency of Ethiopia (CSA 2012:48). In the Ethiopian demographic and health survey the rural respondents were twice as many as the urban dwellers while the current study's respondents from rural areas comprised 77.5% (n=664).

4.2.2 Economic status and environmental factors

Economic status might affect the knowledge and practices of the household members about malaria prevention and control. Households with low socio-economic status might not immediately seek treatment for malaria signs and symptoms if they lack resources to do so.

4.2.2.1 Economic status of the respondents

Wealth is one of the factors that affect people's health status. People with better socio-economic status are more likely to have better nutritional status and thus could be more immune against infections such as malaria. Wealth might also influence the implementation of malaria prevention and control measures and health seeking behaviours of household members.

Household income

Only 775 (90.4%) responses were obtained in relation to the income question. The reported median monthly income of the households in this study was 200 Ethiopian birr (10.4 USD). This means, one member of the household on average earned 36.4 birr (1.88 USD) per month. Only 17.9% (n=139) of the households earned a monthly income of at least 500 birr (25.9 USD). This low level of income was expected since most respondents were from rural communities that did not have regular monthly incomes. The livelihood of rural communities in Ethiopia depends mainly on non-cash assets such as livestock, animal products, small scale farm products like vegetables and fruit. People with sufficient income are likely to afford costs associated with malaria prevention and control such as purchasing door and window screens and ITNs (in addition to the two free ITNs the Ethiopian government had distributed per household). Moreover, malaria prevention, travel and treatment costs might also affect decisions of malaria patients regarding where (public or private health facilities, traditional healers) and when (how soon after the onset of signs and symptoms) to seek treatment.

Possession of domestic animals and other agricultural products

Some researchers consider household assets such as the possession of vehicles, refrigerators, radios and television sets, computers and other electronic apparatus as measures of economic status in addition to monthly incomes (McElroy 2009:95; Oresanya et al 2008). This study did not only assess the possession of radios and television sets because 77.5% (n=664) of the respondents resided in rural areas and were thus less likely to own these assets than people living in urban areas. People living in rural areas might not have access to electricity and could thus not use televisions and radios unless they were battery-operated. As batteries are expensive few people living in the rural areas of Ethiopia might be able to afford such luxuries.

Indicators of wealth measures in this study, therefore, focussed on resources associated with agricultural activities in the rural settings. The data indicated that out of the 775 respondents to this question, 81.3% (n=630) had cattle while 46.3% (n=359) had sheep or goats. In the rural parts of Ethiopia, donkeys are the main means of transportation largely reducing the burden of women for transporting water, goods, agricultural products such as cereals and biomass fuels. Reportedly only 14.6% (113) of the households had donkeys.

Farm products were harvested once per annum in the study area. Only 52.5% (n=450) of the respondents provided information regarding the amount of farm products they harvested per year. Of these, 34.7% (n=156) produced cereals, 24.9% (n=112) produced vegetables, 15.8% (n=71) produced grains and 13.3% (n=60) produced cash-crops such as coffee and khat or both. Khat (catha edulis) is a green shrub commonly grown in many African countries, including Ethiopia, and chewed for its stimulating effects because of its amphetamine contents, according to Mulugeta [2013:209]). The median numbers of farm products were 3 quintals for cereals, 2 quintals for grains and 1 quintal for vegetables per year (1 quintal = 100 kg). Two of the nine districts, namely Wondo Genet and Aleta Wondo produced cash crops (coffee and khat). Only 60 households in these two districts reportedly produced these cash crops which were their main sources of income.

Overall, the economic status of this study's respondents was low. All respondents were women who did not have full control over the resources of the family and thus, might have had limited knowledge about the exact size of harvests (CSA 2012:247). One-third of the studied districts (Hawassa Zuria, Loka Abaya and Boricha) were frequently drought stricken due to the lowland ecological zone's limited annual rainfall. The latter two districts fell within the middle and lowland regions with altitudes ranging between 1200 and 2018 metres above sea level (Sidama Zone Health Department 2011:2). The average annual rainfall of these districts varied from 27.8 to 128.6 mm. Most of the households depended on aid for their survival because of unsuitable weather conditions for sufficient production for their own needs (Tesfaye 2011:20).

4.2.2.2 Environmental factors (housing condition and infrastructure)

A family's type of the house indicates the economic status of the family. The house's condition (type of structure, level of overcrowding, number of rooms, condition of walling - like roughness or smoothness) might affect the resting behaviour of mosquitoes. The utilisation of ITNs could also be affected by the type of house and furniture. It was observed that 77.9% (n=668) of the houses had rough wall surfaces suitable for mosquitoes to hide during the day. Out of the 857 respondents, 53.6% (n=459) lived in thatched houses while 38.4% (n=329) lived in houses with corrugated iron roofs. Thatched or grass-roofed houses are more convenient for mosquitoes to enter into the room and hide between logs and grass layers causing an increased risk of mosquito bites to those who live in thatched roof houses. The remaining 7.7%

(n=66) owned both types of houses. In terms of number of rooms, 24.2% (n=207) of the households lived in single-roomed houses followed by 20.0% (n=171) who reportedly lived in two-roomed houses.

Given the fact that an average of 5.5 persons lived in the participating households, 44.1% (n=378) of the households with only one or two roomed houses were overcrowded, making the implementation of malaria prevention and control measures difficult. Furthermore, 44.7% (n=383) of these households shared their rooms with domestic animals. Sharing a room with animals has negative implications on malaria prevention in that the room attracts adult mosquitoes due to the lack of hygiene and the presence of organic matter such as the manure and urine of the animals. As many as 52.5% (n=450) of the respondents did not have kitchens and 9.0% (n=77) did not have toilets. Similarly, 62.1% (n=532) of the houses did not have windows implying that they were poorly ventilated which is characteristic of houses in Ethiopia (Tesfaye 2007:28), making it easier for mosquitoes to hide inside the house.

All the respondents reported that health facilities (health posts) were available in their villages. The health posts were located within walking distances of the households with an average (± standard deviation) one way travel time of 25 (±11) minutes. Out of these households 81.1% (n=695) travelled less than 30 minutes to reach the nearest health post. Household members could thus receive malaria diagnostic and treatment services within short periods of travelling time. The fact that 93.9% (n=805) reported that public transport to the health posts was unavailable might not pose a huge barrier to accessing malaria diagnostic and treatment services, provided at the health posts, as most respondents lived within walking distance from these facilities.

4.2.3 Respondents' knowledge about malaria and their sources of information

Respondents' knowledge levels about malaria could influence their malaria prevention and control actions. Therefore, it was imperative to examine where the households obtained their information, what level of knowledge they had and what factors might have affected their knowledge about malaria.

4.2.3.1 Findings

This section presents findings pertaining to sources of information and to the level of the respondents' knowledge about malaria. Section 4.2.3.2 presents the findings in the light of similar studies in Ethiopia and other countries, and the implications of such findings for malaria prevention and control in Ethiopia will be presented.

Sources of information about malaria

Respondents were questioned about their sources of malaria-related information to evaluate the relative contribution of different sources of information such as mass media, print media, health care providers, and relatives or family members. Overall, the role of mass media in the dissemination of information about malaria among the study population was minimal. Only 28.3% (n=242) of the respondents owned radios and 26.0% (n=223) received printed materials. Television was available to 4.8% (n=41). Responses about the frequency of using those sources of information, indicated that only 45.0% (n=109) out of the 242 who owned radios used them and 43.9% (n=18) of the 41 respondents who owned televisions regularly used them as sources of information. Out of these 764 respondents, 83.5% (n=638) had received malaria-related information from health care professionals, 15.7% (n=120) from mass media and 8.9% (n=68) from their relatives.

Knowledge of respondents about malaria

Firstly, the knowledge of the respondents was described based on individual items using frequencies and corresponding percentages. Secondly, the overall knowledge level was assessed by computing scores for correct responses of all relevant items into a single variable (termed comprehensive knowledge about malaria). This approach was used to perform further analyses about respondents' malaria-related knowledge.

The proportion of respondents who had heard about malaria was 92.2% (n=790). In this study, the researcher assessed the cause, signs and symptoms, mode of transmission, health seeking behaviours and methods of preventing malaria to assess respondents' comprehensive knowledge levels about malaria. As many as 61.3% (n=525) of the respondents associated the cause of malaria with mosquito bites. However, 33.4% (n=264) of the 790 respondents, who had heard about malaria, incorrectly associated the transmission of malaria with bad weather conditions, bathing in rain water and bad spirits (see table 4.3).

The respondents were aware of the most common signs and symptoms of malaria. Out of 790 respondents who had heard about malaria, 81.9% (n= 647) correctly reported fever, 76.1% (n=601) reported headaches and 72.8% (n=575) identified chills or shivering as prominent signs and symptoms of malaria. The fact that children are more vulnerable to malaria infection was known by 76.8% (607 out of 790) of the respondents. The women who correctly mentioned the time of the day when mosquitoes usually bite comprised 80.6% (n=637) of the sample. More than half, namely 53.4% (n=422) of the respondents who knew about malaria, correctly identified the breeding sites and 57.0% (n=450) identified the resting places of mosquitoes correctly.

Out of the 790 respondents who had heard about malaria, the utilisation of ITNs as a preventive method of malaria was mentioned only by 59.4% (n=469), the application of IRS was reported by 56.7% (n=448) and the destruction of the mosquitoes' breeding sites by 26.8% (n=212). Thus two out of every five respondents did not use ITNs, and 73.2% (n=578) did not mention the destruction of mosquitoes' breeding sites as methods to prevent malaria. In terms of providing priority of utilisation of ITNs, 23.2% (n=183) and 42.4% (n=335) of 790 respondents, who had heard about malaria, did not mention under fives and pregnant women as persons with increased risks of malaria infection.

One of the prominent questions this study attempted to answer was the overall level of respondents' knowledge about malaria and how that might have affected their utilisation of malaria-related health services. The comprehensive knowledge of the interviewees was computed from 26 knowledge items and categorised into a single variable with three ordinal response options (see section 3.2.6.2 for details). There were 53.3% (n=457) of the respondents with “low level” knowledge about malaria, 22.4% (n=192) of them had “medium level” knowledge, and 24.3% (n=208) had “high level” knowledge (see figure 4.2). The mean (±SD) knowledge score was 20.7 (±6.5) out of a possible 46 points.

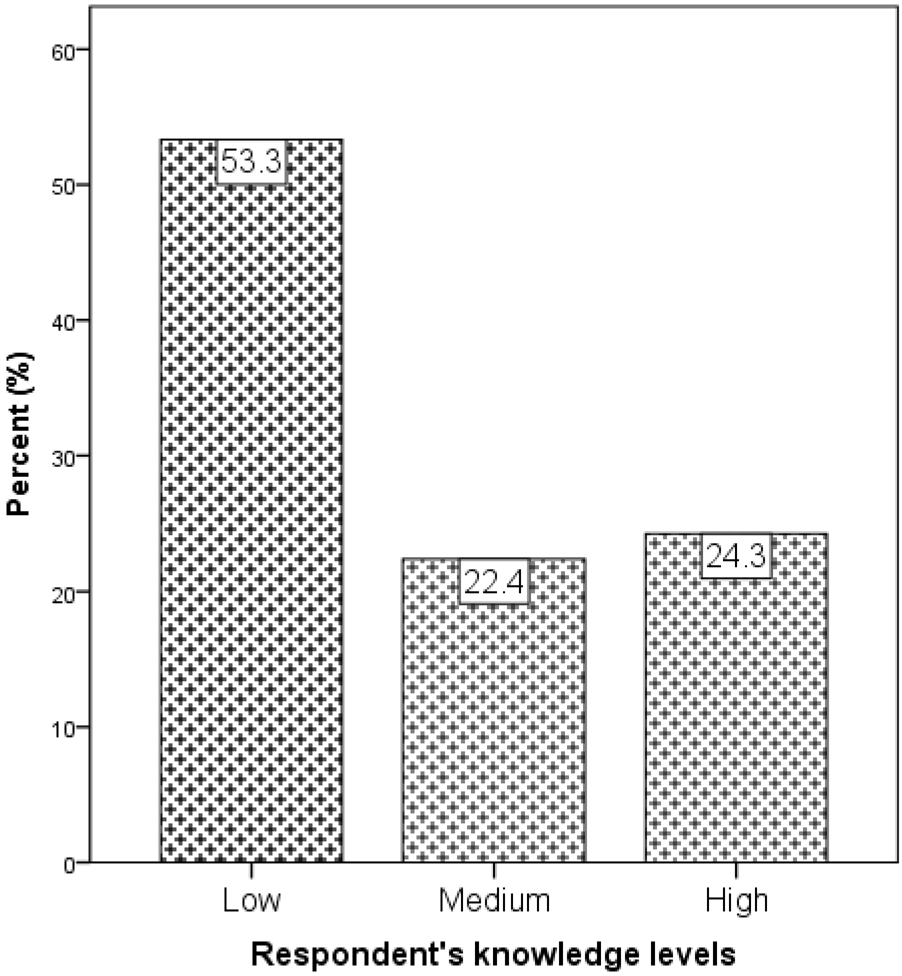

Figure 4.2: Respondents' knowledge levels about malaria (n= 857)

Associations of selected socio-demographic characteristics of the respondents and their overall level of knowledge about malaria were examined using Pearson Chi-square tests after checking the assumptions (less than 20% of the cells for expected frequencies had <5 counts and no cell contained a frequency below 1). Outputs of association between the levels of knowledge and socio-demographic variables are presented in table 4.4. Age had a significant effect on the respondents' knowledge levels about malaria prevention and control. Out of 198 respondents who had good malaria knowledge levels (scored above 75%), 54.0% (n=107) were women aged 25-34 years. Only 46.1% (n=153) of this age group had low levels of malaria knowledge compared to other age categories, whose proportion of respondents had low levels of malaria knowledge ranging from 57.0% (n=49) among those aged 15-24 years to 68.0% (n=17) among those aged $\geq$ 55 years (see table 4.4).

Out of 350 respondents who had not been taught about malaria, 70.3% (n=246) had limited knowledge about malaria compared to 41.6% (n=211) among those who had reportedly received health education. Among those who were trained, 28.4% (n=144) had medium and 30% (n=152) had high knowledge levels. These figures were 13.7% (n=48) and 16.0% (n= 56) for those women who did not get any training on malaria indicating the impact of providing targeted information for improving the level of women’s malaria-related knowledge. Similarly, those who were trained on specific topics such as how to use ITNs demonstrated good knowledge levels by 96.4% (n=185) and 96.6% (n=201) of the respondents scoring above the second and third quartiles of knowledge scores.

Training women about malaria-related issues was associated with their knowledge about malaria ($p<0.001$). Out of 350 respondents who did not receive malaria-related health education, 70.3% (n=246) had little knowledge about malaria as compared to 41.6% (n=211) of those who had received such health education. Among those who had been trained, 28.4% (n=144) had medium and 30% (n=152) had high knowledge levels. These figures were 13.7% (n=48) and 16.0% (n= 56) among those who did not get any training on malaria indicating the impact of providing targeted information for improving the level of knowledge. Similarly, those who had been trained on specific topics such as the use of ITNs, demonstrated good knowledge levels by 96.4% (n=185) and 96.6% n=201) of the respondents scoring above the second and third quartiles of the knowledge scores, respectively.

In this study, basic education of the respondents and their partners, and distances travelled to the health post did not show any association with the level of the respondents’ knowledge about malaria ($p>0.05$). Education is a basic tool in order to benefit from information available in print. The proportion of uneducated persons in this group of respondents was 54.3% (n=464) as shown in table 4.2. As discussed in section 4.2.3.1, 83.5% (n=638) out of 764 women received information about malaria from front line health workers through face to face contacts and discussions with the HEWs.

Table 4.3: Association of knowledge levels and selected socio-demographic characteristics of the respondents

Variables	Knowledge categories			X^2	p
	Low	Medium	High		
Age (years) (n=838)					
15-24	49	23	14	26.5	0.01
25-34	153	72	107		
35-44	173	64	59		
45-54	61	23	15		
=>55	17	5	3		
Highest education attended (n=854)					
Never attended schools	260	101	103	14.2	0.07
Primary school	151	70	81		
Secondary school	39	13	21		
High school and above	6	7	2		
Highest education attended by respondent's partners (n=730)					
Never attended school	146	56	51	13.1	0.11
Primary school	174	64	94		
Secondary school	53	16	14		
High school and above	36	10	16		
Receive training on malaria (n=857)					
Yes	211	144	152	68.5	<0.01
No	246	48	56		
Distance of the household from the health post (n=854)					
< 30 minutes walk	370	156	167	0.1	0.93
=> 30 minutes walk	85	35	41		
Wealth index (n=857)					
Poorest	122	30	30	115.8	<0.01
Very poor	145	50	28		
Poor	64	34	28		
Less poor	86	45	37		
Least poor	40	33	85		

4.2.3.2 Discussion

Respondents reportedly benefited little from brief messages conveyed by the federal or region-based media about the prevention and control of malaria. Only 28.2 % (n=242) of the households had access to mass media such as radios. Out of the 242 households who owned radios, only 45.0% (n=109) regularly listened to the radios, further decreasing the proportion of respondents getting malaria-related information from mass media. Front line health professionals played a larger role in disseminating information about malaria than radios. Out of 764 respondents who had heard about malaria, 83.5% (n=638) had received information from health service providers. This figure is high compared to that reported by the national malaria indicator survey conducted in Ethiopia (Hwang, Graves, Jima, Reithinger, Kachur, & the Ethiopia MIS Working Group 2010). According to these authors, only 28.9% (n=689) of the respondents had received information from health workers serving at the government health facilities and 15% (n=336) of the respondents were informed by HEWs.

In the current study, 77.5% (n=664) of the respondents were rural residents and thus essential health services, provided by HEWs at community level, were their most accessible health care services. More skilled health professionals (nurses, public health officers and physicians) work in health centres and hospitals in urban areas to which the rural population had limited access. Health information was thus more accessible to the respondents from HEWs than from other sources.

This finding is in line with the strategies of the Ethiopian government which aim to improve knowledge, attitudes and practices of the respondents about malaria as part of the RBM programme (FMoH 2010:38). A study from Bangladesh reported different results (Ahmed et al 2009:173). In Bangladesh, the main sources of information about malaria were relatives for 49% of the respondents and neighbours for 35% of the respondents. Compared to the Ethiopian context, the people in Bangladesh seemed to have traditions of exchanging malaria-related information while they socialised with their relatives and in their neighbourhoods.

Respondents' knowledge about malaria

One of the strategies of malaria prevention is to increase the level of awareness and promote behavioural changes among the people living in malaria endemic areas (FMoH 2012a:96). Though respondents in this study had a good level of awareness, as 92.2%, (n=790) of the respondents had heard about malaria [95%CI of the difference=7.8% (5.2, 8.8)], this percentage is smaller than that reported by a study conducted in the north-eastern part of Ethiopia where 100% (n=284) of the respondents had heard about malaria (Abate et al 2013:314).

Correct knowledge of the respondents about the cause of malaria is vital in guiding their decisions and actions about the prevention and control of malaria. As many as 66.5% (525 out of 790 who had heard about malaria) of the respondents of this study associated malaria with mosquito bites. This percentage was higher than the knowledge level reported by a survey that assessed the knowledge and attitudes of women in eastern Ethiopia where only 56% (n=2463) of the respondents mentioned mosquito bites as the cause of malaria (Gobena et al 2013).

The number of respondents who had misconceptions about the cause of malaria in this study was 33.5% (n=265). A survey conducted in south-west Ethiopia reported a higher proportion of respondents who had misconceptions about malaria despite living in malaria endemic areas (Yewhalaw et al 2010b:47). These researchers documented that 51% of their respondents considered exposure to the sun as a cause of malaria and another 13% said eating or drinking contaminated foods or water causes malaria. In another study from the central part of Ethiopia, the proportion of respondents who associated the cause of malaria with factors other than mosquito bites such as lack of personal hygiene, hunger, and chewing maize ranged from 13.7% to 33.8% (Abate et al 2013:315). This evidence suggests that the knowledge level among many people in Ethiopia, regarding the cause of malaria, remained low despite the efforts exerted to raise the level of awareness among the general Ethiopian population (FMoH 2012a:30).

Fever is one of the fundamental signs of malaria (FMoH 2012a:39). Out of 790 respondents, 81.9% (n=647) mentioned 'fever' as the most common sign of malaria. This response rate was also higher compared to that reported in the south-west of Ethiopia in which 73.6% (n=738) of the respondents mentioned fever, 64.3% (n=613) mentioned chills and 37.4% (n=375) identified headaches as common signs and symptoms of malaria (Yewhalaw et al 2010b:50). The observed difference might be attributed to the improved level of awareness about the signs and symptoms of malaria in Ethiopia because of the role HEWs play in providing malaria-related health education (FMoH 2012b:v). According to the Ethiopian malaria prevention and control guidelines (FMoH 2012a:39), any person with a history of fever must be tested and treated for malaria within 48 hours if malaria has been diagnosed. The effectiveness of this service, however, also depends on the behaviour of individuals in seeking treatment at health facilities. This means, residents in malaria endemic areas need to have sufficient knowledge to associate fever with malaria but their behaviour is also determined by other factors such as the levels of the perceived threat of malaria and perceived benefits of treatment by the patient and/or family members.

Since the implementation of the comprehensive health service approach (health extension package) in Ethiopia in 2003 (FMoH 2010:14), malaria prevention and control strategies were expected to be implemented at grass roots level. In particular, women are the most frequently contacted members of the family by the HEWs to deliver several components of PHC services (FMoH 2007a:12). This enables Ethiopian women to learn about common methods of malaria prevention at household levels.

In some African countries, comparable findings of malaria-related knowledge levels were reported. In Zambia, 86.9% (n=330) of the respondents associated mosquito bites with the cause of malaria (Sutcliffe, Kobayashi, Hamapumbu, Shields, Kamagna, Mharakurwa, Thuma, Glass & Moss 2011:324). These authors emphasised that the proportion of households who recognised ITNs as one of the malaria prevention methods ranged from 40% to 76.4% during 2007-2009 (Sutcliffe et al 2011:324). In Nigeria, only 37.3% (Amoran et al 2011) of the respondents mentioned ITNs as a method of malaria prevention. This evidence shows that respondents in Ethiopia seemed to have a higher level of awareness about malaria compared to those in Nigeria (Amoran et al 2011) while the respondents in Zambia (Sutcliffe et al 2011:324) had a higher level of knowledge about the cause of malaria than those in Ethiopia or Nigeria. These findings suggest that the level of knowledge of the respondents varied from one country to another despite intensive ongoing RBM campaigns in the different countries.

On the other hand, in Bangladesh, Ahmed et al (2009:173) concluded that their respondents had superficial knowledge regarding malaria transmission, prevention, and treatment. A similar finding was reported in India (Das, Gupta, Friedman, Pradhan, Mohapatra & Sandhibigraha 2013:39) where many respondents reportedly sought malaria treatment from unqualified health service providers and traditional healers.

Despite the growing awareness in some key areas of malaria-related knowledge, the respondents' wrong perceptions about the strategies of RBM should not be overlooked. Though malaria can infect all people, some segments of the population, such as children and pregnant women, are at increased risk (WHO 2012:5). This reality needs to be understood by communities living in malaria endemic regions in order to emphasise that vulnerable members of the family should use the available ITNs. In this regard, 18.1% (n=143) out of 790 respondents in this study did not identify fever as an important symptom of malaria. This could affect their health seeking behaviours, including accessing diagnosis and treatment services within 24 hours, as suggested by the FMoH (2012:38), to reduce the incidence of complicated malaria cases.

Knowledge is an important tool that can modify a person's perceptions about health and is thus, one of the key factors for behavioural change (Glanz et al 2008:50). In this study, the desirable responses to some knowledge items were high as 92.2% (n=790) had heard about malaria. Out of the 790 respondents who had hear about malaria, 66.5% (n=525) knew the cause of malaria; and 81.9% (n=647) correctly identified 'fever' as one of the typical symptoms of malaria. However, the respondents' comprehensive malaria-related knowledge level, as measured by the combination of 26 different items, was low as 53.3% (n=457) scored below the mean value.

Further analysis of data from the current study indicated that the age of the respondents was associated with their knowledge about malaria (see figure 4.3). In particular, women who were 25-34 years old were very knowledgeable about malaria compared to those younger than 25 and older than 34 years of age. Women aged 25-34 years are in their reproductive ages (CSA 2012:71) and thus, have more access to HEWs for maternal health services such as ANC, post natal care, immunisation and other services including malaria prevention and control (FMoH 2010:8). As the frequency of mothers' contact with HEWs increases because of these services, there is an increased probability that mothers get access to information regarding malaria prevention and control. Formal training on malaria is another factor attributable to the observed difference in malaria-related knowledge among different age groups. Out of 208 respondents with a high level of knowledge, 73.1% (n=152) had received malaria-related training compared to only 46.2% (n=211) among the 457 respondents with lower knowledge levels (see table 4.4).

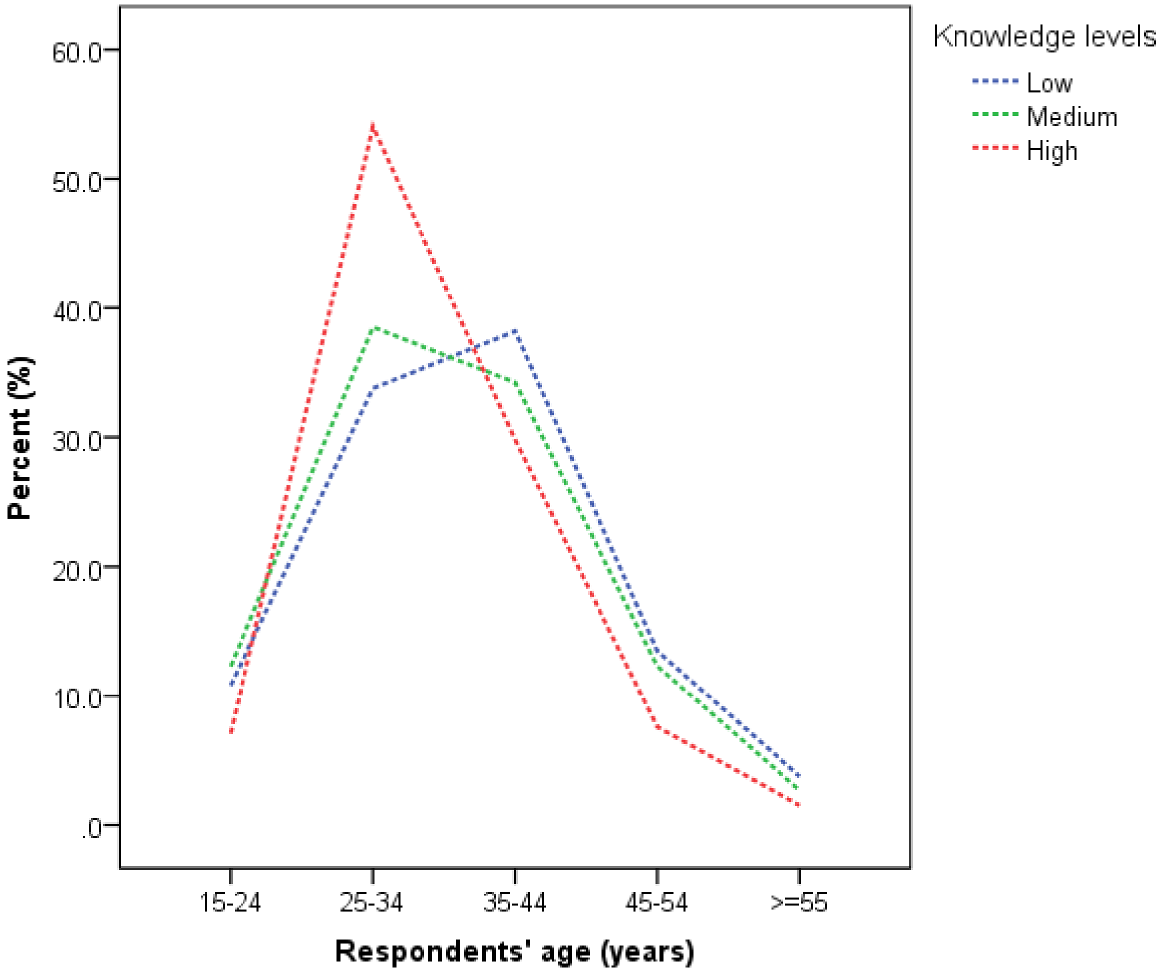

Figure 4.3: Respondents' ages compared with their malaria-related knowledge levels (n=838)

In this study, the role of basic education of the respondents as well as their husbands' education levels were statistically insignificant ($p > 0.05$) in terms of promoting their knowledge about malaria. Out of 854 respondents, 464 (54.3%) reportedly did not attend school at all. The demographic and health survey conducted in Ethiopia during 2011, shows that as age increased beyond 34 years, the illiteracy rate among the female population of Ethiopia increased beyond 70.7% (CSA 2012:27). The relationship observed between knowledge levels and the age of the respondents (figure 4.2) in this study is also explained by the fact that females aged older than 34 were less likely to be educated and thus, would have had lower levels of malaria-related knowledge. Among the 420 respondents older than 34 years of age, 59.8% (n=251) had low knowledge scores compared to 48.3% (n=202) who had low knowledge scores among the 418 respondents aged 34 and younger (see table 4.4).

In conclusion, the level of comprehensive knowledge about malaria among the 838 respondents (see table 4.3) was low. The proportion of respondents with medium and high levels of knowledge constituted only 45.9% (n=385). This figure appears to be low in malaria endemic areas where many malaria preventive efforts have been implemented. These results indicate that several aspects of knowledge of the people in malaria-endemic areas still need to get attention. In particular, preventive strategies of malaria such as the utilisation of ITNs, IRS, and environmental management of vector control need to be understood by women in the study areas. The low levels of the respondents' comprehensive knowledge, pertaining to preventive measures of malaria, should not occur in malaria-endemic areas. This also leads to a situation where knowledge, as one of the factors that modify individuals' perceptions about malaria, will have a minimum effect on the actual malaria preventive behaviours people exhibit. That means, people with low levels of knowledge might be less likely to consider themselves to be at risk of contracting malaria. Consequently, the level of participation of such individuals in malaria prevention and control actions might be limited, because lack of knowledge acts as a barrier to implementing effective malaria preventive and control behaviours (Glanz et al 2008:53).

4.2.4 The Health Belief Model (HBM)

Responses to each construct of the HBM, as applied to malaria, are presented in two ways. Firstly responses to selected individual questions are provided in frequency tables or in the text. Then the overall items used to measure each of the HBM constructs are computed into a single variable that represents the respective domains (table 4.5). Computation into a single variable was accomplished after converting all the responses in same direction implying that desirable responses were assigned higher scores. To do the computation of items, the measure of reliability of the measurements was evaluated by calculating Cronbach's alpha coefficients, as suggested by Field (2009:674). Cronbach's alpha is a reliability index that provides an estimate of the internal consistency of a measure composed of sub-parts (Polit & Beck 2008:751).

Table 4.4: Scales and mean scores of HBM constructs

HBM Constructs	Scales	No of items	Cronbach's alpha	Mean scores	Standard deviation
Perceived susceptibility to malaria	1-5*	7	0.833	25.7	5.6
Perceived severity of malaria	1-5*	4	0.825	16.8	2.9
Perceived benefit of implementing malaria prevention and control strategies	1-5*	13	0.729	47.4	6.6
Perceived barriers to implementing malaria prevention and control strategies	1-5*	14	0.872	36.3	10.3
Cues to actions	1-4**	7	0.843	20.2	4.4

* 1= strongly disagree; 5= strongly agree.   **1= not at all; 4= always

4.2.4.1 Findings

A good level of internal consistency, that is, a Cronbach's alpha of more than 0.7 (Field 2009:681) among items measuring each domain of the HBM was achieved (see table 4.5). Data gained from the respondents, based on each of the HBM's domains, are presented in the following discussions.

Perceived susceptibility to malaria

Responses to some individual items were summarised to provide quantitative evidence regarding perceived susceptibility of the respondents to malaria. Out of 857 respondents, 82.5% (n=707) knew that malaria could cause anaemia in pregnant women and 76.1% (n=652) believed that malaria was a major health problem in their village. Furthermore, 66.2% (567 out of 857) of the respondents thought that everybody living in their village was at risk of being infected by malaria. Self-perception of the risk of malaria in the study area was relatively low with only 55.4% (475 out of 857) respondents believing that they were at risk of getting malaria. Further examination of specific response items showed that 36.2% (n=310) of the respondents did not believe that their family members were at risk of getting malaria.

The overall computed result of measures of perceived susceptibility of the respondents to malaria infection showed that 48.1% (n= 412) of the respondents scored below the mean score and thus, did not believe that they were susceptible to malaria infection. Those who scored above the third quartiles among the 857 respondents constituted only 24.2% (n=207) and thus, believed that their communities were susceptible to malaria infection.

Perceived severity of malaria

Findings about the perceived severity of malaria showed that 9.2% (n=79) and 7.7% (n=66) of the respondents (N=857) respectively disagreed that malaria was a severe and a killer disease in their villages. As compared to the level of perceived susceptibility, more respondents seemed to believe that malaria was a dangerous disease. As many as 88.9% (n=762) of the respondents believed that malaria was a threat to children and 90.3% (n=774) believed this to be the case for pregnant women.

The average computed scores of the perceived threat of malaria among the respondents was 16.8 (± 2.9). Only 49.2% (n=422) of the respondents scored less than the mean value, showing almost a similar situation as perceived susceptibility.

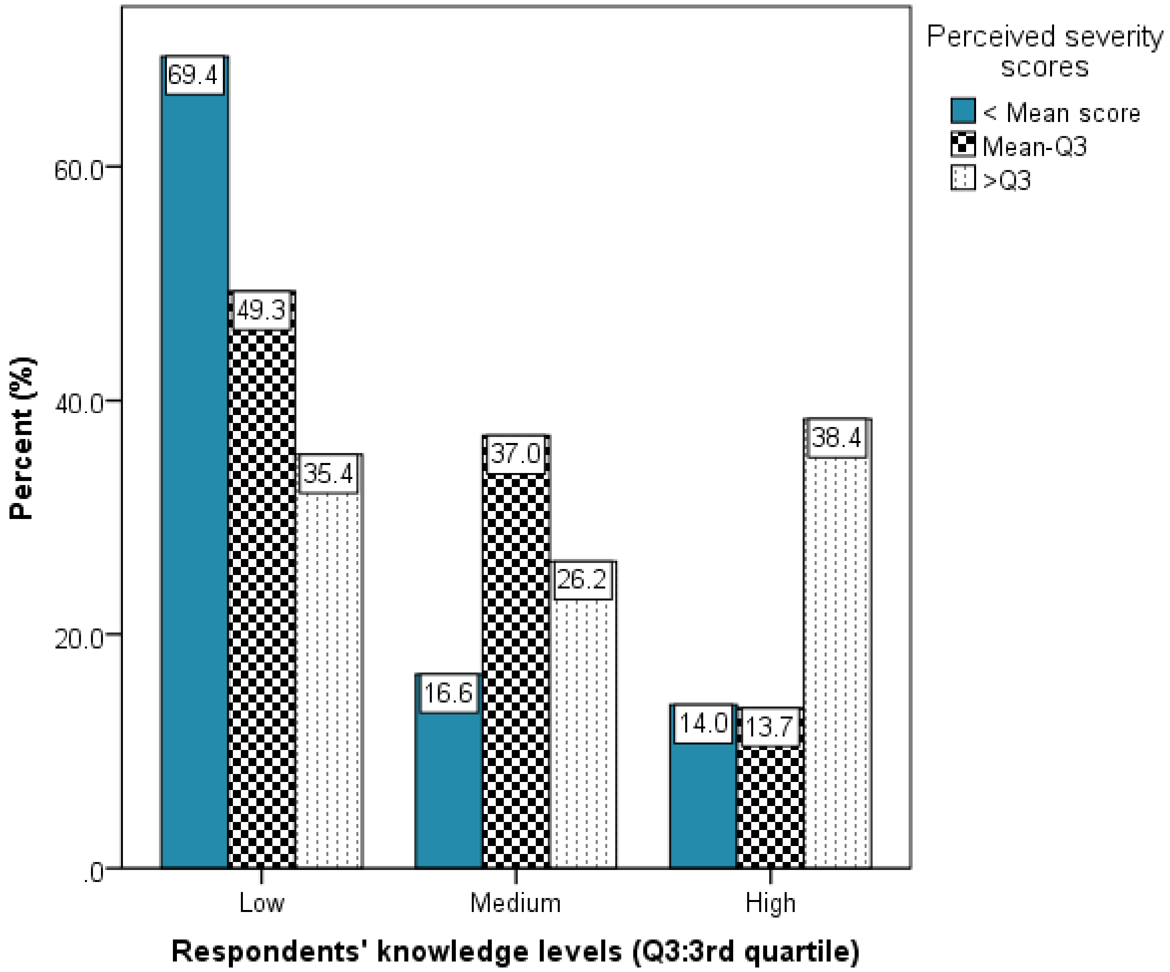

Figure 4.4: Relationship between respondents' malaria-related knowledge levels and their perceived threat of suffering from malaria (n=857)

Perceived benefits of implementing malaria prevention strategies

Out of 857 respondents, 90.1% (n=772) said that they believed that ITNs prevented mosquito bites and 88.4% (758) believed that ITNs prevented malaria The respondents expressed different feelings regarding the benefits related to the utilisation of health posts. As many as 72.3% (n=620) of the respondents believed that the health posts provided preventive and curative services of good quality, specifically for the treatment of malaria, 78.2% (n=670) thought the health posts provided effective treatment for malaria. Similarly, 72.6% (n=622) of the respondents agreed that HEWs were capable of treating malaria at health posts. These findings indicate that the HEWs succeeded to some extent in educating respondents about malaria, and probably also in treating malaria.

The overall mean (±SD) score of the perceived benefit of implementing the RBM programme was 47.4(± 6.6) out of 65 possible points. Out of the 826 respondents, 50.0% (n=413) scored below the mean value (see figure 4.5). The number of respondents with negative perceptions about the value of implementing malaria prevention and control methods steadily decreased as respondents' knowledge levels increased from low to high levels. Thus it seemed as if improved malaria-related knowledge helped to decreased negative perceptions about the RBM programme.

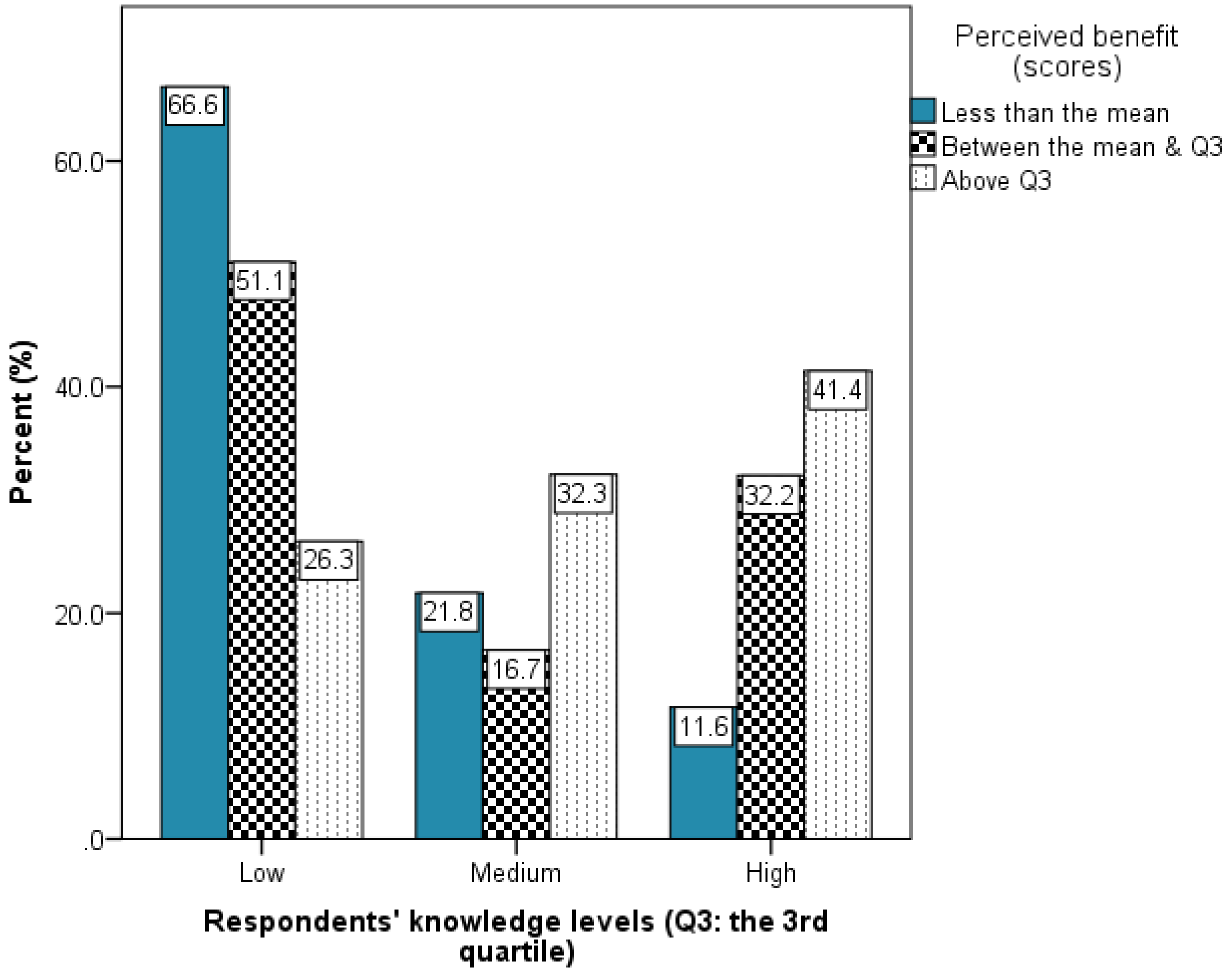

Figure 4.5: Respondents' knowledge cross tabulated by perceived benefit of implementing RBM (n=826)

Perceived barriers impacting on respondents' implementation of malaria prevention and control measures

The data showed that many factors acted as barriers to the implementation of malaria prevention and control measures. Most of these factors included subjective barriers mainly related to the attitudes of the respondents such as perceived lack of knowledge to prevent malaria, lack of comfort to use ITNs, and non-use of the ITNs by significant others (table 4.6).

In this study, non-use of ITNs by the respondents' neighbours (38.2%, n=327), irritation of eyes by IRS (37.0%; n=317) and perceived lack of effectiveness of IRS (37.1%; n=318) were the most frequently mentioned barriers, impacting on the utilisation of malaria prevention and control behaviours.

Misconceptions, related to malaria preventive actions, were observed as potential barriers to implement RBM strategies. Of the 857 respondents, 9.8% (n=84) believed that ITNs were not safe and 12.4% (n=106) said they were not convenient to use.

Moreover, 11.9% (n=102) of the respondents disagreed with the idea that health posts provided preventive and curative health services of good quality and 15.2% (n=130) believed that HEWs were not capable of treating malaria. In response to a question about the affordability of malaria prevention and control, 53.1% (n=455) said that they could not afford to buy additional ITNs, 49.1% (n=421) reported that they could not pay the costs associated with malaria diagnosis and treatment and 47.8% (n=410) of the respondents said that they could not afford to purchase anti-malaria drugs.

Table 4.5: Summary of major barriers impacting on respondents' anti-malaria actions (N=857)

Items	Frequency	(%)
Members of the village do not use ITNs	327	38.2
IRS has no long lasting effects	318	37.1
IRS irritates eyes	317	37.0
IRS causes headaches	293	34.2
Lack necessary knowledge to prevent malaria	234	27.3
IRS harms domestic animals	230	26.8
Lack of information to participate in malaria prevention and control strategies	227	26.5
The home set up is not suitable to use ITNs	220	25.7
Busy with other activities to participle in malaria prevention strategies	219	25.6
Give priority to diseases other than malaria	218	25.4
Other members of the family discourage the use of ITNs	202	23.6
There is no coordinator for malaria prevention and control	169	19.7
ITNs utilisation causes some inconvenience to those who use them	155	18.1
Lacking skills to properly use ITNs	134	15.6

The mean (±SD) score value for the perceived barriers was 36.3 (±10.3) with 53.7% (n= 457) of the respondents scoring below the mean value. Overall, perceived barriers to implement the RBM strategies among the respondents decreased as their knowledge levels increased (see figure 4.6).

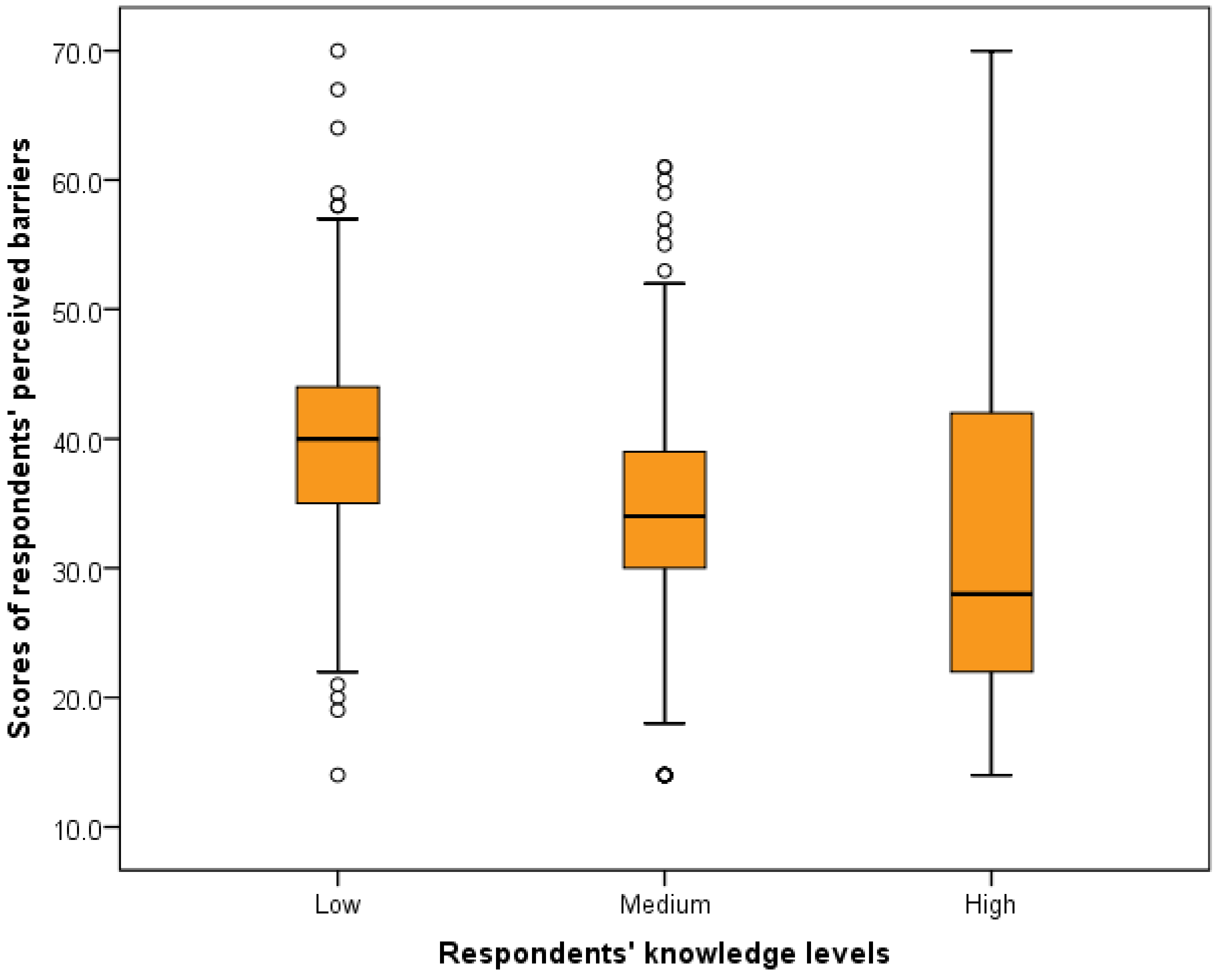

Figure 4.6: Respondents' perceived barriers versus their knowledge levels (n=817)

Cues to action

Out of 843 respondents, 37.7% (n=318) said they regularly implemented malaria preventive and control actions after they had seen that malaria had killed someone in their village. Similarly, 33.9% (284 out of 838) of the interviewees started regular malaria preventive efforts after one of their family members had been infected with malaria and after they had received information from the mass media. Furthermore, 28.0% (n=237) of the 846 respondents always discussed malaria-related issues and 21.6% (n=183) of 849 respondents regularly got support from family members and relatives who engaged in malaria prevention and control activities. The data revealed that the overall support and encouragement obtained from significant others to respondents to implement malaria prevention actions were minimal. This might negatively affect the level of motivation of a person to engage in and to sustain malaria preventive behaviours.

The combined mean score for cues to action was 20.2 with a minimum score of 7 and a maximum score of 28. Out of 806 responses eligible for this analysis, 55.6% (n= 448) scored below the mean values while 22.5% (n=181) scored above the third quartile implying that these respondents were ready for actions to prevent and control malaria.

4.2.4.2 Discussion

As stated in the HBM, knowledge about certain health problems alone will not necessarily lead to the implementation of positive health behaviours (Glanz et al 2008). Other factors such as perceived threats, perceived benefits and barriers are also important determinants of a person's behaviour (Glanz et al 2008). This study assessed these aspects. On the basis of a few items' responses, the respondents demonstrated a good level of risk perceptions. Out of 857 respondents, 82.5% (n=707) believed that malaria might cause anaemia among pregnant women and two thirds believed that residents in their villages were at risk of malaria infection. The levels of perceived susceptibility of mothers (76.9%, n=659) and children (55.4 %, n=475) to malaria infection, reported in this study, were higher than those reported by Paulander et al (2009) in the northern part of Ethiopia. In that study only 32% of the respondents believed that mothers were at risk of malaria infection and 23.4% believed children to be at increased risk. The observed difference might be attributable to the time factor, because the continued and intensive RBM efforts might have improved the level of perception among the respondents of this study over time.

There is a growing level of awareness in Ethiopia that malaria is preventable and treatable (Koenker et al 2013:203) and consequently respondents might develop a feeling that malaria is no longer a threat. Findings from a similar study conducted in south-west Ethiopia (Yewhalaw et al 2010b:47) among mothers caring for children younger than five years of age, who lived close to potential mosquito breeding areas, indicated that 90.6% (n=1003) of the respondents perceived malaria to be preventable and 97.8% (n=1003) perceived malaria to be treatable. Similarly, findings from Zanzibar showed that the perception of households about the susceptibility to malaria infection has decreased in relation to the availability of intensive malaria prevention and control interventions (Koenker et al 2013:203). This indicates that people's perceptions were positively influenced regarding priorities given to family members who are at greater risk of malaria infection, such as children younger than five and pregnant women.

Despite the encouraging responses of risk perceptions of malaria, particularly among the vulnerable population groups (pregnant women and children younger than five), the overall level of perceived susceptibility to malaria infection remained low in the study areas. As many as 48.1% (n=412) of the 857 respondents scored below the mean value of 25.7 out of a possible 35 points. This level of perception was consistent with the level of knowledge about malaria prevention and control observed in this study. This implies that 44.6% (n=382) of the respondents did not consider themselves to be at risk of malaria infection and therefore, were unlikely to engage in malaria prevention and control methods voluntarily.

The perception of benefits of adhering to certain health behaviours is one of the driving forces motivating a person to sustain certain behaviours. The extent of the readiness of the respondents for purchasing resources required for the prevention of malaria and for taking specific actions is affected by their beliefs regarding the expected health benefits. According to Glanz et al (2009:47), perceived susceptibility and threat alone are not sufficient to sustain individuals' desired positive health behaviours. They have to perceive the recommended action as being potentially beneficial to them by reducing the threat. This suggests that recognition of the benefits of the malaria prevention and control methods at the community level is crucial to ensure the effectiveness and sustainability of the RBM programme. In general, this study revealed that the respondents credited the malaria prevention and control method being implemented in the study area. In particular, the fact that 90.1% (772 of 857) of the respondents recognised ITNs as one of the best methods to avoid mosquito bites and 88.4% (758 out of 857) believed that ITNs prevented malaria indicated that the respondents acknowledged that some malaria preventive measures were beneficial to them in terms of reducing their risk of suffering from malaria. This finding is consistent with the findings from north-eastern Ethiopia, where 87.3 %(n=248) of the respondents believed that ITNs protected them from mosquito bites and 70.8 % (n=201) thought ITNs protected them against malaria (Abate et al 2013:315).

Although many respondents recognised some benefits of implementing malaria prevention actions such as the use of ITNs, the average computed scores of the perceived benefit, 47.4 (±6.6) of implementing malaria prevention and control actions was low (50%, 413 of 826). The advantages of preventing malaria need to be recognised by people residing in malaria endemic areas as a result of ongoing RBM activities. Considering the efforts exerted by the local health service implementers in fighting malaria, the fact that only 50.0% (n=413) of the respondents perceived the implementation of malaria prevention and control measures to be worthwhile implementing, implied that the programme was not yet effective in the study areas.

Perceived barriers to implementing RBM strategies influenced the likelihood of taking the recommended actions (Glanz et al 2009:48). As indicated in table 4.6, non-utilisation of ITNs by significant others, perception that the ITNs had no long term protection effects, the irritating effect of IRS to the eyes and headaches attributed to ITNs and IRS, were the most important factors that influenced respondents not to use ITNs and not to allow IRS in their homes. Fourteen items assessed perceived barriers to malaria prevention and control methods. The proportion of respondents who reported potential barriers ranged from 15.6% (n=134) to 38.2% (n=327) in response to specific items (see table 4.6).

In Zanzibar (Koenker et al 2013), the main factors identified as barriers to the utilisation of ITNs included objective barriers such as spending the night away from home for various reasons and spending the night outside the house during mourning sessions for deceased persons. The objective barriers might temporarily expose a person to mosquito bites. Once the behaviour of consistent use of ITNs has been adopted, people can keep their ITNs with them provided that the household has a sufficient number of ITNs. Hence, the objective barriers might not be a huge concern. Rather, the barriers related to the attitudes of the household members need to be emphasised by health managers. In this study most of the barriers identified were attitudinal (see table 4.6). Real behavioural changes, impacting on the prevention and control of malaria, could be achieved when the surrounding environment is supportive of the desired behavioural changes.

4.2.5 Malaria prevention and control measures

Table 4.6: Practices of respondents regarding malaria prevention and control

Duration of owning ITNs	1-2 year	340	47.7
	=>2 years	263	36.9
	Never used	75	10.5
Methods currently used to prevent malaria(n=850)*			
	IRS	635	74.7
	Environmental sanitation	331	38.9
	Use ITN	488	57.4
	Use prophylactic drugs	437	51.4
	Drain mosquito breeding sites	362	42.6
	Fumigation of rooms	148	17.4
	Close doors/windows in the evening	107	12.6
Reasons for preference of the methods used(n=843)			
	Easily available and simple to apply	229	27.2
	Effective to prevent malaria	517	61.3
	Low cost	97	11.5
Used ITNs the night preceding the study(n=713)*			
	Children under five years of age	240	33.7
	Children 5-10 years of age	156	21.9
	Household head	242	33.9
	Other adults	35	4.9
	Others	60	8.4
Consistency of ITNs utilisation (n=713)			
	Every night	368	51.6
	Not frequently	345	48.4
Action taken when one of the family members gets fever(n=850)			
	Take to public health facilities	753	88.6
	Take to private health facilities	73	8.6
	Go to traditional healers	24	2.8
Sprayed houses over 1 year preceding the study(n=664)			
	Yes	422	63.6
	No	242	36.4

* Due to multiple responses, the total number exceeds the (# of ITNs possession)

Effective and continuous malaria prevention and control actions at household level are key determinants of the success of RBM programmes. The extent of the implementation of the preventive strategies could be affected by environmental and socio-cultural factors. This study assessed these aspects and the relevant findings are discussed in sections 4.2.5.1 and 4.2.5.2 of this thesis.

The application of IRS (74.7%, n=635), maintaining effective environmental sanitation (38.9%, n=331), utilising ITNs (57.4%; n=488), using prophylactic drugs (51.4%; n=437) and destroying breeding sites of mosquitoes by draining stagnant water (42.6%; n=362), were among the most frequently reported strategies implemented in the study area (see table 4.7). Stagnant water that serves as potential breeding sites for mosquitoes were observed by the research assistants at 19.1% (n=164) of the households during the data collection period.

4.2.5.1 Findings pertaining to the respondents' practices for preventing and controlling malaria

This section's results are presented by describing the frequencies of individual items that assessed practices of the respondents (see table 4.7) and by computing combined scores for groups of relevant items. The scores were computed from 9 items (based on the malaria prevention and control strategies implemented in Ethiopia) to provide a reliable and overall picture of respondents' practices.

The utilisation of ITNs

The mean number of ITNs owned by a household was 1.4 and 38.6% (n=275) of the 790 respondents had at least two ITNs. Out of 713 respondents whose households owned ITNs, 47.7% (n=340) had used them for the previous 1-2 years while 10.5% (n=75) had reportedly never used their ITNs. There was a consistent use of ITNs by 51.6% (n=368) of the respondents out of the 713 households who reportedly possessed ITNs. In terms of the family members prioritised to use the ITNs, household heads and children under five years of age received similar ratings of 28.1% (n=200). Next to household heads and under-five children, children aged 5-10 years of age received priority for using the ITNs among 21.9% (n=156) households.

Although 57.6% (n=455) of the 790 respondents acknowledged that pregnant women were more susceptible to malaria, no respondent mentioned the use of ITNs by pregnant women the night preceding the study. This might be attributed to the fact that less priority is given to pregnant women in the actual ITN use. Despite ITN utilisation being reported by 51.6% (n=368) of the 713 households possessing ITNs, the research assistants observed that only 66.9% (n=477) of the 713 households that owned ITNs, had these nets hanging over their sleeping places. The ITNs were not in good conditions as 34.2% (n=244) of the 713 respondents reported that their nets were torn, 13.3% (n=95) said the nets were too dirty to use and 7.6% (n=54) reported their ITNs to be both torn and dirty. In order to examine whether the households used their ITNs correctly, volunteers were asked to demonstrate how they used the ITNs. As many as 82.8% (395 out of 477) of the households that had ITNs hanging over their sleeping places correctly demonstrated how the nets should be tucked in around the sleeping places but 17.2% (n=82) were unable to do it correctly. However, it was impossible to identify the skills of 33.1% (n=236) of households who reportedly owned nets but did not hang their ITNs over their sleeping places.

Indoor residual spraying

The indoor spraying of insecticides is a long-acting malaria prevention method. In order to assess this practice, respondents residing in rural areas (193 urban respondents were excluded since priority in IRS was given to rural areas) were asked whether their houses had been sprayed during the six months preceding the interviews. Of 664 rural houses, 63.6% (n=422) reported that their houses had been sprayed. The houses were sprayed on average 4 (± 2.1) months preceding the study.

Treatment of fever

In situations of sickness, people could take different remedial actions. The respondents of this study were given 10 different options to choose from regarding the actions they would take when any member of the family had a fever. The summarised responses indicated that out of 850 respondents, 97.2% (n=826) would seek modern treatment for malaria in public or private health facilities and the remaining 2.8% (n=24) preferred traditional healers (see table 4.7). In a separate item (question 121) that assessed whether the households had used traditional medicine at home over the previous 12 months, 16.2% (n=138) said that they had used herbs to prevent malaria. As many as 79.7% (110 out of 138), who had used traditional medicines, mentioned leaves from the eucalyptus trees as the best herb to repel mosquitoes from entering houses at dusk.

Further analysis of the frequency of herbal use showed that 47.8% (66 out of 138) used it sometimes while 6.5% (n=9) used it all the time. Although the use of traditional medicines is not new in Ethiopia, the use of eucalyptus leaves to repel mosquitoes has not been documented as a general practice in Ethiopia. However, there are few studies from China (Maia & Moore 2011:S11) and Iran (Medhi, Ali Reza, Mahnaz, Reza, Abbas, Fatemeh & Hassan 2010:841) that examined the effect of eucalyptus leaves on mosquitoes and plasmodia. A study conducted in China reported the use of eucalyptus species as repellent against adult mosquitoes providing a 72.2% protection for two hours when leaves were directly burned inside the house (Maia & Moore 2011: S11). According to Maia and Moore (2011), the burning of *Corymbia citriodora* (eucalyptus) leaves in the rooms provided a 70.1% protection against *Anopheles arabiensis* and 51.3% protection against *Anopheles gambiae*. In Iran, oil extracted from *eucalyptus lamaldulensis* was reportedly used as larvacidal and adulticidal agents against *Anopheles stephensi* (Medhi, Ali Reza, Mahnaz, Reza, Abbas, Fatemeh & Hassan 2010:841). In the light of these findings from Asia, the experiences of Ethiopian respondents in this study might be justifiable in using eucalyptus to discourage the entry of mosquitoes into their houses, but this could not be confirmed nor refuted on the basis of the available information.

Respondents' overall practices related to malaria

Nine key items assessed the overall malaria prevention and control practices implemented at household level and these were scored and the scores were added across the 9 questions. A value of '0' was assigned if the respondent reported that the household never or rarely implemented the behaviour, or a value of '1' assigned if the behaviour had been implemented sometimes, frequently of consistently. Those who obtained scores below the mean score were then categorised as exhibiting 'poor practices' and those who scored the mean value or above as demonstrating 'good practices'. Out of the 857 respondents, there were 61.1% (n=524) respondents with 'good practices' and 38.9 %(n=333) with poor practices. The mean (±SD) score for all respondents was 3.9 (±SD=1.5) out of possible 9 points. The distribution of malaria practices across the knowledge levels of respondents is depicted in figure 4.7.

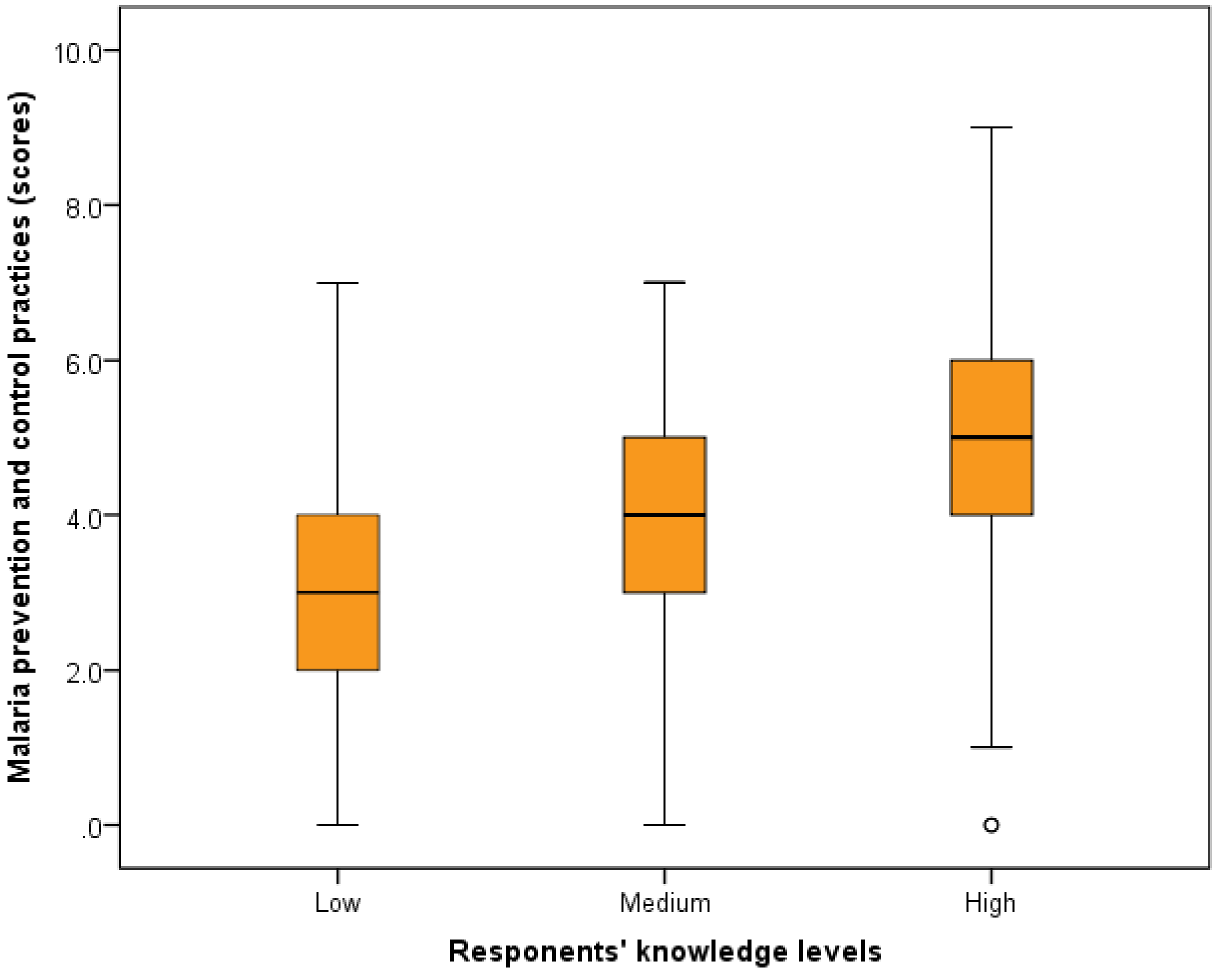

Figure 4.7: Respondents' knowledge levels and malaria prevention and control practices

4.2.5.2 Discussion

Ethiopia's national malaria guidelines recommend environmental management such as destruction of mosquito breeding sites, larviciding, IRS, and the utilisation of ITNs (FMoH 2012a:6-28). Active participation of the community living in malaria endemic areas in the implementation of these malaria preventive measures is vital for the effectiveness of the programme. This study's respondents attempted to apply all the malaria preventive methods recommended by the WHO and Ethiopia's national guidelines (FMoH 2012a:6; WHO 2012:4), although the extent of such implementation varied from one type of intervention to another.

Possession of a sufficient number of ITNs for every household is mandatory to prevent mosquito bites in malaria endemic areas. Because of this, ownership of ITNs by the households is used as one important indicator of the implementation of RBM strategies in Ethiopia (FMoH 2011:32). In this study, ownership of ITNs was high, 83.2% (n=713) compared to 55.2% reported by a malaria indicator survey conducted in Ethiopia during 2011 (FMoH 2012b:4). Despite the fact that a high percentage of households owned ITNs, the reported consistent utilisation by households who owns ITNs was only 51.6% (n=368). Similarly, the utilisation of ITNs by the vulnerable group of children younger than five years of age (33.7%, n=240) was lower than the national figure of 64.5% (FMoH 2012b:5]. One factor that might explain this discrepancy could be the precedence given to the household heads to use ITNs which reduces the chance that children might use the ITNs. The proportion of household heads using the ITNs, however, was not reported in the national malaria indicator survey (FMoH 2012b).

ITNs have been distributed in malaria-endemic areas of Ethiopia since 2005 (FMoH 2012b:20). However, this study indicated that 52.6% (n=375) of the 713 households who possessed ITNs had used ITNs only for two years or less. This study did not explore why the households' ITN utilisation was short and why 10.5% (n=75) of the households had never used ITNs at all. Compared to other findings reported from different parts of Ethiopia, this study reported a fairly good performance of ITN utilisation coverage, but it was too low to ensure effective prevention of malaria. The ITN coverage of 83.2% (n=713) observed in this study was higher than the reported values of 21.5% (Biadgilign et al 2012), 33.5% (Gobena et al 2013), and 60.6% (Batisso et al 2012). In a study conducted in the southern region of Ethiopia, 67.5% of the households reportedly had at least one ITN (Batisso et al 2012) while Biadgilign et al (2012) found an ITN coverage rate of at least one among 62.4% among the households participating in that study. The government sectors reported 100% coverage (FMoH 2012b:31) of the ITNs at a minimum rate of 2 ITNs per household, it was not clear why there was a significant discrepancy between the research findings and the health sector's reports.

Despite ITNs' free distribution in the study area of Ethiopia, ITN possession was higher among the less poor than the poorest households (90.3%; n=140 versus 71.3%; n=127). This was consistent with several studies conducted in Ethiopia (Astatkie &

Feleke 2009:306; Das et al 2012:47; Njau, Stephenson, Menon, Kachur & McFarland 2013:245; Ouattara et al 2011). Although empirical information is required to learn why ITN possession is lower among the poorest households, one reason might be that ITNs might be sold to get money for other essentials like food. Evidence shows that different socio-economic and demographic factors determine the utilisation rate of ITNs by households. For instance, housewives and farmers were reportedly less likely to use ITNs compared to merchants (Biadgilign et al 2012). Similarly, Negash et al (2012:11) reported that people older than 60 years of age compared to those 15-30 years old, those who possessed radios compared to those who did not, and daily labourers compared to government employees, were more likely to use ITNs.

Respondents who were aware of IRS in this study were 56.7% (n=448) out of 790. Two of the districts included in the current study were lowlands. IRS is applied every year after the rainy season in low lying areas leading to an increased level of awareness about the role of IRS in these areas compared to higher lying areas. The increased level of awareness about IRS among the respondents would have had a limited impact on the role of the respondents in promoting the application of IRS. This spraying is done by the public sector and the key decisions whether to spray residual chemicals are made by the government officials. The observed increase in the coverage of IRS in the study area is therefore, seen positively in terms of the willingness of households to permit their houses to be sprayed and to cooperate with the programme of the government in the steps implemented by the RBM programme.

The reported IRS coverage of 63.6% (n=422) out of the 664 rural residents of this study was high compared to the national figures of 20% in 2007 and 46.6% in 2011 (FMoH 2012b:6). In the eastern part of Ethiopia the IRS coverage among the households was 27.8% (Gobena et al 2013). Similarly, IRS was under recognised as a method of malaria prevention by people in western Ethiopia (Yewhalaw et al 2010b). A study conducted in the east Shoa Zone of the Oromia region in Ethiopia reported that IRS resulted in the reduction of the incidence of malaria by 62% (Hamusse, Balcha & Belachew 2012). Because of this impact of IRS, the government of Ethiopia has been scaling up the IRS coverage to all areas below 2000 metres above sea level where malaria is believed to be endemic (FMoH 2012b:10).

In some African countries such as Nigeria, only 30.2% of the respondents mentioned IRS as one of the malaria prevention methods (Amoran et al 2011), while 1.7% to 3.9% of the respondents mentioned IRS as one method of malaria prevention in Zambia during 2007 to 2009 (Sutcliffe et al 2011). IRS was better recognised in Uganda where 374 out of 770 respondents (48.6%) acknowledged the use of IRS, comparable with the current study's finding. IRS is not universally applied in all malaria endemic areas. Rather, areas most at risk of malaria epidemics are prioritised for IRS. This seems to lower the number of households acknowledging IRS as one of the methods used to prevent malaria.

Factors associated with households' practices of RBM

Identification of factors that could explain malaria prevention and control practices at the household level was one of the core objectives of this study. The data showed that the level of participation of households in malaria prevention and control strategies varied. In this study, there was no association between the practices of the respondents and some socio-demographic characteristics of the respondents ($p>0.05$). These included: place of residence, respondents' and partners' education levels, household size, occupation of the respondent, distance of the respondent's house from the health post. Similarly, marital status and religion of the respondents were not useful to predict practices of the respondents regarding malaria prevention and control (see table 4.8).

In this study, urban and rural residents were not significantly different in the level of their implementation of malaria prevention and control practices (see table 4.8). Urban residents could have better access to information sources, such as mass media compared to rural residents, and therefore urban residents could be more knowledgeable about malaria, and thus they might also be more involved in the RBM programme's activities (Ediau et al 2013:170). One of the possible explanations for the lack of difference between urban and rural residents in the practices of malaria prevention could be that there was a small number of urban respondents in this study (193 urban versus 664 rural residents).

Table 4.7: Socio-demographic and economic predictors of malaria prevention and control practices implemented by households in the Sidama zone

Predictors	Practice		COR (95%CI)	AOR(95%CI)
	Poor	Good		
Place of residence (N=857)				
Urban	75	118	1.0	1.0
Rural	258	406	1.0(0.72, 1.40)	0.9 (0.48, 1.78)
Age (years) n=838				
15-24	42	44	1.0	1.0
25-34	123	209	1.62(1.01, 2.61)*	1.17(0.63, 2.18)
35-44	110	186	1.61(0.99, 2.62)	1.22(0.64, 2.32)
45-54	36	63	1.67(0.93, 3.01)	1.15(0.53, 2.48)
=>55	12	13	1.03(0.42, 2.52)	0.63 (0.21,1.85)
Education of the respondent (n=854)				
Never educated	182	282	1.0	1.0
Educated	149	241	1.04(0.79, 1.38)	0.96 (0.63,1.47)
Partner's education (n=730)				
Never educated	115	138	1.0	1.0
Educated	177	300	1.41(1.04, 1.93)*	1.44(0.97,2.14)
Marital status (n=852)				
Single	35	77	1.0	1.0
Married	270	392	0.66(0.43, 1.01)	0.24(0.024,2.29)
Divorced	1	4	1.82(0.19, 16.87)	1.09(0.04, 27.16)
Widowed	26	47	0.82(0.44, 1.53)	0.38(0.04, 3.96)
Occupation (n=857)				
Job less	28	23	1.0	1.0
Farmer	212	355	2.04(1.15, 3.63)*	1.75(0.86,3.56)
Government employee	43	57	1.61(0.82, 3.18)	1.02(0.44,2.38)
Trader	50	89	2.17(1.13, 4.16)*	1.37(0.56,3.31)
Wealth index (n=857)				
Poorest	104	78	1.0	1.0
Very poor	91	132	1.93 (1.30, 2.88)*	1.92(1.24,3.01)*
Poor	47	79	2.24(1.40, 3.57)*	2.02(1.95,3.40)*
Less poor	56	112	2.67(1.73, 4.12)*	2.73(1.67,4.46)*
Least poor	35	123	4.69(2.91, 7.55)*	5.69(3.23,10.04)*

*The test of significance was at the 5% level

Similarly, respondents' and their partners' education levels provided no evidence of differences between educated and uneducated respondents in malaria prevention and control practices. This implies that the impact of education level on malaria prevention and control in this study's communities was sub-optimal. One of the benefits of basic education is that it raises a person's awareness through reading printed messages. In this study, only 26.5% (223 out of 843) of the respondents reportedly had access to printed materials. This implies that most respondents relied on the same sources of health information which could be obtained from health facilities or house-to-house visits by the HEWs.

Other socio-demographic variables such as age, marital status and type of occupation did not explain the variability in the malaria-related practices of the respondents. The association observed in the bivariate analysis for age group 25-34, partners' education level, and being a farmer or trader, did not appear in the adjusted analysis when controlled for potential confounding variables. Further analysis of the data showed that proximity of the households to the health post, education about malaria provided to the household member(s), and perceived barriers of the respondents did not explain the overall practices of the households pertaining to the implementation of malaria prevention and control actions (table 4.10). Although 29.4% (n=252) of the respondents reported malaria cases during the three months preceding the interviews, 48.1% (n=412) of the respondents did not perceive themselves to be at risk of malaria infection. The current malaria prevention and control measures, being implemented by public sectors in Ethiopia, might have reduced the households' level of risk perception (Koenker et al 2013:203).

Wealth index was the strongest predictor of the malaria prevention control practices of the households. When wealth index of the households increased from the poorest to the least poor, the likelihood of the households to perform good malaria prevention and control practices increased from 43% (n=78) to 78% (n=123) as shown in table 4.8.

Table 4.8: HBM constructs and the implementation of malaria-related actions

Predictors	Practice		COR (95%CI)	AOR(95%CI)
	Poor	Good		
Knowledge levels(N=857)				
Low	230	227	1.0	1.0
Medium	74	118	1.62(1.15, 2.28)*	1.55(0.96,2.50)
High	29	179	6.25(4.06, 9.64)*	8.70(4.9, 15.56)*
Received health information on malaria(n=857)				
Yes	180	327	1.0	1.0
No	153	197	1.41 (1.07, 1.86)	0.97(0.67, 1.42)
Distance of house from Health Post (n=854)				
<30 minute walk	271	422	1.0	1.0
30-60 minutes' walk	59	102	1.11(0.78, 1.58)	1.47(0.93, 2.34)
Perceptions of respondents regarding malaria (based on HBM domains)				
Perceived susceptibility (n=724)				
Low	93	164	1.0	1.0
Medium	96	99	0.59(0.40, 0.85)*	0.67(0.42, 1.07)
High	83	189	01.29(0.89, 1.86)	1.03(0.62, 1.68)
Perceived severity(n= 855)				
Low	191	229	1.0	1.0
Medium	16	57	2.97(1.65, 5.34)*	3,32(1.42, 7.78)*
High	126	236	1.56(1.17, 2.09)*	0.91(0.55, 1.48)
Perceived benefit (n=826)				
Low	136	142	1.0	1.0
Medium	38	97	2.45(1.57, 3.81)*	2.89(1.64, 5.13)*
High	148	265	1.72(1.26,2.33)*	1.27(0.79, 2.03)
Perceived barrier(n=817)				
Low	83	126	1.0	1.0
Medium	88	142	1.06(0.72, 1.56)	1.09(0.67, 1.77)
High	141	237	1.11(0.78, 1.57)	0.83(0.51, 1.34)
Cues to action(n=806)				
Low	102	160	1.0	1.0
Medium	77	109	0.90(0.62, 1.32)	0.78(0.52, 1.19)
High	133	225	1.08 (0.78, 1.49)	0.72(0.49, 1.06)

***** The test was significant at $\alpha < 0.05$

Table 4.8 shows that knowledge about malaria, perceived severity of malaria, benefits of implementing malaria prevention and control actions are the independent predictors of respondents' malaria-related practices. Knowledge promotes one's level of awareness about his/her responsibilities for health-related behaviour (Bensley 2010:5). This author further argued that knowledge enables one to make informed decisions which are good for one's health and/or the health of others. In line with this fact, respondents with a good level of knowledge about malaria in this study were 8.7 times more likely to demonstrate good practices of malaria prevention and control compared to those with poor knowledge levels (AOR=8.7, 95%CI [4.9, 15.56]. This was consistent with findings of malaria indicator surveys conducted in Ethiopia (Hwang et al 2010) in which respondents' knowledge of malaria was reported to improve the use of ITNs compared to those with no knowledge.

Contrary to findings by Hailesellasie et al (2008), the perceived severity of malaria was found to be a powerful predictor of implementing malaria preventive behaviours, Respondents who perceived malaria to be a 'threat' were 3.3 times more likely to demonstrate good practices compared to those with low levels of perceived severity of malaria (AOR =3.3 [95% CI] (1.42,7.78). Those respondents who were aware that the consequences of malaria could be life-threatening implemented actions that they believed would reduce their risks of getting malaria. Especially, in relation to health seeking behaviour, people who know the potential risks of complicated malaria would be likely to seek treatment as soon as they noticed signs and symptoms of the disease, meeting one of the ultimate objectives of the RBM programme in Ethiopia (FMoH 2012a:38)

The other HBM construct that explained practices related to malaria prevention and control in this study was the 'perceived benefits' of specific actions. Respondents who were able to foresee the benefits of implementing actions related to the RBM programme were 2.9 times more likely to implement malaria prevention and control strategies compared to those who expected limited benefits from implementing the recommended actions (AOR =2.9 [95% CI] (1.64, 5.13)] as shown in table 4.9. This finding is consistent with Dye et al's (2010:345) report indicating that the positive views of household members about the protective effects of ITNs against malaria infection caused them to adhere to ITN utilisation. In another study, conducted among pregnant women in Ethiopia, 27% of the women who did not own ITNs did not believe that ITNs could protect them against malaria (Belay & Deressa 2008:1302). These findings confirm that perceived benefits comprise one of the determinants of an individual's behaviours related to implementing RBM actions in the study area. This finding is in line with a conclusion from Ali and Tonekaboni (2009:29) regarding the relationship between an individual's perceived benefit and his/her behaviours about malaria prevention and control. In some African countries, consistent findings were reported. Similar to this study's finding, in Tanzania and Uganda, the poorest households were less likely to own ITNs, namely 21.4% and 2.8% of the households respectively (Njau et al 2013:245). According to these authors, the wealthiest households were more likely to use ITNs and therefore, children from these families were less likely to be infected by malaria compared to children from the poorest families. Similar findings were reported from another study conducted in the Côte d'Ivore (Ouattara et al 2011:288), indicating that the wealthier (or 'least poor') households were more likely to use ITNs and modern drugs compared to the poorest households.

4.2.6 Reported sickness due to malaria

The prevalence of malaria' in this study refers to the number of households who reported malaria attacks suffered by any family member during the three months preceding the interviews. The reported number of cases was divided by the total number of all individuals living in the studied households and then multiplied by one hundred.

4.2.6.1 Findings

A total of 4 662 persons lived in 857 households and 29.6% (n=252) of the respondents said that at least one member of their family had been infected with malaria within three months preceding the interviews. That provided a reported prevalence rate of 5.4% (252 out of 4 662 household members). According to the 252 respondents, malaria occurred frequently among children under five years of age (53.6%; n=135). For 56.3% (n=142) of the households, the reported attack of malaria occurred once whereas it occurred twice in 38.9% (n=98) of the households over the three month period. Repeated attacks exceeding two incidences occurred only in 4.8% (n=12) of the households. In terms of the number of persons in the households who reportedly suffered malaria attacks, only one person per household had the disease in 60.7% (n=153) of the households while 29.4% (n=74) reported two persons and the figure was three or more for 9.9% (n=25) of the households.

Factors associated with reported malaria cases

This study identified four characteristics that explained the households who reported malaria cases. These included the overall practices of households regarding malaria prevention and control strategies during the time of the survey, the utilisation of ITNs the night preceding the interview, distances of the households from the nearest health post and the application of IRS during the previous six months (see table 4.10). Households that consistently used ITNs were 56.0% less likely to report malaria cases due to the protective effect of the nets. Houses located far away (30 minutes or more walking distance) from health care services were 2.1 times more likely to report malaria cases.

Similarly, households who reported that their houses had been sprayed during the previous six months were 1.9 times more likely to report malaria cases. Families residing in houses sprayed with IRS were expected to be protected from malaria infections but this was not always the case. Out of 201 rural residents who reported malaria attacks, 26.4% (n=53) were from houses that had not been sprayed while 73.6% (n=148) were from houses that had reportedly been sprayed.

The increased number of malaria cases reported by those whose houses had reportedly been sprayed might be attributed to different factors. One is that these respondents might have re-plastered their walls since the IRS, as this was the practice in Ethiopia (FMoH 2012b:21) or it might be associated with resistance of mosquitoes to the insecticides used during the IRS (FMoH 2012b:18). This might also be due to the lack of consistent use of ITNs among those who reported IRS. Regarding the latter, it was observed that the proportion of respondents who reported consistent use of ITNs were 56.0% (79 out of 141) among those whose houses had not been sprayed compared to 48.6% (197 out of 405) among those whose houses had been sprayed.

4.2.6.2 Discussion

Determining the prevalence of malaria was not the main objective of this study. However, it is plausible to discuss the meaning of these figures within the context of the empirical prevalence of malaria in the study population. The reported prevalence of malaria in this study might not necessarily indicate the actual situation of malaria in the study area. The figures were compiled based on what the respondents believed caused the sickness. Whether the illness was indeed malaria was not confirmed either clinically or by laboratory-based diagnostic tests.

Since malaria is endemic in the study areas, people tended to associate any acute febrile presentation with malaria thus, possibly inflating the prevalence of malaria. Most respondents of 97.2% (n=826 of 850) sought modern medical attention at health facilities (see table 4.7) when signs and symptoms of malaria manifested. This observed treatment seeking behaviour of the respondents could be regarded as effective RBM behaviours.

The reported malaria prevalence of 5.4% in the study's sample is higher than the diagnostically confirmed prevalence of 2.8% (n=425) reported in Ethiopia by Abate et al 2013:315), 95% CI of the difference: 26% (2.2%, 31%) and 4.8% (n=1 429) by Bekele et al (2012:130), 95% CI of the difference: 6.0% (4.5%, 7.5%). In the malaria indicator survey of 2011, the microscopically confirmed national malaria prevalence of 1.3% (n=11 933) was documented (FMoH 2012a:9) which is lower than the findings of this study (95% CI of the difference: 52.7% (52%, 54%). The prevalence rate reported in the health facilities annual report of 2011 (FMoH 2011:29) was 10% (n=919 469) clinical malaria (not laboratory confirmed) among female outpatients. The reported prevalence of malaria attacks in this study area might have been due to an overestimation of fever attacks by the respondents and other fevers might have been reported as malaria. This study's findings depended on respondents' answers to questions and no laboratory diagnoses of malaria were available.

Table 4.9: Predictors of reporting malaria cases by household, Sidama Zone

Predictors	Reported malaria Cases		COR (95%CI)	AOR (95%CI)
	No	Yes		
Residence (n=852)				
Urban	142	51	1.0	1.0
Rural	458	201	1.22(0.85, 1.75)	1.16(0.72, 1.86)
Household size (n=806)				
<5 persons	293	138	1.0	1.0
=> 5 persons	274	101	0.78(0.57, 1.06)	0.66(0.42, 1.04)
Knowledge level(n=852)				
Low	297	157	1.0	1.0
Medium	141	50	0.67(0.46, 0.98)*	0.93(0.52, 1.60)
High	162	45	0.53(0.39, 0.77)*	1.03(0.55, 1.92)
Wealth index (n=852)				
Poorest	103	77	1.0	1.0
Very poor	145	77	0.71(0.47, 1.06)	0.82(0.47,1.42)
Poor	91	34	0.50(0.31, 0.82)*	0.69(0.36,1.31)
Less poor	136	32	0.32(0.19,0.51)*	0.57(0.30, 1.06)
Least poor	125	32	0.34(0.21, 0.56)*	0.73(0.36, 1.48)
Practice(n=852)				
Poor	172	157	1.0	1.0
Good	428	95	0.24(0.19, 0.33)*	0.34(0.21, 0.56)*
ITNs utilisation Experience (years)(n=711)				
< 1 year	28	5	1.0	1.0
1-2	260	80	1.72(0.64, 4.61)	1.65(0.53, 5.14)
> 2	201	62	1.73(0.64, 4.66)	1.55(0.49, 4.94)
Never used	53	22	2.33(0.79, 6.80)	1.25(0.36, 4.32)
ITNs utilisation status (n=711)				
Inconsistent	229	115	1.0	1.0
Consistent	314	53	0.32(0.23, 044)*	0.52(0.33, 0.82)*
Distance of house from HP(n=849)				
< 30 minutes walk	505	183	1.0	1.0
30+ minutes' walk	93	68	2.02(1.41, 2.88)	2.09(1.29, 3.37)*
IRS (n=659)†				
Not sprayed	122	53	1.0	1.0
Sprayed	336	148	0.84 (0.62, 1.14)	1.92(1.11, 3.30)*

* The test was significant at α=0.05; †: case from urban (n=51) were not included as IRS does not apply to urban respondents.

Households with good practices (routine implementation of malaria preventive methods) were 72.0% less likely to report malaria cases (see table 4.10) compared to those with poor practices. This implies that families adhering to good practices were better protected against malaria than families who did not implement such actions. This finding was consistent with results reported from the central part of Ethiopia (Abate et al 2013:316). These results signify the importance of consistently implementing all the recommended malaria prevention and control methods by households in malaria endemic settings. Given the sporadic nature of malaria, there is always a possibility that inconsistent malaria prevention activities could lead to epidemic situations, particularly where the migration of people from non-immune areas is prevalent.

Contrary to the current study's finding, Koenker et al (2013) found that households with good levels of knowledge were 62% less likely to be affected by a malaria epidemic, than other families, compared to the 72% reported by this study. Findings of this study, however, might not be comparable with those of Koenker et al's report since the current study measured endemic cases, rather than epidemic cases of malaria studied by Koenker et al.

Wealth was found in Tanzania and Uganda (Njau et al 2013:245) to be an influential factor in malaria prevention, treatment and control. Children from the wealthiest households were less likely to become parasitaemic than those from the poorest households. The present study provided similar results. As indicated in table 4.8, respondents with better economic status (least poor) were 5.7 times more likely to implement malaria prevention and control strategies compared to the poorest. And those who had demonstrated good overall practices were 66.0% less likely to report malaria cases compared to those who poorly implemented malaria prevention and control measures (see table 4.10).

4.2.7 Reported deaths due to malaria

People's perceptions about malaria prevention and control measures might change if they witness somebody dying from malaria. This experience could pose a threat to them or their families and increase their perceived susceptibility to malaria. In this study, respondents reported deaths associated with malaria over a period of one year preceding the interviews.

4.2.7.1 Findings

A total of 32 deaths, 22 males and 10 females, were reported. Sixteen (50.0%) of the deaths occurred among children under five years of age while 10 deaths were among those aged 5-15. Although there is a possibility of bias in correctly reporting the causes of death, the respondents' answers were accepted, as there was no possibility of correlating the respondents' answers with their medical records.

Factors associated with deaths

Respondents were questioned about factors associated with the reported deaths in their households related to malaria during one year preceding the interviews. Places of residence (urban versus rural), household size and knowledge levels were not useful to predict malaria death reports. In the adjusted binary logistic regression model, three factors were identified to be associated with reported malaria deaths. These included wealth quintiles, practices of households concerning malaria prevention and control and distance of the households from the nearest health post.

Households in the upper wealth quintiles reported fewer deaths associated with malaria compared to those in the poorest category. Respondents from less poor households were 90.0% less likely to report deaths associated with malaria compared to the poorest households [AOR=0.10, 95%CI (0.01,0.82)]. Similarly, respondents with good practices related to malaria prevention and control were 67.0% less likely to report deaths associated with malaria. However, respondents who lived 30 or more minutes of walking distance from the health posts reported four times more malaria deaths compared to those who lived within 30 minutes' walking distance (9.9%, 6 out of 683 versus 2.34%, 16 out 161) from health posts, as indicated in table 4.11.

Table 4.10: Predictors of reported malaria deaths in households, Sidama Zone

Predictors	Reported death due to malaria		COR (95%CI)	AOR(95%CI)
	No	Yes		
Residence (n=847)				
Urban	182	9	1.0	1.0
Rural	633	23	0.74(0.33, 1.62)	0.67(0.29, 1.55)
Household size (n=800)				
<5 persons	405	20	1.0	1.0
=> 5 persons	363	12	0.67(0.32, 1.39)	0.82(0.37, 1.79)
Knowledge level(N=847)				
Low	430	17	1.0	1.0
Medium	184	11	1.51(0.69, 3.29)	1.99(0.86,4.60)
High	201	4	0.50(0.17, 1.52)	1.12(0.33,3.68)
Wealth index (n=847)				
Poorest	183	17	1.0	1.0
Very poor	210	6	0.31(0.12,0.78)*	0.35(0.13, 0.93)*
Poor	112	7	0.62(0.25,1.53)	0.74(0.28, 1.94)
Less poor	151	1	0.07(0.009, 0.54)*	0.10(0.01,0.82)*
Least poor	149	1	0.07(0.01, 0.55)*	0.13(0.02, 1.09)
Practice(n=847)				
Poor	307	22	1.0	1.0
Good	508	10	0.28(0.13,0.59)*	0.35(0.15, 0.79)*
Distance of house from HP(n=844)				
< 30 minutes walk	667	16	1.0	1.0
30+ minutes walk	145	16	4.6(2.25,9.41)*	4.11(1.94, 8.73)*

* The test was significant at $\alpha < 0.05$

4.2.7.2 Discussion

The extent to which the households implemented malaria preventive and control practices such as the utilisation of ITNs, the application of IRS, environmental management of malaria and health seeking behaviours affected the risk of infection and death from malaria in malaria endemic regions. In this study, practices of the households predicted the reported deaths associated with episodes of malaria. Households that routinely practised malaria prevention and control strategies at household level (demonstrating good practices) reported 65.0% fewer deaths associated with malaria compared to those with poor practices (AOR=0.35, 95%CI [0.15, 0.79]) (see table 4.11). The variation in reporting deaths was also observed among the households on the basis of the distances of the households from the health posts. Households located 30 or more minutes of walking distance from the health posts were 4.11 times more likely to report deaths associated with malaria compared to those located closer (within 30 minute walking distance) to health posts [AOR=4.11, 95% CI(1.94, 8.73)].

This difference might be ascribed to seeking early treatment. This might mean that patients living in households closer to the health posts were more likely to get early treatment compared to those living in households further away. This might affect the probability of cure or of developing complicated malaria. Therefore, fewer deaths could be expected among malaria patients living in households located closer to health facilities.

This study showed that households with better economic status could afford costs associated with malaria treatment (transportation and drugs) and therefore, could avert the complications related to malaria thus, minimising the risk of deaths. Households that afforded costs associated with malaria treatment had the possibility of seeking early treatment (compared to the poorest households) preventing malaria infection from becoming complicated malaria which is the main cause of malaria deaths. These analyses show that the RBM programme needs to consider the economic status, the location of the community with reference to the local health facilities and indeed the extent to which the households implement preventive strategies. This signifies the importance of monitoring and evaluating the RBM programme at grassroots level which provides up to date evidence regarding the status of the households' involvement in malaria preventive strategies.

In terms of the segment of population most affected by malaria deaths, this study indicated that children were the most affected. Out of 32 reported deaths due to malaria, 50.0% (n=16) occurred among children under five years of age and 81.3% (n=26) among children under fifteen years of age. This was in line with the report of the

WHO (2013:xi & xiv) which revealed that children were more affected by malaria in all malaria endemic countries.

4.3 SUMMARY

In this chapter, the analysis of quantitative data collected in phase I from households, using structured interview schedules, was presented. The knowledge, perceptions and practices of the respondents living in the study area were discussed in relation to the HBM's major tenets and in relation to Ethiopia's malaria prevention and control strategies. Factors explaining practices of the study population were identified. The data showed that the respondents had poor knowledge (53.3%, n=457) about malaria and 28.9% (n=333) of the households implemented poor malaria prevention and control practices. The reported mortality associated with malaria was 3.9% (n=32) and the reported proportion of malaria cases was 29.6% (n=252). The knowledge level, perceived severity of malaria and perceived benefits of implementing malaria prevention strategies were among the factors that explained households' practices of malaria prevention.

The next chapter presents the analysis and discussion of data obtained from HEWs working at health posts of the kebeles (in phase 2 of this study)

CHAPTER 5

ANALYSIS AND DISCUSSION OF THE RESEARCH FINDINGS (PHASE II)

5.1 INTRODUCTION

In this chapter data, obtained during phase 2's structured interviews conducted with the HEWs, are presented and discussed. Data from the second phase were required to complement the findings from the household survey (phase 1) to better understand malaria prevention and control in the Sidama Zone of southern Ethiopia from both the community's and health services providers' perspectives. The data sources for phase II were HEWs providing primary health care services at health posts in the communities where respondents for phase I lived.

5.2 RESEARCH FINDINGS

Results obtained from the structured interviews conducted with the HEWs are presented and discussed under sub-headings to address the following objectives striving to:

- determine the HEWs' knowledge, attitudes and practices concerning the prevention and control of malaria;
- identify the challenges related to malaria prevention and control at the health post level;
- assess the challenges related to treating patients suffering from malaria at the health post level.

Section 5.2.1 describes respondents' socio-demographic characteristics. Sections 5.2.2 - 5.2.5 present the main findings relating to the research objectives. The data are presented in tables, figures and numerical summaries such as measures of central tendency and spread or dispersion. Percentages (and the corresponding frequencies in parentheses) are used to describe responses pertaining to categorical variables.

5.2.1 Socio demographic characteristics of the respondents

The researcher aimed to interview a total of 54 HEWs (18 from urban and 36 from rural health posts). However, one HEW from a rural clinic was on maternity leave during the data collection period. Hence, 53 HEWs (18 or 34.0% from urban and 35 or 66.0% from rural clinics) were interviewed providing a response rate of 98.1%. Twenty-six (49.1%) of the respondents lived in urban areas while the remaining 50.9% (n=27) lived in rural villages. Out of 26 HEWs who lived in urban areas, eight worked in health posts in the rural communities, travelling to-and-from these health posts on a daily basis.

Socio-demographic characteristics of the respondents including age, gender, marital status, religion, ethnicity, education, household size and types of occupation were compiled to describe the background of the respondents. This provides useful information about how socio-demographic aspects might affect the practices of the HEWs in the PHC services they provided at household and health post levels.

5.2.1.1 Age

The mean age ($\pm$SD) of the respondents was 26.8 ($\pm$ 2.6) years, ranging from 20 to 33 years of age. Most HEWs were young and capable of providing PHC services, including malaria prevention and control services. In Ethiopia, HEWs are expected to use 75% of their time to provide services through conducting home visits thereby reaching households who are unable or unwilling go to the health posts. The age distribution of the respondents is, therefore, suitable to provide community-based malaria preventive services and to conduct home visits.

5.2.1.2 Gender

All HEWs in the study areas were women. Most of the HEWs' programmes in Ethiopia target mainly women and children. Female HEWs might be better able to understand women's health problems. This might have benefits for implementing the activities of malaria prevention and control strategies at the household level.

5.2.1.3 Marital status

Out of the 53 HEWs who were interviewed, 60.4% (n=32) were married and the remaining were single. No respondent was divorced or widowed.

5.2.1.4 Religion

Of the respondents 81.1 % (n= 43) were Christians and 18.9% (n=10) were Muslims.

5.2.1.5 Ethnicity

Respondents from the Sidama ethnic group were 84.9% (n=45) followed by Wolaytas 9.4% (n=5) and Amharas 5.7% (n=3). Since most HEWs belonged to the Sidama ethnic group, they spoke the same language as most members of the local community. This facilitated communication between the community members and the HEWs, enhancing discussions during home-based health visits as well as at the health posts.

5.2.1.6 Educational characteristics of the respondents

The HEWs serving in rural health posts (n=35) had completed one year's training after completion of their basic education of ten years (up to high school level) and were certified as HEWs. Those who had been trained for urban HEW programmes (n=18) had attended a minimum of three years of professional training after ten years of basic education at high schools and obtained a diploma in nursing.

Out of the 53 interviewed HEWs, 66.0% (n=35) were certified as HEWs to function in rural health posts, while 34.0% (n=18) were certified as nurses who implemented health extension programmes in urban communities.

5.2.1.7 Household size

Caring for family members poses extra workloads to HEWs, which might affect their performances in the static (health post-based) and outreach (community-based) health services. To appreciate this reality the family size of the HEWs was assessed. The mean (±SD) household size was 3.3 (±1.1) persons per household with a range of 2 to 6 persons. Eight (15.1%) of the 53 HEWs lived in households of at least five persons, larger than Ethiopia's average household size of 4.6 (CSA 2012:21). Being women, HEWs have several social and household responsibilities such as looking after children and caring for the sick and for the elderly.

5.2.1.8 Monthly income of the respondents

Income is one of the factors that motivates a person to perform his/her duties and responsibilities effectively. It also determines the attrition rate of the workforce and therefore, affects the quality of health services. Table 5.1 shows the monthly income of the HEWs in the study area. The mean (±SD) monthly income of the respondents was 912 (± 212) birr. This provides an average per person daily income of 9.2 virr (0.47 USD per person per day). The minimum and maximum monthly household income was 650 and 1 355 birr. Thirty-six HEWs (67.9%) earned 1 000 birr (51.3 USD) or less per month. HEWs are engaged in the provision of 16 health service programmes that are time consuming and physically demanding to provide.

Table 5.1 monthly income of the respondents(n=53)

Monthly income (birr)	Frequency (*f*)	Percentage%	Cumulative percentage
600-800	24	45.3	45.3
801-1 000	12	22.6	67.9
1 001-1 200	11	20.8	88.7
1 201-1 400	6	11.3	100.0
Total	53	100.0	

5.2.2 Respondents' knowledge about malaria

Items used to assess the malaria-related knowledge of the HEWs included questions regarding HEWs' awareness of malaria prevention and control strategies (environmental management, early diagnosis and treatment, selective vector control, surveillance and epidemic control) in Ethiopia (FMoH 2010:8; FMoH 2012b:6). A fifth RBM strategy, namely human resources development, fell beyond the scope of responsibilities of HEWs. Findings pertinent to knowledge questions are presented in section 5.2.2.1 and the discussions in section 5.2.2.2.

5.2.2.1 Findings

Sixteen (30.2%) of the participating HEWs correctly answered at least three of the five questions pertaining to malaria prevention and control strategies that should be implemented at health post level (figure 5.1). Out of the 53 respondents, 94.3% (n=50) mentioned selective vector control, 58.5% (n=31) early diagnosis and treatment, 32.1% (n=17) environmental management and 20.8% (n=11) surveillance and epidemic control with the latter being the least frequently mentioned strategy. In response to the question on mosquito-breeding sites, as many as 92.5% (n=49) of the HEWs knew that mosquitoes spreading malaria breed in stagnant water, and (81.1%; n=43) said in thrown-away household articles that temporarily store rainwater and 7.5% (n=4) mentioned that the wild ("false") banana plants could serve as possible breading sites for mosquitoes because they capture and retain water in their funnel-shaped leaves.

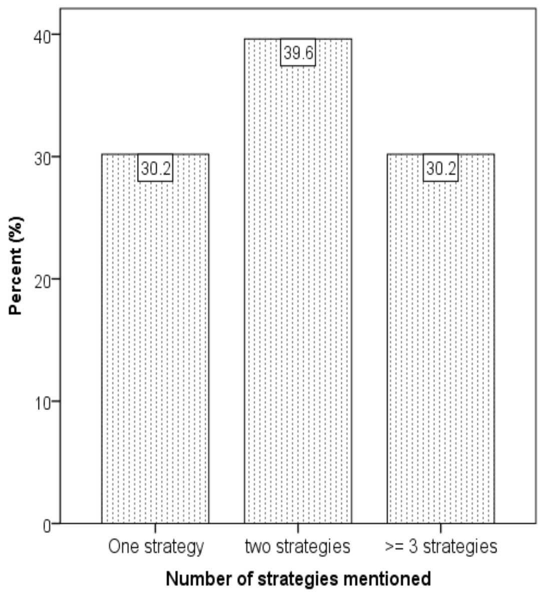

Figure 5.1: Number of malaria-related strategies correctly answered by HEWs (n=53)

Although walls were most commonly mentioned, only 17.0% (n=9) of the respondents acknowledged the role of physical structures as places where mosquitoes hide during the day. Fundamental signs and symptoms of malaria were also assessed (items 16 &17). Fifty-one (96.2%) respondents stated fever as a cardinal sign of uncomplicated malaria while 88.7% (n=47) identified convulsion as one of the signs of complicated malaria. In terms of identifying the community members most at risk of malaria, 92.5% (n=49) and 88.7% (n=47) identified children under five years of age and pregnant women as the groups most vulnerable to malaria attacks (table 5.2).

Table 5.2 Knowledge level of respondents (n=53)

Knowledge Items	Frequencies (*f*)	Percentage %
Breeding places for mosquitoes that transmit malaria*		
Stagnant waters	49	92.5
Thrown household articles that store water	43	81.1
Toilets	4	7.5
False banana	4	7.5
Mosquitoes resting places *		
Walls inside the house	51	96.2
Outside of the house	41	77.4
Underneath household articles	9	17.0
Signs and symptoms of uncomplicated malaria*		
Fever	51	96.2
Headaches	45	84.9
Chills/shivering	38	71.7
Back pains	38	71.7
Joint pains	27	50.9
Vomiting	7	13.2
Thirsty	5	9.4
Loss of appetite	5	9.4
Sign and symptoms of complicated malaria *		
Convulsion	47	88.7
Headaches	31	58.5
Hypoglycaemia	15	28.3
Shivering/chills	4	7.5
Individuals most vulnerable to malaria infection *		
Children under five years of age	49	92.5
Pregnant women	47	88.7
Lactating mothers	29	54.7
Children five years of age and above	25	47.2
The elderly	18	34.0
Adults	1	1.9
Locally abundant species of plasmodia*		
P. falciparum	53	100.0
P. vivax	50	94.3
P. ovalae	8	15.1
P. malariae	1	1.9
* The total does not add up to ‘n’ and 100% because of the multiple responses.		

In response to the question about species of plasmodia commonly found in the study area, all the respondents (100%) mentioned *plasmodium falciparum* followed by 94.3% (n=50) who also identified plasmodium vivax as the second MOST common species. Furthermore, 15.1% (n=8) of the respondents mentioned that plasmodium ovalae species were identified in the study area though the frequency was very low. Although the level of knowledge of the respondents regarding the treatment of plasmodium falciparum infection was good with the correct responses ranging between 84.9% (n=45) and 92.5% (n=49), the respondents seemed to have some knowledge gaps pertaining to the treatment options for plasmodium vivax cases where the incorrect responses ranged from 18.9% (n=10) to 24.5% (n=13). Figure 5.2 indicates the summarised results of the items that assessed knowledge of the HEWs regarding treatment options for malaria parasites plasmodium falciparum and plasmodium vivax for adults and children.

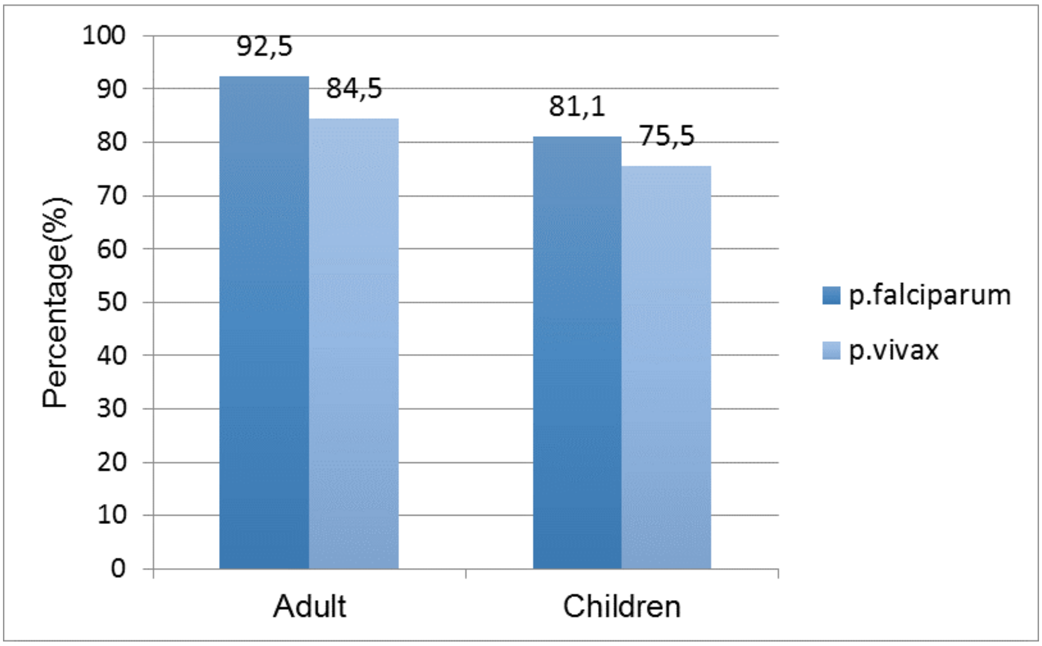

Figure 5.2: Proportion of respondents who knew the correct prescriptions of anti-malaria drugs for adults and children with uncomplicated malaria (n=53)

The side effects associated with malaria drugs were also assessed (see question 22). Out of the 53 respondents, 52.8% (n=28) mentioned vomiting, 47.2% (n=25) recognised headaches and 39.6% (n=21) of the HEWs mentioned nausea as manifestations of adverse effects associated with anti-malarial drugs. However, the respondents recognised only a few of the potential side effects with a maximum proportion of 52.8% (n=28), implying that the HEWs' level of knowledge about the potential side-effects of anti-malaria medications was low.

In addition to the analysis of knowledge of the HEWs based on individual items, the overall knowledge scores were computed from 9 different items (with possible minimum and maximum scores ranging from 0 to 24. These scores were further categorised into an ordinal scale (see figure 5.3) to determine the proportion of respondents with 'poor', 'medium' and 'good' levels of comprehensive knowledge relative to the mean score. The overall knowledge score ranged from 7 to 20 out of 24 possible points. The mean and standard deviation of the knowledge score were 15.8 (±0.35). Thirteen (24.5%) HEWs had a poor level of knowledge (below the mean score) and 26.4% (n=14) had good level of knowledge (scored above 75th percentage points) while 49.1% (n=26) as shown in figure 5.3.

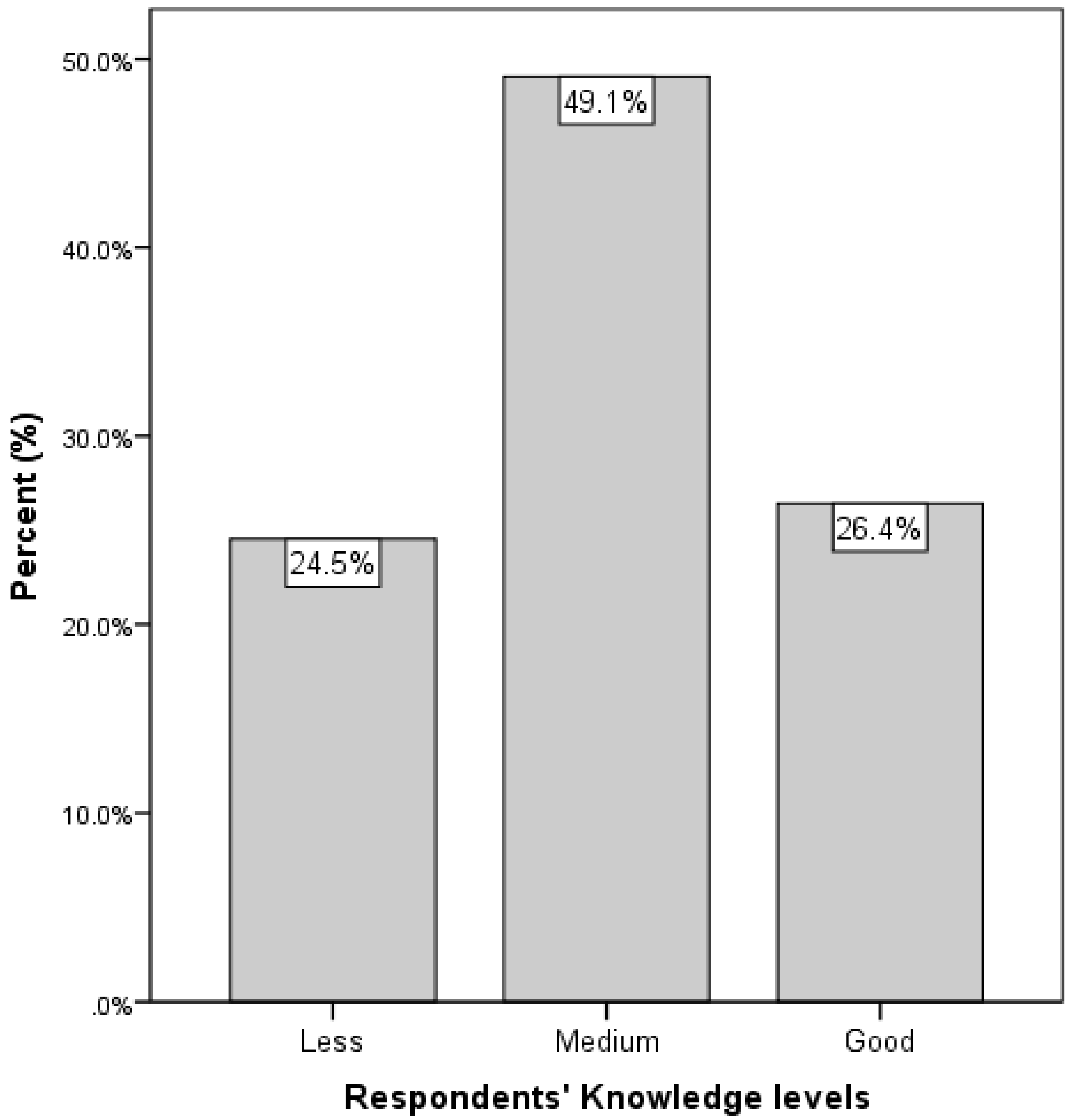

Figure 5.3: Knowledge levels of HEWs about malaria (n=53)

The level of knowledge of the HEWs about malaria might be associated with several factors. These factors were examined using a chi-square test. A Fisher exact test was used instead of Pearson Chi-square since the assumptions required for the latter test were not met because of the small sample size (Field 2008:690). The data showed that the ages of the respondents were not associated with respondents' levels of knowledge regarding malaria prevention and control. Out of 26 HEWs, 46.2% (n=12) of the HEWs, who lived in urban areas, had demonstrated a good level of knowledge about malaria compared to only 3.7 % (n=1) who had a good knowledge level among those (n=27) who lived in rural areas (see table 5.3).

Out of 49 HEWs who had attended in-service training on malaria prevention and control, 53.1% (n=26) scored medium compared to only 1 HEW who scored medium knowledge level out of four (25.0%) who did not attend such training (p=0.027). While 26.5% (n=13) of the 49 HEWs, who had attended training on malaria prevention and control strategies, had scored a good level of knowledge, none of those who did not receive the training attained a good knowledge level. The role of in-service training in improving HEWs' knowledge about malaria was demonstrated by these findings.

Table 5.3: Association of knowledge scores and selected socio-demographic and economic characteristics of the respondents (n=53)

	Knowledge scores			Fisher exact test	P
	Less	Medium	good		
Age of the respondents (years)					
20-24	2	6	1	26	0.32
25-29	10	16	9		
30-34	1	5	3		
Respondents' place of residence					
Urban	5	9	12	13.5	<0.001
Rural	8	18	1		
Highest education attended					
Certificate (11 years of schooling)	10	24	1	26	<0.001
Diploma (13 years of schooling)	3	3	12		
Respondents' monthly incomes (ETB)					
650-850	2	10	0	19.8	0.003
851-1050	5	11	1		
1051-1250	4	3	5		
1251-1450	2	3	7		
Received training on the diagnosis and treatment of malaria					
Yes	10	26	13	4.5	0.027
No	3	1	0		

5.2.2.2 Discussion

Only 32.1 % (n=17) HEWs acknowledged environmental management and only 20.8% (n=11) recognised surveillance and epidemic control as malaria prevention and control strategies. This suggests that HEWs in the study area seemed to underemphasise some malaria prevention and control strategies which the Ministry of Health of Ethiopia considers key elements to adopt positive and sustainable health behaviours among the community members to enhance the prevention and control of malaria epidemics (FMoH 2012a:6).

On the other hand, the respondents paid more attention to IRS and ITNs which was mentioned by nearly all respondents (94.3%; n=50). IRS and ITNs are the most effective malaria prevention and control strategies. However, these methods largely depend on donor funding (for procurements of the ITNs and insecticides used for IRS) and thus, might not guarantee the sustainability of the programme should the aid stop at some point. To ensure the effectiveness of the RBM, all the strategies recommended by the WHO (WHO 2010:3) need to emphasise implementation. Environmental management is a particularly important strategy of malaria prevention that is universally applicable to households at limited costs. The effectiveness of malaria prevention through environmental management, however, depends on local topography such as low-lying areas compared to mountainous areas (Randell & Kramer 2008:32). Low-lying areas are more likely to contain multiple mosquito breeding sites requiring more attention to mobilise the community for active participation in environmental management activities. Frontline health service providers need to emphasise prevention and control activities relating to constant environmental factors that might spur a malaria epidemic.

On the other hand, one of the main tasks of HEWs is to enhance behaviour changes through dissemination of malaria-related health information such as consistent utilisation of ITNs (FMoH 2012a:38). Thus, HEWs need to have a good level of knowledge about malaria as such, the spread of malaria and the prevention of spread to convey the correct information to the community. Comprehensive knowledge of health service providers is therefore an important component of the quality of services. A sufficient level of knowledge of health service providers can be maintained through regular refresher courses on developments regarding malaria prevention strategies, treatment guidelines, and case management practices (Jaskiewicz & Tulenko 2012:16). Respondents of this study demonstrated good knowledge levels about some key aspects of malaria. Since mosquitoes are nocturnal, they hide during the daytime mainly on, and under, physical structures in houses that sufficiently obscure adult resting mosquitoes. The respondents' knowledge about mosquitoes' breeding and resting places was high as 92.5% (n=49) of the respondents correctly answered questions relating to breeding sites and 98.1% (n=52) correctly answered questions about mosquitoes' resting places.

HEWs residing in urban areas demonstrated good knowledge about malaria compared to those living in rural areas (see table 5.3). This might be attributed to the fact that HEWs assigned to urban health posts are more likely to access different sources of information such as scientific literature and other printed media that provide them with the opportunities to update themselves with new information. In addition to that, HEWs working in urban health posts are trained for three years and graduate as diploma holding nurses (FMoH 2010:16) who are more knowledgeable and skilled compared to HEWs in rural areas with only one year's training. This might explain the observed difference in good knowledge between urban HEWs and HEWs working at rural health posts.

In addition to malaria preventive measures, HEWs have a responsibility to provide diagnostic and curative services for malaria patients. Effective provision of curative services for malaria cases - diagnostic skills and knowledge of recommended treatment modalities - requires sufficient knowledge of these as well as of patients' clinical manifestations. Out of the 53 HEWs, 96.2% (n=51) correctly mentioned fever as one of the vital signs of malaria. This level of knowledge might have a positive implication on the decisions made by the HEWs regarding the appropriate case management practices at the health post level as well as for the timely referral of complicated malaria cases.

Plasmodium falciparum and plasmodium vivax are the two dominant species of malaria parasites in Ethiopia (FMoH 2012b:3). Respondents' knowledge about the distribution of these species of plasmodia was consistent with national reports (FMoH 2011:33). However, 15.1% (n=8) reported plasmodium ovale as one of the causes of malaria in the study area. This response was inconsistent with the national figures where both plasmodium ovalae and plasmodium malariae constitute <1% of confirmed malaria cases in Ethiopia (FMoH 2010:16). No laboratory diagnostic documents were referred to for confirmation of reported plasmodium ovale diagnoses. Therefore, further investigations might be required regarding the reported slight increase of malaria parasites other than plasmodium falciparum species in the study area.

The level of knowledge of HEWs pertaining to the type and dose of treatment options for different species of plasmodia for adult and paediatric malaria cases varied. According to the national malaria guidelines of Ethiopia, Coartem (Artemether-lumefantrine) is the first line drug for uncomplicated plasmodium falciparum and Chloroquine for plasmodium vivax malaria cases (FMoH 2012a:120-121). Considering the relapsing nature of plasmodium vivax, the number of observed incorrect treatment/prescriptions (24.5%; n=13) of anti-malaria drugs for patients might pose challenges to the effective treatment strategies of malaria prevention and control programmes in the study areas. Knowledge of side effects of anti-malarial drugs are critically important to provide effective treatment and care to patients suffering from malaria. Artemether-Lumefantrine, the first line drug of choice in Ethiopia against plasmodium falciparum, has several side effects (FMoH 2012a:120). These include: dizziness, fatigue, anorexia, nausea, vomiting, abdominal pain, myalgia, sleeping disorders, arthralgia, headaches and skin rashes. Appropriate actions that health providers need to take when adverse reactions occur are limited where these manifest when patients had left the health facility. If the patients are not informed during the initiation of malaria treatment, adverse reactions might not be reported to the health post. This might be one of the factors contributing to a low level of recognition of adverse reactions arising from anti-malarial drugs identified by HEWs. Under treatment with anti-malaria drugs (patients failing to take the anti-malaria treatment as prescribed) might also increase the patient's sickness status and some reactions such as vomiting might aggravate under treatment of patients.

In some parts of Africa, several studies assessed knowledge of health care providers. In a study that assessed knowledge of community health workers about the management of malaria in children under five years of age in Uganda, 70% (n=68) of the respondents were reportedly knowledgeable about malaria (Kalyango, Rutebemberwa, Alfven, Ssali, Peterson & Karamagi 2012:282). The current study provided a comparable result, namely 75.4% (n=40). In another study conducted in Uganda, community health workers were able to provide an exhaustive list of signs and symptoms of malaria in children (Mwanje 2013:27). Similarly, the correct level of knowledge of health workers in Uganda regarding the prescription of anti-malaria drugs for children under five years of age ranged between 80 and 82% (Kalyango et al 2012:282). In the current study, a comparable rate of correct prescriptions of drugs for children ranged from 75.5% (n=40) to 84.9% (n=45).

In Nigeria, researchers noted some gaps in knowledge, perceptions and practices among health workers in public primary health care centres, especially relating to the understanding of malaria-related data (Mbachu, Uzochukwu, Onwujekwe, Ilika, & Oranuba 2013:81). The report revealed that 55.6% out of 213 health workers had at least one wrongly completed data format indicating poor management practices of malaria data despite the fact that more than 90% of the respondents reported correct practices of malaria monitoring and evaluation. Incorrect data recording might also emanate from the assignment of unqualified (less knowledgeable) health professionals to malaria prevention and treatment programmes (Kyabayinze, Achan, Nakanjako, Mpeka, Mawejje, Mugizi, Kalyango, D'Alessandro,Talisuna & Jean-Pierre 2012:695).

Misconceptions among community health workers present notable challenges to malaria-related interventions (Denbo 2012:1). A study was conducted in Malawi to assess the beliefs and perceptions of community health workers relating to interventions implemented for malaria prevention and treatment. Denbo (2012:1) noted that, being part of the community, some community health workers did not dare to promote interventions that, according to the broader public, clashed with certain cultural mores and rites. While community health workers need to act as role models in malaria prevention and control, such taboos impinge negatively on their overt reflection of environmental management of vector control. This then becomes another challenge in promoting behavioural change among the community members.

5.2.3 Attitudes and level of satisfaction of HEWs

Attitudes and the HEWs' level of satisfaction with their working environment might affect their job performance either positively or negatively (Jaskiewicz & Tulenko 2012:17). Respondents' attitudes about malaria were assessed based on responses obtained from 8 items (questions 23-30) using a 5-point Likert scale ranging from "strongly disagree" (scored 1) to "strongly agree" (scored 5). Similarly, the respondents' level of job-satisfaction was assessed by 10 items (questions 31.1-31.10) based on a 5-point Likert scale ranging from "very dissatisfied=1 score" to "very satisfied=5 scores". These findings are presented in sections 5.2.3.1 and 5.2.3.2.

5.2.3.1 Findings

Table 5.4 exhibits the responses pertaining to attitudes related to malaria infection. There was a high level of perception (86.0%; 43 out of 50) among the HEWs that they had effectively treated malaria at the health posts. Out of 50 HEWs that responded to a statement about whether they were susceptible to malaria or not, 74.0% (n=37) believed that they were susceptible to malaria infection and the same proportion (74.0%; n=37) believed that malaria was a major public health problem in their area. The perception of HEWs that malaria was a threat to children obtained the third highest score (68.0%; n=34 out of 50) in the study.

The study showed that only 44.0% (n=22) of the 50 HEWs believed that households in their village used ITNs to prevent mosquito bites. The remaining 26.0% (n=13) did not agree with the statement that households used ITNs and 30.0% (n=15) said that they were unsure about the matter. Similarly, only 62.0% (n=31) of the respondents believed that malaria could cause anaemia in pregnant women and 60.0% (n=30) believed that it was a killer disease.

Table 5.4: Respondents' perceptions of malaria-related aspects (n=50)

Characteristics/Items	Agree		Disagree		Not sure	
	(*f*)	%	(*f*)	%	(*f*)	%
Malaria is effectively treated at this health post	43	86	0	0	7	14
Malaria is a major health problem in this kebele (village)	37	74	7	14	6	12
I am susceptible to malaria infection	37	74	4	8	9	18
Malaria is a threat to children in this kebele	34	68	5	10	11	22
Malaria causes anaemia to pregnant women in this kebele	31	62	6	12	13	26
Malaria is a killer disease in this kebele	30	60	9	18	11	22
Households in this kebele regularly use ITNs	22	44	13	26	15	30

The level of satisfaction of the 53 interviewed HEWs regarding different aspects of their work environment ranged between a minimum of 7.5% (n=4) and a maximum of 66% (n=35) as shown in table 5.5. HEWs' perceived their capability of treating uncomplicated malaria cases at the health posts as being most satisfying (66.0%; 35 out of 53). Of the respondents 64.2% (n=34) were satisfied with their level of knowledge about malaria and 60.4% (n=32) with their profession. However, only 7.5% (n=4) of the 53 respondents were satisfied with their monthly incomes, while 24.5% (n=13) were satisfied with their workloads, and 52.8% (n=28) with their places of residence.

The overall level of satisfaction of the HEWs with their jobs was computed from 10 different items. The mean (±SD) level of satisfaction scores was 33.1 (±5.6). The minimum and maximum scores ranged between 20 and 42 out of a possible 50 points. Twenty-five (47.2%) HEWs scored below the mean value and were thus classified as being dissatisfied with their jobs while the remaining 52.8% (n=28) were satisfied.

Table 5.5: HEWs' level of satisfaction with work related matters (n=53)

Characteristics	Satisfied		Dissatisfied		Neither	
	(*f*)	%	(*f*)	%	(*f*)	%
Level of satisfaction of the respondents with:						
capability of treating uncomplicated malaria	35	66.0	6	11.3	12	22.6
knowledge about malaria	34	64.2	3	5.7	16	30.2
own profession	32	60.4	10	18.9	11	20.8
capability of diagnosing and treating complicated malaria	32	60.4	5	9.4	16	30.2
current job	29	54.7	7	13.2	17	32.1
quality of health service provided at the HP	28	52.8	6	11.3	19	35.8
place of residence	28	52.8	14	26.4	11	20.8
work setting at the health post	27	50.9	9	17.0	17	32.1
work load	13	24.5	28	52.8	12	22.6
monthly income	4	7.5	47	88.7	2	3.8

Figure 5.4 shows the degree of support that the HEWs reportedly received from different establishments in the study area and their corresponding level of satisfaction. These were measured using a 5-point Likert scale ranging from "very dissatisfied=1" to "very satisfied=5". Overall, kebele chairpersons, who are the immediate bosses of the HEWs; kebele administrative bodies and health centre staff members, provided better support as compared to support from community figures (religious leaders, the elderly) and NGOs.

Factors that might be associated with HEWs' level of satisfaction were examined using a multiple linear regression model. Respondents' knowledge about malaria, the extent of support HEWs received from various establishments and their monthly incomes, explained 59% of HEWs levels of job-satisfaction (R^2= 0.59).

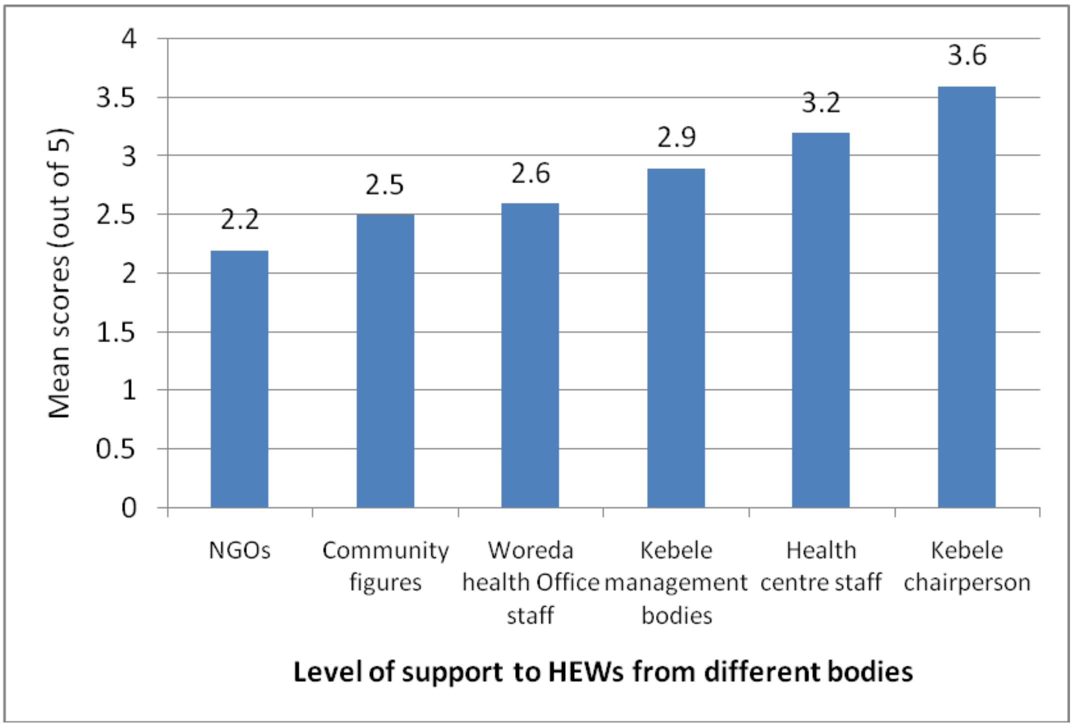

Figure 5.4: Level of support HEWs received from different bodies (n=53)

These three variables were identified as independent predictors of HEWs' job satisfaction. For instance, an increase of HEW's knowledge about malaria by a factor of 0.69 scores improved their job satisfaction by one unit score whereas increasing support to HEWs by a factor of 0.33 improved their level of satisfaction by one unit (table 5.6).

Table 5.6 predictors of the level of satisfaction of HEWs with their work set ups (n=53)

Predictors	Coefficients (β)	S.E	Test statistic (t)	95% CI		p
				Lower	Upper	
Knowledge scores of HEW	0.69	0.17	4.1	0.35	1.04	0.001*
Supports given to HEWs	0.33	0.12	3.1	0.11	0.54	0.004*
Age of respondents	- 0.05	0.21	-0.24	-0.47	0.37	0.81
Household size	-0.88	0.50	-1.8	-1.89	0.12	0.08
Monthly income (ETB)	0.01	0.01	3.8	0.005	0.016	0.001*

* The test was significant at α=0.05

5.2.3.2 Discussion

The 50 HEWs who responded to these items, believed that the curative services they provided were effective (86.0%; n=43) and 74.0% (n=37) recognised malaria as being a major public health problem in their locality. These perceptions of the HEWs might have positive implications for malaria prevention efforts. Such recognition of the magnitude and severity of malaria by health providers guides their practices (decisions taken and actions implemented) regarding the management of malaria cases and the implementation of preventive strategies. It is thus likely that malaria becomes the first suspect for patients manifesting signs and symptoms of malaria, enabling patients to get prompt treatment. The perception of 86.0% (n=43) of the HEWs that they treated malaria effectively at their health posts might be attributed to past experiences of high cure rates among malaria cases treated at the health posts. Out of 50 HEWs, 74.0% (n=37) believed that they were susceptible to malaria and 68.0% (n=34) believed that malaria was a threat to children, suggesting that HEWs in the study area regarded malaria realistically as posing a public health concern.

The attitudes of health service providers may affect the quality of curative services for malaria. The extent to which health providers adopt new treatment approaches and diagnostic procedures might play pivotal roles in malaria treatment outcomes. Adoption of a new treatment approach by health providers is more likely to take place when they have positive attitudes towards the new approach. A study, conducted in Ghana, provided evidence that some health providers resisted implementing new anti-malaria treatments (Lagarde, Smith Paintain, Antwi, Jones, Greenwood, Chandramohan, Tagbor & Webster 2011).

Lack of motivation of health providers might affect health seeking behaviours of the community. Poor attitudes of health workers could cause delayed treatment for malaria or even no treatment due to absent health professionals from the health facilities (Iwalokun, Agomo, Egbuna, Iwalokun, Adebodun, Olukosi, Aina, Okoh, Agomo, Ajibaye, Orok, Enya, Akindele & Akinyele 2011:680). Evidence from Nigeria indicates that respondents deterred seeking curative services at health facilities because of the unavailability of doctors at health posts (95.2%; n=59), delayed treatment (80.6%; n=50), and poor attitudes of health workers (40.6%; n=13) (Iwalokun et al 2011:48).

Despite the expectation that HEWs should spend 75% of their time on household services by doing house-to-house visits (FMoH 2007b:12), 30.0% (n=15) out of 50 HEWs were unsure whether the households in their villages regularly used ITNs. This implied that some HEWs might have missed opportunities to make critical observations regarding malaria prevention activities at household level. This might compromise the quality of their malaria prevention and control services. In addition, 18.0% (n=9) of the HEWs did not believe that malaria was a killer disease and 12.0% (n=6) did not agree that malaria could cause anaemia in pregnant women. This might be attributed to the fact that only one death associated with malaria was reported at the health posts during the three months preceding the interviews.

Levels of satisfaction with their work-related conditions were low among the 53 HEWs (58.8%; n=28). The ability of the respondents to treat malaria patients, was most satisfying to the HEWs (66.0%; n=35). This situation was also in line with the proportion of HEWs that reportedly had positive attitudes with the effectiveness of the malaria treatment services they offered. The motivation of the respondents probably emanated from previous positive malaria treatment outcomes and from cured malaria patients' feedback. Sources of dissatisfaction of the HEWs derived from factors such as their monthly incomes (88.7%; n=47), workloads (52.8%; n=28), places of residence (26.4%; n=14) and being unhappy with their profession (8.9%; n=10). Collectively these factors might impact negatively on the effectiveness and motivation of health workers (Mubyazi et al 2012:48) with negative implications on the activities of the RBM programme.

The levels and types of support (technical, material, financial and social) HEWs received were also sources of dissatisfaction and demotivation which are key factors leading to effective malaria prevention and control services (Susanty, Jie & Miradipta 2013:21). Though supportive supervision from woreda health offices to HEWs were crucially important, such support could be challenged by budget limitations, lack of transportation services and high turnover rates of supervisory staff in the health sector (Kitaw,Teka & Meche 2013:26). The efforts of the HEWs, who participated in this survey, were not optimally backed by technical support, as demonstrated in figure 5.4. The support given to HEWs was found significant for boosting the job-satisfaction of

HEWs, but contributions from community figures and NGOs were far below the expected levels (see table 5.6).

Effective malaria prevention and control requires integrated efforts of all stakeholders (mainly that of service providers and their local and international partners) and the beneficiaries. The role NGOs played in supporting the malaria prevention and control efforts in the study areas was minimal (below the mean score). The contribution of community figures, such as religious leaders and the elderly, is important for mobilising the community towards participation in malaria prevention and control activities, which is mainly the responsibility of household members. Lack of adequate support from community members could be one of the challenges facing the implementation of malaria prevention and control strategies (Jaskiewicz & Tulenko 2012).

5.2.4 Malaria prevention and control strategies (practices)

Assessment of challenges related to RBM at the health post level was the second objective of this study. In line with this objective, the extent to which the HEWs have implemented the five malaria prevention and control strategies was examined. The results are presented in section 5.2.4.1 and a discussion of these results follow in section 5.2.4.2.

5.2.4.1 Findings

In Ethiopia, five different strategies that stem from the WHO's recommendation (WHO 2010:4) have been implemented on a wide scale since 2006 (FMoH 2006:14). In this study, performance of these strategies at health post level was assessed.

Strategy 1: Early diagnosis and treatment of malaria cases

All 18 (100%) of the HEWs working in urban health posts did not provide curative services because of the presence of health centres in urban areas where more qualified health workers (nurses, health officers and physicians) provide curative health services. Questions pertaining to "strategy 1" (items 32-43) were therefore, relevant only to 35 HEWs working in health posts located in rural kebeles. Out of 35 HEWs working in 18 rural health posts, 91.4% (n=32) reported that they had annual action plans for providing curative health services for malaria. Out of the 18 health posts, 16 (88.9%) had treated malaria cases during the month preceding the survey.

On average, each of the 16 health posts provided diagnostic services for 9 malaria cases per week out of which 33.0% (n=3) tested positive for malaria per week. Out of the 16 health posts that provided clinical services during the month preceding the study, 68.8% (n=11) had referred malaria patients to health centres during the three months preceding the study. Most of these cases referred to the health centres were pregnant women who presented with manifestations of malaria requiring management by more qualified health personnel at health centres. Only one death associated with malaria was reported at the health posts during three months preceding the interviews.

Strategy 2: Selective malaria vector control

All 53 (100%) HEWs reported that ITNs were distributed in their respective kebeles at the rate of two ITNs per household. However, in response to a question regarding the actual rate of ITNs possessed by the households, 66.0% (n=35) of the HEWs believed that all the households had ITNs, 15.1% (n=8) believed that not all households had ITNs while 18.9% (n=10) were unsure. Of the HEWs, 79.2% (n=42) said that ITNs were distributed to the local households more than three years ago.

Coordination of the implementation of IRS in rural kebeles is another responsibility of HEWs. Out of 35 HEWs serving in rural kebeles, 82.9% (n=29) reported that their kebeles had been sprayed by IRS while 17.1% (n=6) HEWs did not accomplish the task. The median time since the households were last sprayed was two months.

Strategy 3: Epidemic prevention and control

The respondents were asked about actions undertaken to prevent a malaria epidemic at the time of the study. Out of 53 HEWs, 54.7% (n=29) applied IRS, 60.4% (n=32) promoted utilisation of ITNs, 75.5% (n=40) drained stagnant waters and 22.6% (n=12) cleared shrubs. (Each respondent could provide more than one answer). These were among the actions reportedly carried out in the communities to prevent the occurrence of malaria epidemics in the study area. Regarding the practices of the community members to use traditional medicines against malaria, only two HEWs witnessed the practice whereas 83% (n=44) did not know whether the practice existed or not. The respondents acknowledged that the community had used different heath facilities when they encountered fever, the universal sign of malaria. The 53 HEWs reported that of patients with fever 58.5% (n=31) would go to health posts; 41.5% (n=22) to health centres; 26.4% (n=14) to curative services at private health facilities; and only 22.6% (n=12) to hospitals.

In addition to mobilising the community, the respondents were asked if they had ever participated in any epidemic control activities since they had started their jobs. Out of the 53 HEWs, 98.1% (52) had participated in epidemic control activities and 88.7% (n=47) participated in larval control activities such as draining mosquito breeding sites. Moreover, 69.8% (n=37) HEWs performed some awareness creation activities by disseminating warning messages to alert households to malaria, 11.3% (n=6) of the HEWs reported the epidemic to their immediate bosses at their health centres while 28 out of the 35 (80.0%) rural HEWs treated the patients at the health posts. The overall efforts exerted to prevent a malaria epidemic in the study area ranged between a minimum of 20.8% (n=11) for the use of aerosolised insecticide to a maximum of 75.5% (n=40) for the destruction of mosquito breeding sites by draining stagnant water.

Strategy 4: ***Information communication education***

In disseminating general information about malaria, 84.9% (n=45) HEWs orientated the community about malaria, while 94.3% (50 out of 53) provided targeted training such as proper utilisation of ITNs. Out of the 50 HEWs who trained the community about general aspects of malaria, 40.0% (n=20) did it on a regular basis while 60.0% (n=30) taught intermittently. Though awareness creation was done by most of the HEWs, only 35.6% (16 out of 45) also distributed leaflets containing short messages about malaria and 75.0% (12 out of 16) of the HEWs did these tasks during the three months preceding the survey. As an effective way of promoting behavioural changes among the community, a technique of community conversation was reported by 86.8% (n=46) of the respondents. Community conversation is a method of conveying health information through brief meetings held among local residents (‘gots’). The HEWs play a facilitative role in these discussions. According to the HEWs, 93.5% (43 out of 46) of the communities conducted these meetings within the three months preceding the study.

Strategy 5: Development of human resources (capacity building)

In order to get insight into efforts invested to improve the capacity of the front line health workers’ malaria prevention and control activities, the types and frequency of training provided to the HEWs were assessed. In-service training was most widely used to build the capacity of HEWs. Nine of every ten (90%) HEWs were trained on different topics including prevention, diagnosis and treatment of malaria both for adult and paediatric patients. Two- thirds of the respondents were also trained how to manage malaria during pregnancy despite the fact that HEWs were not mandated to manage malaria in pregnant women at health post level as these women should be referred to higher level health care services.

5.2.4.2 Discussion

According to the national malaria prevention and control strategies of Ethiopia, all suspected malaria cases must be diagnosed and treated within 24 hours of developing fever (FMoH 2012a:49). Effective implementation and success of this strategy, however, requires that the health posts need to have well developed action plans and be ready to provide curative services during this 24 hour period. This study was conducted during the rainy season (from the last week of July to the end of the third week of August, 2013) when the prevalence of malaria is considered to be low in the study area (FMoH 2012a:27). As a result, the flow rate of malaria patients during the low transmission season such as the months of July and August might underestimate the overall annual prevalence of malaria in the study area.

The performance of the first malaria prevention and control strategy (early diagnosis and treatment) at grassroots health facilities, such as health posts, seems to be working. This is the case because reducing delays in the treatment of malaria cases reduces the rate of complicated cases and deaths attributed to malaria. However, some HEWs, working in rural health posts, lived in towns some kilometres away from the health posts and were therefore, unavailable at the facilities during non-working hours (such as at night) and were also unable to provide services for emergency cases. This is further compounded by the lack of electricity at most health posts and a lack of transport services at night. These conditions might challenge the implementation of early diagnosis and treatment of malaria within 24 hours of the onset of fever, as recommended by the Ministry of Health of Ethiopia (FMoH 2012a:49). This condition could further be aggravated by a lack of action plans for curative services provided at health posts.

Referral of patients with complicated malaria is another component of the first strategy. The referral system aims to improve access of patients with complicated malaria and pregnant women manifesting malaria to higher health facilities for better case management and care in health centres or hospitals. The study showed that the referral system across the PHC units has been working well as over two-thirds of the 16 health posts referred malaria patients to higher level health facilities. This could help to prevent deaths associated with malaria. However, no transport facilities were readily available affecting the transfer of patients.

The universal distribution of free ITNs for rural communities has been widely implemented in Ethiopia since 2005 (FMoH 2012a:32). Despite the 100% coverage of the decree of the Ministry of Health of Ethiopia (FMoH 2012a:32), of the distribution of two ITNs per household, only two-thirds of the HEWs believed that households in their areas had ITNs at the time that the data were collected. This suggests that a significant number of HEWs suspected that many ITNs might not have been used for the suggested period of 3-4 years (FMoH 2012a:32). The recommended method of preventing an occurrence of a malaria epidemic is the scaling up of IRS, complemented by the use of ITNs in malaria prone areas (FMoH 2012a:71). In this regard, achievements in the study area is remarkable as 82.9% (n=29) of 35 HEWs working in rural areas reportedly achieved the goal.

An adequate number of health providers plays a vital role in improving basic health services (FMoH 2010:70). In Ethiopia, there were 30 576 HEWs (Kitaw, Teka & Meche 2013:18) out of which 7 915 were working in the SNNPR (Kitaw, Ruck & Geressu 2013:31) during 2009. More recently there appears to be a shortage of human resources in the rural health sectors with a HEW to population ratio of 1:5 426 in 2011 (FMoH 2011:5). To tackle the problem of shortage of HEWs, the government has planned to increase the number of HEWs to 33 320 by 2015 and 41 664 by 2020 (Geresu, Shiferaw, Mitikie, Hailemariam 2013:41). What is alarming is that it seems that front line health workers do not get adequate basic training to comply with the minimum quality of the health care services (Hailemariam 2013:2). A mere increase in the number of HEWs will thus not completely solve the problem; a case of quantity versus quality. The vocational training centres where HEWs undergo basic training lack adequate facilities such as reference materials and trainees also experience limited practical exposures, adversely affecting the quality of training (Hailemariam 2013:2). HEWs trained in poorly equipped centres might poorly manage malaria patients. Basic pre-service professional training, therefore, might be insufficient to effectively deliver both curative and preventive services pertinent to malaria. The use of diagnostic technologies such as multi-species RDT requires orientation and demonstration at the point of service, which is not part of the basic training offered at vocational training colleges (Kitaw et al 2013:20). The intensive in-service training (92.5%; n=49) provided to HEWs, as evidenced by this research, is an appropriate action to narrow down gaps in the capacity of HEWs in the study area. The in-service training frequently provided to the HEWs might have attributed to the observed good level of knowledge of health workers though the figure was not high (see figure 5.3).

Malaria prevention strategies implemented in some African countries, including Senegal, to prevent malaria epidemics involve coordinated efforts of community members and health post workers (Tine, Ndiaye, Ndour, Faye, Ndiaye, Sylla, Ndiaye, Cisse, Sow, Magnussen, Bygbjerg & Gaye 2013:467). That has resulted in a raised level of malaria-related awareness among 92% of mothers in Senegal and ensured the acceptability of chemoprevention of a malaria epidemic by the community. Moreover, continuous dissemination of targeted key messages to the community in malaria endemic areas continues to gain emphasis as an important means of achieving behavioural changes.

Effective delivery of community education by community health workers requires strengthening of health service providers' capacity as part of the RBM programme. In this regard, Rakhshani and Mohammadi (2009:395) have demonstrated improved knowledge about malaria and behaviour changes of community health workers in Iran. According to their report, health workers who participated in a training programme, improved the content of health education material about malaria by 30% compared to the control group. This finding justifies the importance of continuing in-service training to keep the knowledge of health workers fresh so that they can be effective and motivated to perform the activities of the RBM programme.

5.2.5. Availability of resources at the health posts and HEWs' challenges

One of the components indicating the quality of health care services is the availability of resources required to provide specific health care and infrastructure. Availability of infrastructure and resources, used for preventive and curative services, provided at the health post were assessed. Sections 5.2.5.1 and 5.2.5.2 present the findings and a discussion of the findings.

5.2.5.1 Findings

Figure 5.5 shows the availability of infrastructure and inputs at health posts. Health posts in the study area were not sufficiently equipped with basic facilities. For instance out of 18 health posts, only 55.6% (n=10) had toilets, 27.8 %(n=5), had access to water supplies while 44.4% (n=8) had dispensaries.

This study's findings indicate that the coverage of diagnostic facilities (RDTs) is the highest at 94.4% (n=17). Continued availability of anti-malarial drugs was reported by 77.8% (n=14) of the health posts (see figure 5.6). However, malaria treatment guidelines were reportedly available only in 16.7% (n=3) of the health posts while 38.9% (n=7) had safety boxes.

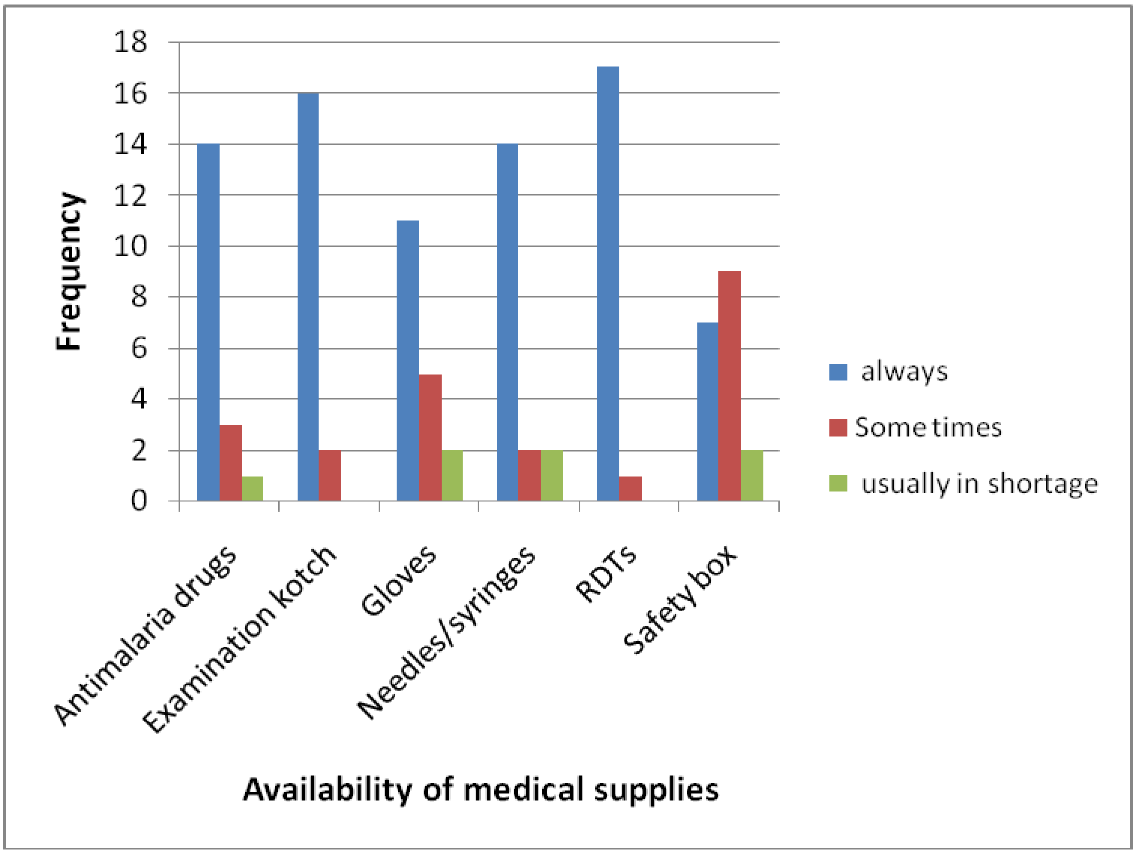

Figure 5.5: Availability of medical supplies at the health posts (n=18)

Shortages of these facilities might affect both the performances of the health providers as well as the utilisation of health posts by malaria patients. These aspects could be "perceived barriers" affecting malaria treatment and prevention. This was also noted by Jaskiewicz and Tulenko (2012:44) who conducted a document review to examine factors affecting work performance of health workers. According to these researchers, when supplies are disrupted, productivity of the community health workers and visiting such facilities by the community, significantly decreased.

Reported challenges facing the HEWs in the implementation of RBM

To get an understanding of the challenges the HEWs in the study area encountered, they were asked some open-ended questions (see items 67.1-67.6 in annexure B-1) to outline the most important challenges they faced while implementing RBM strategies. The reported challenges are addressed in the following sections.

High level of expectations from the community

The respondents indicated that the local communities expected too much from the HEWs, including curative services such as treatment of systemic bacterial/viral infections which is beyond the mandate of HEWs. Such patients are normally referred to health centres though they expressed their disappointment with this arrangement. Some HEWs also pointed out that some patients doubted their negative RDT test results thus questioning the capacity of the HEWs. These perceptions, might affect the clinical service uptake of the community jeopardising the RBM programme’s outcomes.

Resistance to behavioural change

HEWs spend most of their time on promoting PHC with behavioural changes as expected primary outcomes. These mainly include disease preventive activities such as immunisation, environmental sanitation, maternal health and family planning (FMoH 2010:52). Many of these services are achieved through behavioural changes at individual and community levels (FMoH 2012a:38). HEWs reported facing the following challenges while they attempted to enhance behavioural changes:

- Community fatigue as they regularly conduct home visits for implementating 16 different health service packages.
- There was a growing tendency that people associated any recommended changes sought with a demand for something in return.
- Lack of interest by some households to make an appointment for the next discussion session

Workload

Almost all the respondents (96.2%; n=51) said that, the implementation of 16 different health service packages at the community level was too diverse to accomplish. In the process of implementing these packages, several factors were recognised as being problematic, serving as possible barriers for their achievement. Some of the main challenges related to the HEWs' workload including:

- being overwhelmed by too many responsibilities, leading to a lack of focus on specific priorities;
- difficulty maintaining set schedules because of unpredicted occurrences and circumstances, such as meetings and training sessions;
- shortages of earmarked budgets for some outreach activities;
- transport problems, especially in bigger villages where it is difficult to cover the village on foot.

Referral systems

Referral of malaria patients is implemented under conditions where the patient is pregnant, failed to respond to treatment provided at the health post or when the patient continuously vomits and manifests signs of dehydration. Referral of such malaria patients is critical to increase timely access to better diagnosis and treatment at higher level health centres or hospitals. Although a referral system has been established between health posts and the health centres, the HEWs outlined some challenges that they faced in maintaining patient referral systems:

- Transportation problems have been one of the bottle necks that hindered quick referral of emergency cases associated with malaria as there was no means of transportation services available to patients in rural areas. Patients or care givers are responsible for their own means of transportation. As there was no public transportation, many patients used animals or human power to move patients to the health facilities to which the patient was referred. Such situations contribute to unnecessary delays to reach higher level health facilties.

- The lack of referral forms, used to provide detailed information about the case to the health facility to which the patient has been referred, presented another barrier to the referral system.
- Lack of feedback from health centres, regarding treatment outcomes of referred patients, was another challenge. Feedback is an important means of facilitating the exchange of information about the patient's situation and thus of enhancing the follow up of malaria patients.
- Some referred patients never returned to the health posts and thus HEWs could not ascertain whether or not the patient has gone to the referral facility or not.

5.2.5.2 Discussion

The findings indicate that health facilities might not be acceptable to the local community in terms of environmental cleanliness and the availability and utilisation of sanitary facilities. Only 55.6% (10 of 18) of health posts had toilets. The water supply was also very poor with only 5 of 18 (27.8%) health posts supplied by a reliable source of water. These poor environmental conditions might pose a two pronged obstacle in attaining set goals for malaria treatment, prevention and control: de-motivated HEWs and avoidance of the clinics by those in need of the services rendered.

Medical supplies such as gloves were "always" available in only 61.1% (n=11) health posts, needles and syringes in 77.8% (n=14), and anti-malaria drugs in 77.8% (n=14) of the health posts. These findings show that health facilities in the study areas were only partially equipped with basic facilities, probably compromising the management of malaria cases. Similar findings were reported by a study conducted in Uganda on 131 health facilities from 11 districts (Kyabayinze et al 2012:695). According to that report, anti-malarial drugs were available only in 56% (n=70) of the health posts, malaria treatment guidelines in 82% (n=108) of the health posts, and RDTs in 10% (n=12) of the health facilities. The availability of the malaria treatment guidelines in only 16.7% (n=3) of the health posts in the present study compares poorly to the Ugandan study of 82%. This could be one of the factors that might have contributed to the observed incorrect prescription of anti-malarial drugs by 24.5% (n=13) of HEWs.

In Kenya, community health workers have been effective in increasing health seeking behaviours of care givers of children by 5.7 fold and they assisted in increasing the utilisation of health workers for malaria cases from 2% at the base line to 34.6% at the end line (Kisia, Nelima, Otieno, Kiilu, Emmanuel, Sohani, Siekmans, Nyandigisi & Akhwale 2012:248). Similar studies should be repeated in Ethiopia and the potential contribution of voluntary health care workers to enhancing the utilisation of malaria-related services should also be investigated.

Referral of cases of complicated malaria seems to be limited to pregnant women suffering from malaria. The non-referral of malaria cases, other than pregnant women, might suggest two scenarios. The first is that patients with complicated malaria might go directly to health centres or hospitals without reporting to the health post. Such cases therefore, remain unnoticed by the HEWs. The second scenario could be that complicated malaria cases might be very rare in the study area suggesting that suspected malaria cases sought treatment at the health posts during the early stages of the disease preventing the development of complicated malaria.

5.3 SUMMARY

This chapter presented the main findings of phase II of the study. It addressed knowledge, attitudes and practices of HEWs and the challenges they encountered in the course of implementing RBM strategies. The 53 HEWs who participated in the present study were well aware of malaria prevention and control strategies implemented in Ethiopia. Out of the 53 respondents, 69.8% (n=37) correctly mentioned at least two malaria prevention and control strategies, selective vector control being recognised by 94.3% (n=50) of the HEWs. Only 26.4% (n=14) of the respondents demonstrated a good level of overall knowledge about malaria, especially those who lived in urban areas; received in-service training and had higher monthly incomes. However, income might not directly influence HEWs knowledge. Because, HEWs working in urban health posts had spent more years training as nurses and received higher monthly incomes simply because of their advanced training. The HEWs working at rural health posts only had one year’s training and received lower monthly incomes than their urban counterparts.

Out of 50 HEWs, 44.0% (n=22) did not confirm that the households used ITNs in their areas. Similarly, only 24.5% (n=13) of the 53 HEWs were satisfied with their workloads, 7.5% (n=4) with their monthly incomes, and 50.9% (n=27) with their work environments. The limited level of support from the community figures and NGOs could represent important drawbacks for the sustained successful implementation of the RBM programme in Ethiopia. These factors might have deleterious effects on the implementation of the malaria prevention and control strategies and should be seen as potential challenges to this programme's effective implementation.

The main findings emerging from both phase I (households level data) and phase II (health service providers) will be further discussed in chapter six. Conclusions, limitations of the study, and recommendations based on the findings of the study will also be presented in chapter 6.

CHAPTER 6

CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

6.1 INTRODUCTION

The purpose of this study was to assess the implementation of malaria prevention and control measures at the household level in phase 1, and at the health post level in phase 2 of the study. The study was done in the Sidama Zone, southern Ethiopia. Based on the findings, recommendations are proposed to combat malaria in Ethiopia.

Knowledge of the household members and HEWs about malaria prevention and control strategies is crucial to strengthen the RBM programme in the study area. The main focus of this research was therefore, to assess the knowledge, perceptions and practices of the household members (phase 1) and of the HEWs (phase 2) regarding malaria prevention and control. In chapter four, findings of the household level survey and in chapter five findings from the health post level findings were presented and discussed.

In this chapter (section 6.2), findings from households and from the HEWs are compared and contrasted to reach conclusions and to make recommendations based on the conclusions. Limitations of the study are presented in section 6.3 and conclusions of the study and recommendations follow in sections 6.4 and 6.5 respectively. The last issue addressed in this chapter addresses the implicaitons of the study for malaria-related prevention and control issues in Ethiopia (see section 6.6).

6.2 COMPARISON OF THE FINDINGS OF PHASES 1 AND 2 OF THE STUDY

The comparison of data obtained from different sources helps to enhance the reliability the findings (Polit & Beck 2008:768). The core findings from the two phases of this study are presented in sections 6.2.1 to 6.2.4.

6.2.1 Respondents' malaria-related knowledge levels

In this study, the findings obtained from structured interviews conducted with households (N=857 in phase 1) and the structured interviews conducted with the HEWs (N=53 in phase 2) provided similar findings regarding health information provided about malaria to the residents in the study area.

Out of 764 household respondents who had heard about malaria, 83.5% (n=638), and of the 53 HEWs, 84.9% (n=45) reported that HEWs were the main sources of malaria-related information to the community. All HEWs (100%; N=53) reported that they conveyed such information to the community through various methods such as malaria-targeted awareness creation campaigns (94.3%; n=50), community conversations (86.8%; n=46), and distribution of leaflets (30.2%; n=16). However, out of 507 household respondents who had received malaria-related information (see table 4.8), only 31.6% (n=160) reported that dissemination of such information was done at least once per week and 60.0% (n=30) of the 50 HEWs (section 5.2.4.1), who replied to this question, confirmed this to be the case. Out of the 507 household respondents who were reportedly informed about malaria, 61.5% (n=312) believed that the information was useful to them.

The HEWs and household respondents agreed that HEWs were the main sources of malaria-related information and that this knowledge was conveyed at household level. However, the 790 household respondents' malaria-related knowledge was low (see section 4.2.3.2) as only 66.5% (n=525) of them were able to correctly identify the cause of malaria but they demonstrated better knowledge levels about the signs and symptoms of malaria (see section 4.2.3.1). Of the 790 household respondents, 81.9% (n=647) mentioned fever, 76.1% (n=601) mentioned headaches and 72.8% (n=575) identified chills/shivering as the main signs and symptoms of malaria. However, the levels of respondents' knowledge of signs and symptoms of malaria might not be attributed only to the information provided by HEWs, but could emanate from experiences gained from repeated infections of household members with malaria. For instance, out of the 252 households who reported malaria cases during the three months preceding the study, 43.7% (n=110) household respondents reported that at least two of their households' members suffered from malaria during the three months preceding the study (section 4.2.6.1). This implies that these respondents were aware of the particular signs and symptoms of malaria, based on their recent experiences with household members suffering from malaria.

The overall malaria-related knowledge levels of respondents was assessed by asking questions that lay persons would be expected to answer correctly. On the other hand, knowledge of HEWs was assessed, based on professional knowledge about malaria (table 5.2) such as differentiating between the signs and symptoms of uncomplicated and complicated malaria, different species of malaria parasites commonly encountered in the study area and malaria treatment options. The findings revealed that more household respondents (in phase 1) had poorer levels of overall knowledge about malaria [53.3%, 95%CI (50%, 57%)] compared to the HEWs [24.5%, 95%CI (13%, 36%)] (see figure 5.1). However, the HEWs also scored poor levels of overall malaria-related knowledge as indicated in figures 5.3 and 6.1).

Similarly, 49.1% (n=26) (95% CI [35.6%, 62.6%]) of the 53 HEWs had medium levels of knowledge about malaria (see figure 5.3) compared to only 22.4% (n=192) (95% CI [19.6%, 25.2%]) of the 857 household respondents (see figure 4.2). On the other hand, the proportion of respondents with good levels of knowledge about malaria was similar between both the household respondents and HEWs (24.3%; n=208 versus 26.4%; n=14) as indicated in figures 4.2, 5.3 and 6.1.

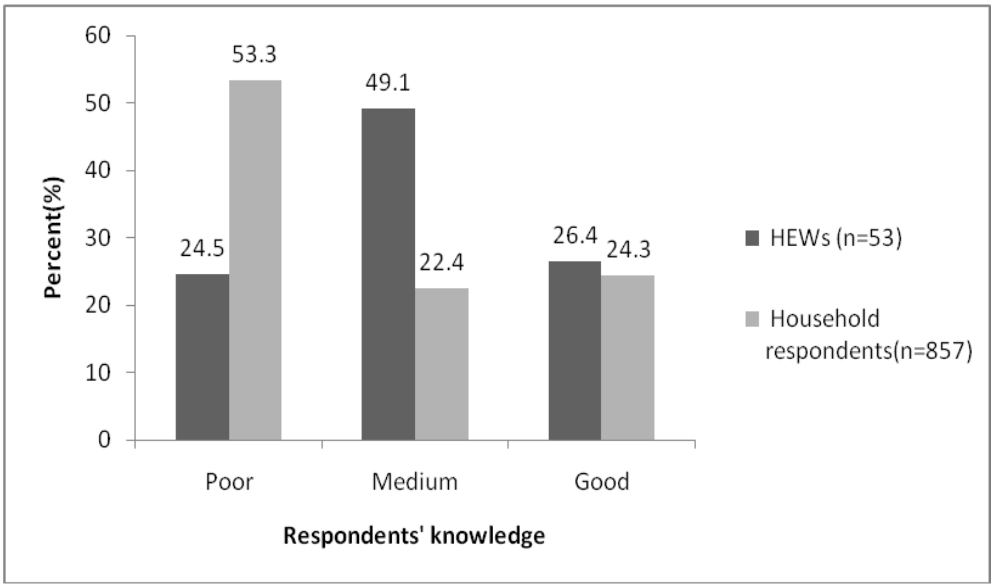

Figure 6.1: Comparison of the malaria-related knowledge of HEWs and household respondents

The Pearson Chi-square test indicated that household respondents who were 25-34 years old (p=0.01); had received targeted health information about malaria (p<0.001) and those who were 'less poor' or wealthier (p< 0.001) demonstrated higher levels of malaria-related knowledge than their counterparts (See table 4.3). Household respondents, aged between 25 and 34 years were in their prime reproductive ages and thus, were likely to access malaria-related information from HEWs during maternal and child health services (antenatal care, delivery services, post natal care, well baby and immunisation services). This could be one of the reasons that might have improved malaria-related knowledge among this age category of household respondents.

The role of training in improving malaria-related knowledge is predictable. The coverage and frequency of training provided to the household members, as reported by the HEWs, was high. Out of 53 HEWs, 94.3% (n=50) reported that they had provided training targeting malaria (section 5.2.2.2). However, the efforts from the HEWs seemingly had limited impact on the malaria-related knowledge of the 857 household respondents as 53.3% (n=457) had poor overall knowledge levels in the study area (see figure 4.2). Women using maternal and child care services have more frequent contact with HEWs than older or younger women. This could be one of the reasons why respondents below 25 or above 34 years of age had poorer levels of knowledge about malaria than those falling within the 25-34 year age group (see figure 4.3) when the women would be likely to visit health facilities for childbearing-related issues. Knowledge of HEWs about malaria was associated with four factors. Those who lived in urban areas (p<0.001), those with increased numbers of school years (p< 0.001), those with better monthly incomes (p<0.003) and those who received in-service training (p<0.003) had better knowledge levels about malaria than their counterparts (see table 5.3). Education and income levels had significant effects on the level of knowledge both at the household and health facility levels. In fact, the correlation of income with improved knowledge might not be direct. Those with good incomes were also likely to be more educated and thus, could get information from multiple sources such as scientific literature, mass media and scientific conferences enhancing these individuals' levels of malaria-related knowledge. Less educated persons with lower incomes might not have ready access to these sources of information.

6.2.2 Perceptions of household and HEW respondents about malaria

Table 6.1 compares selected perceptions about malaria of HEWs with those of the household respondents. Respondents from phases 1 and 2 had similar levels of perceptions as 74.0% (n=37) out of the 50 HEWs versus 76.1% (n=652) out of the 857 household respondents regarded malaria to be a major public health problem in the study area. However, as indicated in section 4.2.4.1, more respondents from the household survey perceived that malaria could cause anaemia in pregnant women (82.5%; n=707) compared to HEWs (62%; n=31) (see table 5.4), and malaria was a threat to children under five years of age (88.9%; n=762 household respondents versus 68%; n=34 HEWs). The 95%CI for these proportions does not overlap (see table 6.1) in each of these cases suggesting that perceptions of respondents in the two phases differed significantly (see table 6.1). More HEWs than household respondents believed that they were at risk of malaria infection (74%; n=37) as shown in table 5.4 than HEWs (55.4%; n=475) (see section 4.2.5.2) and that effective treatment of malaria was offered at the health posts (86%; n=43) of HEWs (see table 5.4) versus 72.6% (n=622) of the household members (see section 4.2.4.1).

Perceptions of self-risk and quality of treatment of malaria at health posts were low among the household respondents compared to the HEWs. The low level of perception of risk noted among household members might affect the malaria prevention practices implemented at household levels. Likewise, the level of perception of household respondents and HEWs, regarding the undesirable effect of malaria on most vulnerable household members, such as children and pregnant women could affect both groups' malaria-related practices (see figure 6.2). Out of 790 household respondents, 76.8% (n=607), (95%CI [73.9%, 79.7%]) believed that children were at increased risk for malaria infection (see section 4.2.3.1) compared to 49 out of 53 (92.5%) (95%CI [85.0%, 99.4%]) HEWs who believed that children in the study area were more vulnerable to malaria than adults (section 5.2.2.1). Similarly, 455 out of 790 (57.6% [95%CI [55.8%, 59.4%]) of the household respondents (see section 4.2.5.1) compared to 47 out of 53 (88.7%), [95%CI [84.4%, 93.0%]) of HEWs perceived that pregnant women were the most vulnerable group for suffering from malaria.

Table 6.1: Perceptions of household respondents (phase 1) and HEWs (phase 2) about malaria in the study area

Perception of respondents about malaria	HEWs (N=50)			HH* survey's respondents (N=857)			P
	(f)	%	95% CI	(f)	%	95%CI	
Malaria is a major health problem in this kebele (village)	37	74.0	(61.8, 86.2)	652	76.1	(73.2, 78.9)	>0.05
I am at risk of infection by malaria	37	74.0	(61.8, 86.2)	475	55.4	(52.1, 58.7)	<0.05
Malaria is a threat to children under five years of age	34	68.0	(55.1, 80.9)	762	88.9	(86.8, 91.0)	<0.05
Malaria can be effectively treated at the health posts	43	86.0	(76.4, 95.6)	620	72.3	(69.3, 75.3)	<0.05

HH*: households; (f): frequency

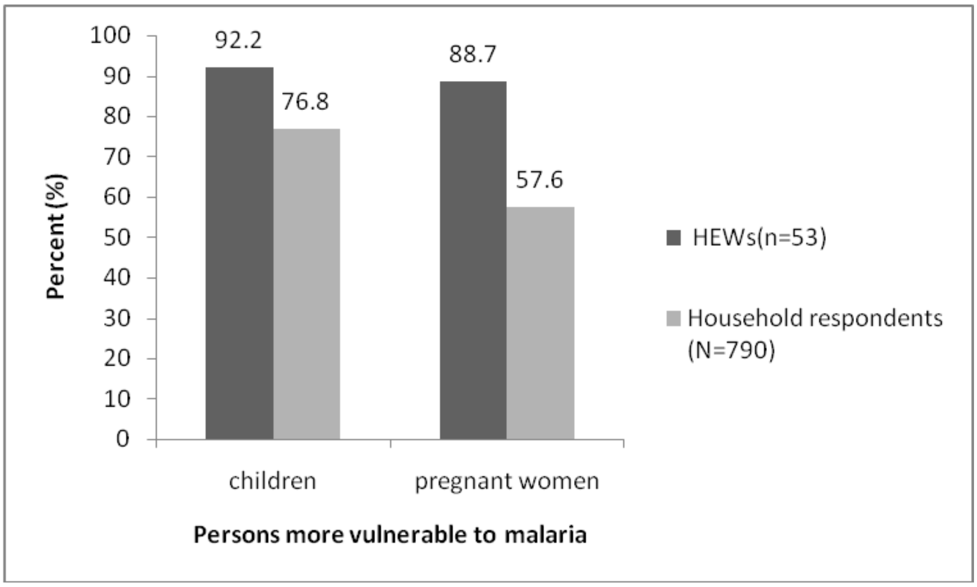

Figure 6.2: Perceptions of HEWs and household respondents regarding the greater susceptibility of children and pregnant women to malaria

If HEWs perceive pregnant women and children to be at greater risk of suffering from malaria than other persons in the community, then they would prioritise children and pregnant women during malaria prevention and control campaigns implemented in the villages, and during the management of malaria cases at health posts. The observed low level of perception among household respondents about the undesirable effects that malaria could pose to pregnant women might thus have negative effects on the prevention and early treatment of malaria at the household level. For instance, with a low level of perceived susceptibility of pregnant women to malaria, it might be less likely that pregnant women would be prioritised to use ITNs to prevent mosquito bites. Moreover, HEWs are unlikely to emphasise the need for pregnant women to sleep under ITNs if the HEWs do not perceive pregnant women to be more susceptible to malaria infection than other household members.

6.2.3 Implementation of the RBM programme in the study area

Malaria prevention and control strategies require continuous efforts both at household and health post levels in order to achieve and maintain successful outcomes. In this study, practices of households and HEWs were assessed. For the purpose of comparison and identification of gaps, items common to both the HEWs and household respondents were emphasised.

In terms of malaria prevention and control methods, only 59.4% (n=469) of the 790 household respondents acknowledged the use of ITNs and 56.7% (n=448) mentioned the application of IRS (see section 4.2.3.1). These figures are lower than the FMoH's target because it had planned to increase IRS coverage to 90% and consistent use of ITNs to 80% of people at risk of malaria in all malaria endemic areas by 2013 (FMoH 2012a:xii). Destruction of mosquito breeding sites was recognised by 53.4% (n=422) of the 790 household respondents (see section 4.2.3.1) compared to 92.5% (n=49) of the 53 HEWs (table 5.2) who mentioned this method as a fundamental strategy of malaria prevention and control. Compared to the reported malaria prevention efforts by HEWs, the observed behavioural changes that the household respondents exhibited were very low for sufficiently halting the prevalence of malaria in the study area.

The reported practices of the HEWs and household respondents about malaria prevention and control activities during the study period were compared. Consistent findings were reported from both phases in the following practices. Utilisation of ITNs by the households was reported by 60.4% (n=32) of HEWs (section 5.2.4.1) versus 57.4% (n=488) of the 850 household respondents (table 4.6). However, inconsistent findings were reported between the HEWs and household respondents concerning the possession of ITNs by the households (66.0%; n=35) of the 53 HEWs (section 5.2.4.1) versus 83.2% (n=713) of the 857 (see section 4.2.5.2) household respondents; the application of IRS, 82.9% (n=29) out of 35 HEWs versus 63.6% (n=422) of the 664 household respondents (section 4.2.5.2), and, the draining of mosquito breeding sites (75.5%; n=40) out of 53 HEWs versus 42.6% (n=362) of the 850 household respondents) (see table 4.6 and section 5.2.4.1).

Findings that were inconsistent between the household respondents and the HEWs included that the HEWs were more likely to report higher proportions pertaining to the application of IRS and draining mosquitoes' breeding sites. HEWs reported a lower figure than the household respondents only in the number of ITNs possessed by the households. Although the HEWs reported that two ITNs had been distributed per household in the study area, only 66.0% (n=35) of the 53 HEWs (section 5.2.4.1) believed that the households had ITNs during the study period.

6.2.4 Reported sicknesses and deaths attributed to malaria

Sicknesses attributable to malaria, as reported both by the HEWs and household respondents, were consistent with the perceptions of both the HEWs and the household respondents that malaria was a major public health problem in the study area. In the household survey, 29.4% (n=252) of the respondents (see section 4.2.6.1) reported malaria cases during the three months preceding the study which provided a prevalence rate of 5.4% (n= 252) out of the 4 662 persons in the 857 households (see section 4.2.6.1). This report is consistent with that of HEWs, who reported that they treated at least nine fever cases of whom an average of three (33.3%) tested positive for malaria per week during the study period (see section 5.2.4.1). However, the burden of malaria reported by the HEWs was based on health facilities' records that could not include possible patients suffering from malaria who did not visit health posts. Household members could also have obtained anti-malaria medications from pharmacies or traditional healers or from other clinics or hospitals.

Pertaining to deaths attributed to malaria, 32 deaths were reported by the household respondents compared to only one death report by the HEWs during the study period. The higher discrepancy observed between the two reports might emanate from different sources. One is that, some deaths might have occurred in the community which might have not been reported by the HEWs. On the other hand, complicated malaria cases, which is more likely to lead to death, are usually referred to and treated at health centres or hospitals. Deaths from such cases might happen at these higher level health facilities, and not at health posts, reducing the number of malaria-related deaths that would have been reported by health posts.

6.3 LIMITATIONS OF THE STUDY

The following limitations are recognised in this research:

- A high incidence of malaria cases in Ethiopia occurs from September to November following the summer rains (FMoH 2012a:21). In this study, the data on the burden of and mortality related to malaria were collected during March to May (phase 1) and July to August (phase 2) 2013 when malaria transmission was low. The findings pertaining to the prevalence and number of deaths attributed to malaria reported in this study might therefore, be lower than would have been reported during the annual periods of high incidence of malaria from September to late November (FMoH 2012:27). However, it was difficult, if not impossible to access some rural communities during the high malaria periods of the year as the roads are impassable.

- Sicknesses and deaths related to malaria were based on the respondents' responses, and could not be controlled against their medical charts, which might have affected the accuracy of the information.

- Phase 2 included 53 HEWs who provided malaria preventive and curative (applicable to 35 HEWs serving in the rural areas) services for over 135 000 people in the study area. The number of HEWs included in this study was based on the kebeles from which respondents for the household survey were selected. Therefore, these findings might not be generalisable to HEWs and health posts falling outside the study area.

- The findings of this study might have been affected by social desirability issues, especially during the HEWs' interviews. HEWs might have under reported the number of fever-related illnesses and malaria-related deaths and over reported the HEWs' malaria-related actions to portray the expectations of HEWs rather than the real situations. However, a comparison of the answers from the HEWs and from the household respondents revealed no major discrepancies.

Despite these limitations, the following conclusions could be formulated based on the findings of the current study.

6.4 CONCLUSIONS

Conclusions of this study are presented separately for phase 1 in section 6.4.1 and phase 2 in section 6.4.2.

6.4.1 Conclusions: Phase 1 (interviews conducted with household members)

Conclusions of findings from phase 1 are based on the conceptual framework (HBM) and on the major research objectives that aimed to:

- assess the knowledge, attitudes and practices of households in the study area about their malaria prevention and control methods;
- identify factors that could be associated with malaria prevention and control activities in the study areas;
- identify the malaria preventive measures implemented at household level;
- ascertain which persons are most affected by malaria at household level in the study areas

6.4.1.1 Objective 1: Assessing the malaria-related knowledge, attitudes and practices of households

The study revealed the following findings regarding respondents' knowledge, attitudes and practices related to malaria.

Household respondents' knowledge about malaria

Details of findings related to the malaria-related knowledge of the household respondents who participated in phase 1 of this study are presented in section 4.2.3.1. According to the 764 household respondents, their major sources of malaria-related information were HEWs (83.5%; n=638), the mass media (15.7%; n=120) and relatives 8.9% (n=68). Although 92.2% (n=790) of the 857 household respondents had heard about malaria, only 66.5% (n=525) of these 790 respondents knew that mosquito bites can cause malaria. Respondents of phase 1 were well aware of malaria's signs and symptoms: 81.9% (n=647) correctly identified fever, 76.1% (n=601) mentioned headaches, and 72.8% (n=575) knew about shivers/chills. Respondents' knowledge related to the methods of malaria prevention was generally low, only 59.4% (n=469) of the 790 respondents were able to identify use of ITNs, and 56.7% (n=448) knew about IRS while those who mentioned the destruction of mosquitoes' breeding sites comprised 26.8% (n=212) of the respondents (see table 4.3).

Out of the 857 respondents, 53.3% (n= 457) had low; 22.4% (n=192) had medium and 24.3% (n=208) had high levels of overall malaria-related knowledge scores (see figure 4.2). The low level of knowledge among the household respondents could explain the reported prevalence of malaria in the study area. Households can only implement and sustain malaria preventive and management activities if they have the required knowledge to do so. Particularly, knowledge about the cause of malaria and methods of prevention were low, thus, contributing to the sustained prevalence of malaria cases in the study area despite the continuous and regular awareness raising activities reported by the HEWs (see section 5.2.4.1).

Malaria prevention and control strategies reportedly implemented in the study area focussed on increasing household members' knowledge about malaria. This suggests that the information provided by HEWs might have had little impact on respondents' acquisition of adequate knowledge. Respondents' knowledge about malaria was associated with age, attending malaria training programmes and on their wealth index (table 4.3). Respondents aged 25-34; who attended malaria training and who were less poor (or wealthier) were more likely to score high levels of knowledge about malaria (see section 4.2.3.1). It is thus concluded that this finding could indicate that malaria-related education efforts should target poorer women older than 34 years of age.

Respondents' perceptions based on the HBM's major tenets

Results, pertaining to the major tenets of the HBM, as applied to malaria prevention and control, include:

- perceived susceptibility to malaria
- perceived severity of malaria
- perceived benefits of implementing malaria prevention and control measures
- perceived barriers to implement malaria preventive actions and
- cues to action.

In computing individual items into a composite single score, a minimum Cronbach's alpha coefficient (a measure of internal consistency of items) of 0.729 and maximum of 0.872 were achieved.

Perceived susceptibility

Out of the 857 respondents, 48.1% (n=412) scored below the mean value of 25.7 out of possible 35 points, computed from 7 items and measured on a 5-point scale. The level of perceived susceptibility to malaria among the respondents was generally low as only 431 out of 843 (51.1%) scored at the average value or above (see section 4.2.4.1). This might affect the level of participation of households in the implementation of malaria prevention and control actions.

Perceived severity of malaria

Malaria was not perceived as being a threat among 49.2% (n=422) of the 857 respondents. While malaria is the leading cause of morbidity in the study area, this level of perception might negatively impact on the efforts to ensure effective participation of the households in the RBM activities. Out of 422 respondents who did not perceive (scored below the mean) malaria to be a threat, 69.4% (n=293) had low levels of knowledge indicating the possible role of knowledge in influencing a person's perceived severity of malaria (see section 4.2.4.1 & figure 4.4 for details).

Perceived benefits of implementing malaria prevention strategies

Out of 826 household respondents, only 50% (n=413) scored a mean value of 47.4 (± 6.6) or above, out of a total of 65 possible points, computed from 13 different items and measured on a 5-point scale, thus acknowledging the benefits of implementing malaria prevention and control methods. The proportion of respondents with negative perceptions (those who scored below the mean value) towards the benefits of routinely implementing malaria preventive actions consistently decreased as respondents' overall knowledge about malaria increased (section 4.2.4.1 & figure 4.5). Out of the 413 respondents with negative perceptions about the benefits of malaria prevention and control methods, 66.6% (n=275) had low levels of knowledge; 21.8 % (n=90) had medium knowledge levels and 11.6% (n=48) had high levels of knowledge about malaria. In conclusion, this study has indicated that respondents' overall knowledge about malaria might positively impact on their levels of perceptions about malaria, thus suggesting that knowledge could play pivotal role in promoting positive health behaviours (actively engaging in malaria prevention and control actions).

Barriers impacting on respondents' implementation of malaria prevention and control measures

The proportion of responses based on the 14 different items that measured perceived barriers ranged from a minimum of 15.6% (n=134) who lacked skills to properly use ITNs to a maximum of 38.2% (n=327) members of the village not using ITNs (table 4.5). The mean score for the perceived barrier, computed form 14 items on a 5-point scale was 36.3 (±10.3), out of 70 possible points, with 53.7% (n=457) of 851 respondents scoring below the mean value. Among the 457 respondents who reported barriers to implement malaria prevention and control methods, 38.3% (n=175) had low levels of knowledge; 29.3% (n=134) had medium levels of knowledge and 32.4% (n=148) had high levels of knowledge (see figure 4.6). The highest percentage of household respondents who reported barriers to implementing malaria prevention and control measures was from those with low levels of knowledge. However, fewer respondents who had medium levels of malaria-related knowledge reported barriers to such actions than those with high knowledge levels. This finding indicated that perceived barriers to implementing malaria prevention and management strategies are not necessarily linearly related to increased levels of knowledge.

Cues to action

Having seen that malaria had killed someone in their village, 37.7% (318 out of 843) and having a household member infected with malaria, 33.9% (284 out of 838) were the major factors that initiated the implementation of malaria prevention activities in the study area. Furthermore, regular discussions about malaria, 28.0% (237 out of 846) and support provided by family members, while engaging in malaria prevention activities, 21.6% (183 out of 846) were reported as factors that enabled the household respondents to implement malaria prevention and control measures. The overall score that assessed cues to action was computed from 7 different items measured on a 4-point scale. Out of the 806 respondents, 55.6% (n=448) scored below the mean value of 22.2, out of a total of 28 possible points. Therefore, the finding revealed that a significant proportion (55.6%; n=448) of the respondents in the study area lacked readiness to get involved in malaria prevention and control activities (see section 4.2.4.1).

Household respondents' malaria prevention and control practices

As many as 61.1% (524 out of 857) respondents scored a mean (±SD) value of 3.9 (±1.5) or above out of 9 possible points and thus, demonstrated good practices about malaria prevention and control activities. With this level of practice, it is less likely that malaria prevention and control could become effective in the study area.

6.4.1.2 Objective 2: Identifying factors that could be associated with malaria prevention and control activities in the study areas

The study has identified factors that impacted on respondents' malaria prevention and control actions. These included wealth index, respondents' knowledge about malaria, perceived severity of malaria and perceived benefits of implementing malaria prevention and control actions. The poorer respondents were less likely to implement good malaria preventative measures (see table 4.7) to effectively counteract the spread of malaria. This finding is consistent with a study conducted in three regions (Amhara, Oromia and SNNPRS) of Ethiopia (Ayele et al 2012:102).

The 'least poor' (those in the upper wealth quintiles) respondents were more likely to report good malaria prevention and control practices compared to the poorest households (see table 4.7). Respondents' knowledge levels about malaria impacted on their perceived threat of malaria (see figure 4.4), perceived benefits of implementing malaria preventive measures (see figure 4.5), and perceived barriers to implement malaria preventive actions (see figure 4.6). Respondents with high knowledge levels about malaria demonstrated good malaria prevention and control practices (see table 4.8 and figure 4.7). Similarly, those with a high level of perceived severity of malaria, and perceived benefits reported good levels of involvement in malaria prevention and control activities compared to those with low levels of perceptions as shown in table 4.8.

6.4.1.3 Objective 3: Identifying the malaria preventive measures implemented at household level

This study reported malaria preventive measures most likely to be implemented at household levels. IRS, 63.6% (422 out of 664), environmental sanitation, 38.6% (331 out of 857), consistent use of ITNs, 51.6% (368 out of 713), and larval control by destruction of mosquitoes' breeding sites, 42.6% (362 out of 850) were the four most commonly implemented malaria prevention strategies in the study area (see section 4.2.5.1). The effectiveness of these methods for preventing malaria was the main reason for choosing these methods for 61.3% (517 out of 843) of the respondents and the simplicity of the method's application was the second most important reason for 27.2 % (n=229) of the respondents (see table 4.6). Though the proportion of the respondents using them was low, fumigation of rooms, (17.4%; n=148 out of 850) and closing of doors/windows (12.6%, n=107 out of 850) were reported by some respondents. Some respondent (16.2%; n=138) respondents reported the use of eucalyptus leaves to repel mosquitoes from entering homes.

Despite the application of IRS as the most common practice in the study area, the action was limited to rural settings and is technically initiated and applied by the local health sectors. IRS was not based on the demand of the households but on the service-related decisions made by the health care authorities of the areas concerned. The utilisation of ITNs and environmental management of malaria control methods were implemented, based on the informed decisions of the households, but the extent of performance of these methods was generally low as indicated in table 4.6.

6.4.1.5 Objective 4: Ascertaining which persons are most affected by malaria at household level in the study area

The reported prevalence rate of malaria was 5.4% (252 cases out of 4 662 persons who lived in the 857 households). Children younger than five years of age were most affected, comprising 53.6% (135 out of 252 reported malaria cases). Rural residents reported 79.8% (201 out of 252) of the total malaria cases indicating that rural residents were more affected compared to their urban counterparts. Respondents with good overall malaria prevention practices compared to those with poor practices, and those who consistently used ITNs compared to those with inconsistent ITN use, were less likely to report malaria cases (see table 4.9), probably contributing to the 5.4% of reported malaria cases at household level. On the contrary, respondents who lived 30 minutes' walking distance from health posts, compared to those who lived closer (less than 30 minutes walking distance), and those whose houses were sprayed were more likely to report malaria cases. The finding that those household respondents whose houses had undergone IRS reported more malaria cases, than those whose houses had not been sprayed, was an unexpected finding which cannot be explained based on the data gathered by the structured interviews. However, it is possible that some of these households re-plastered the walls of their houses after IRS, destroying the effect of the spaying. Although re-plastering of houses' walls is known to be an accepted practice in the study areas, the data obtained during this study cannot be used to verify or nullify this possibility. Another aspect to consider is that only houses in the rural areas were treated with IRS and that malaria prevalence was much higher among those living in the rural areas than in the urban areas. Consequently, the finding that more people whose houses had been treated with IRS (only in the rural areas) reported more malaria cases than those whose house had not been sprayed (mostly in urban areas) might merely confirm that malaria is more prevalent in rural than in urban areas.

Out of the 32 reported deaths associated with malaria, 50% (n=16) were children under five years of age. Males were more affected accounting for 68.8% (n=22) out of 32 deaths. Furthermore, wealthier households compared to the poorer and respondents, and those households implementing good practices of malaria prevention and control compared to poor practices, reported fewer deaths attributable to malaria. Respondents who lived far from health posts were twice as likely to report deaths compared to those who lived closer to health posts (within less than 30 minutes' walking distance) as indicated in table 4.9.

6.4.2 Conclusions: Phase 2: HEWs' interviews

Conclusions for phase 2 of the study were derived from the following objectives:

- determine the HEWs' knowledge, attitudes and practices concerning the prevention and control of malaria;

- identify the challenges related to malaria prevention and control at the health post level;
- assess the challenges related to treating patients suffering from malaria at the health post level.

6.4.2.1 Objective 1: HEWs’ knowledge, attitudes and practices concerning the prevention and control of malaria

The first objective of phase 2 dealt with three key components. Conclusions pertaining to these key aspects are discussed under the actions of HEWs deemed to be critical for effective malaria prevention and control.

HEWs’ malaria-related knowledge levels

The study showed that the HEWs were aware of the existing malaria prevention and control strategies implemented in Ethiopia. Selective vector control was the most familiar method as it was mentioned by 94.3% (n=50) of the 53 respondents and surveillance, was the least often recognised by the HEWs as only 20.8% (n=11) of the respondents mentioned this strategy (see section 5.2.2.1). The average (±SD) knowledge score of HEWs about malaria was 15.8 (±0.35) out of a possible 24 points. Out of the 53 HEWs, 24.5% (n=13) had low malaria-related knowledge levels (scored below the mean value), 49.1% (n=26) had medium knowledge and 26.4% (n=14) had good knowledge levels (scored above 75th percentage point) as shown in figure 5.3.

Four socio-demographic and economic backgrounds of the respondents were associated with HEWs’ knowledge about malaria. These included respondent’s places of residence (urban/rural), level of education, monthly income and in-service training on the diagnosis and treatment of malaria. HEWs who resided in urban areas, had spent more years at school, earned better monthly incomes and received training on clinical aspects of malaria, were more knowledgeable about malaria than their counterparts who lived in rural areas.

HEWs' attitudes towards malaria

Out of 53 HEWs, 94.3% (n=50) responded to the 7 items assessing their attitudes towards malaria. Out of these 50, as many as 74.0% (n=37) of the HEWs believed that malaria was a major public health problem and that it was a threat to children (68.0%, n=34) in the study area. Furthermore, 60.0% (n=30) of the HEWs believed malaria was a killer disease, but only 44.0% (n=22) believed that households in the study area used ITNs on a regular basis (see table 5.4).

HEWs' practices of malaria prevention and control

Reportedly 'strategy 1' (curative services of malaria as specified in FMoH 2006:7) was implemented by 91.4% (n=32) of the 35 HEWs working in rural health posts and had action plans for annual activities; 88.9% (16 out of 18) of the health posts provided curative services for malaria cases (during one month preceding the study) and 68.8% (11 out of 16) health posts that provided clinical services referred malaria patients to higher level health care facilities.

Selective vector control (strategies 2 and 3) is supposed to be promoted and coordinated by HEWs. However, only 66.0% (n=35) out of 53 HEWs reported that households had ITNs, despite the previous 100% distribution of two nets per household in the area. IRS of houses was reported by 82.9 % (29 out of 35) HEWs. These findings therefore, indicate that vector control activities in the study area were satisfactory but not sufficient to prevent a malaria epidemic in the area (see section 5.2.4.1).

Performance of information, education and communication (IEC) efforts to combat malaria (strategy 4) should be implemented once per week in the study area. Achievement of behavioural changes requires systematic and continuous efforts. However, only 37.7% (n=20) of the 53 HEWs reportedly provided malaria-related information on a regular basis and community conversation was done only once every three months. Developing capacity of HEWs (strategy 5) was achieved as 90.6% (n=48) of the 53 HEWs received in-service training on curative services of malaria.

The performance of HEWs interviewed in this study might be affected by a lack of support from various authorities and a high level of job-related dissatisfaction. The amount of support provided to the HEWs from the public sectors (health centre and district health office), NGOs, and the community was only 56.6% (2.83 scores out of possible 5 points) on average. Out of the 53 HEWs, 47.2% (n=25) were dissatisfied with their jobs, which might negatively impact on their work performance (Section 5.2.3.1)

6.4.2.2 Objective 2: Identifying the challenges related to malaria prevention and control at health post level

As indicated in the previous discussion, the study identified challenges faced by HEWs while performing their professional responsibilities at the health posts (see section 5.2.5.1). These challenges included:

- a disproportion between the community's health service demands and the scope of curative health services HEWs have been mandated to provide;
- very slow progress in positive behavioural changes among the household members regarding malaria prevention and control which might be associated with the observed low level of comprehensive knowledge among more than half of the respondents who participated in this study (see figures 4.2,4.6 and 4.7) ;
- community fatigue to implement malaria prevention strategies;
- lack of transportation for HEWs while providing home-based PHC services, thus limiting the number of households that receive the service regularly;
- excessive workloads of HEWs as implementing 16 different health service packages at health post level negatively affected the time HEWs had to spend on malaria prevention and control.

6.4.2.3 Objective 3: Assessing the challenges related to treating patients suffering from malaria at the health post level

Challenges associated with the diagnosis and treatment of malaria, as revealed by the previous discussion (section 5.2.5.1) included:

- patients visiting the health posts for treatment of systemic infections, falling beyond the scope of curative services provided at health posts, are dissatisfied and distrust the HEWs, negatively affecting health seeking behaviours such as diagnosis and treatment of malaria at health post level;
- lack of transportation services for referring emergency cases of malaria from remote kebeles to higher level health facilities causing unnecessary delays of malaria patients; and,
- lack of feedback from higher health facilities to health posts regarding the treatment outcomes of the referred malaria patients. Such lack of information impeded the potential follow-up visits that the referred patients could have received.

6.5 RECOMMENDATIONS BASED ON THE MAIN FINDINGS OF THE STUDY

Based on the key findings of this study, the following recommendations can be made for enhancing malaria prevention and treatment strategies in the study area. These are grouped according to the roles and responsibilities of the relevant stakeholders in the fight against malaria.

6.5.1 Recommendation for the SNNPR's Health Bureau

- Dissatisfaction of the HEWs with huge workloads and low monthly income require attention as these might affect their performances on RBM. Restructuring the 16 packages offered by HEWs should allow for specialisation and the appointment of additional staff members are recommended to enhance HEWs' malaria-related accomplishments.

6.5.2 Recommendation for Sidama Zonal Health Department

- This study showed that the poorer (lower wealth quintiles) respondents and those aged 35 and older of the household survey had low levels of knowledge about malaria. These segments of the population therefore, deserve targeted awareness creation about malaria. In particular, the cause of malaria and its preventive measures need to be emphasised in the process of awareness raising.

- Challenges of malaria prevention and control in the study area persisted because of low level risk perceptions (in terms of the HBM's tenets). Therefore, it is recommended that efforts to improve these low levels of perceptions about malaria among the households need to use HBM tenets as tools for promoting behavioural changes. The development of teaching materials and leaflets should focus on cause of malaria and its prevention and control methods.

6.5.3 Recommendations for district health offices and health centres

- IEC was regularly implemented only by 40% (n=20) of HEWs. The district health offices need to further decentralise some of the tasks of HEWs to voluntary community health workers where HEWs provide only supportive and technical supervision. This will slightly reduce the reported high workload of HEWs thereby improving their performances enabling to prioritise malaria prevention and control activities.
- ITN possession and utilisation must be monitored in the study area as only 713 (84.3%) of 846 respondents owned and 51.6% (368 out of 713) used ITNs regularly.
- Children in the study area need special attention as they were more affected by malaria (53.6%, n=135 out of 252 reported malaria cases were children under five years of age) and 50% (n=16) of the 32 deaths associated with malaria were reported among children. Considering such a high burden attributed to malaria among children, malaria prevention and control should be a prioritised among children in the study area.
- The district health offices need to conduct regular supportive supervision to guide HEWs and provide timely feedback that could be used as an input for planning effective malaria-related interventions.
- Environmental management of vector control through the active involvement of the community is considered to be the cheapest and most sustainable method of malaria prevention. However, its implementation was low (implemented only by

42.6%, 362 out of 850 households) in the study, necessitating health service providers' and health planners' urgent attention.

- NGOs working on different public health interventions such as 'community based nutrition promotion programmes' need to integrate their interventions with the malaria prevention and control activities. That would benefit children in the study area in receiving comprehensive disease prevention and control services.

6.5.4 Recommendation for the community/households

- The insufficient support given to HEWs from community figures needs to be improved. Malaria, being the leading cause of morbidity in the study area, justifies that community figures, such as the elderly, need to recognise malaria as a major public health problem in the study area. This could be done by arranging regular meetings with the HEWs to discuss the role the community leaders can play in promoting good malaria prevention and control behaviours.
- The implication that the plastering of walls or any other renovations to houses might hold for IRS effectiveness should be communicated to community members.

6.5.5 Recommendation for further research

- Both phases of the present study relied on the quantitative approach and thus, may not provide in-depth understanding of why perceived susceptibility about malaria and malaria prevention and control practices were low in the study area. Therefore, future studies need to consider using qualitative approaches. This should enable researchers to obtain information about socio-cultural factors contributing to poor practices of RBM in the Sidama Zone by conducting in-depth interviews with purposively selected village members and focus group discussions involving men and women.
- The malaria-related information provided to the households by HEWs had little impact on positively influencing practices of 38.9% (n=333) respondents. This suggests that the effectiveness of the methods, the HEWs used to enhance

behavioural changes regarding malaria prevention and control, needs to be investigated, evaluated and improved.

- Since the proportion of respondents who scored below the mean values in each of the RBM constructs were high, further research is needed to concentrate on methods that would benefit changing the community's perceptions about malaria. Particularly intervention studies, involving effective behavioural change models, are recommended to make gains towards realising the objectives of the RBM programme.
- Further investigations might be required regarding the reported slight increase of malaria parasites other than *p falciparum* and *p vivax* species in the study area
- The government of Ethiopia has been exerting enormous efforts to improve access to PHC services and HEWs playing a central role at grass-roots level. The maximum workloads that HEWs can effectively perform, in terms of frequency and scope and holistic number of assigned tasks, need to be assessed. This needs to include how HEWs allot and use their time on malaria-related activities
- Research into the effectiveness of RBM should include items on homestead renovations that could negatively impact on IRS.

6.6 THE IMPLICATIONS OF THE STUDY'S FINDINGS FOR MALARIA-RELATED ISSUES IN ETHIOPIA

Ethiopia is hoping to eliminate malaria in areas with low malaria transmission (in areas above 2 000 metres above sea level) and reduce deaths associated with malaria to near zero level in all other parts of the country by 2015 (FMoH 2012a:77; National Strategic Plan [NSP] 2010:4). The country has targeted the elimination of malaria by 2020 (NSP 2010:33). Despite the positive progress made in halting the epidemic of malaria, malaria remains the leading cause of morbidity and mortality (FMoH 2011:29-31). The elimination of malaria targeted for 2020, seems to be an overambitious plan. The findings of the present study further provide useful and up-to-date evidence regarding the performance of the country in general and the study area in particular in relation to the set targets.

This study was initiated in an attempt to seek answers for research questions regarding the high burden of malaria and the associated factors in malaria endemic areas of the Sidama Zone in the SNNPR of Ethiopia. In particular, the high prevalence of malaria cases in the study area, was the centre of research problem picked up by this study. In addressing the core research questions, factors that might influence malaria prevention and control strategies such as socio-economic and demographic conditions, environmental factors, and the HBM tenets were assessed. In this regard, the study used two phases in a single study where data were collected at household level (phase I) and health post level (phase 2). This benefited the investigation to cover a wider breadth of information about malaria. It provided data from the perspectives of both the health service providers and health service users.

The source of data for the household survey were women who play a pivotal role in caring for malaria patients, actively involved in malaria prevention and control actions implemented at household levels such as the utilisation of ITNs by children and pregnant women. These respondents therefore, constitute an appropriate study population that provides more reliable information that could reflect the malaria situation in the study area. Men could have skewed the data, as they are not as aware or involved as women in malaria-related activities, and studies that targeted women are very few in Ethiopia

6.6.1 The application of the major tenets of the Health Belief Model

This empirical study employed the HBM in assessing malaria-related situations in Ethiopia. Of the HBM tenets, the perceived severity of malaria and perceived benefit of implementing malaria prevention activities were the two constructs that independently predicted good malaria prevention practices in the study area. Application of these constructs might be useful in the promotion of malaria prevention and control in the study area. On the other hand, the general belief of being susceptible and cues for action were low among respondents while 53.7% (n=457) of the respondents believed that there were several barriers preventing them from participating in malaria prevention actions. These are important factors revealed by this study that 38.9% (n=333) of the

857 household respondents therefore, had poorly participated in malaria prevention and control, thus, malaria remained the leading cause of sickness in the study area.

6.6.2 The implications of the study's findings for the Roll Back Malaria Programme

These points generally witness that the RBM efforts in the study area require further attention to effectively halt sicknesses and deaths attributed to malaria. These gaps were consistent with the annual reports of health facilities in the Sidama Zone in 2014 indicating that malaria was the second most frequent cause of morbidity among children under five years of age, who visited health facilities for fever and constituted 23.1% (n=15 896 out of 68 775). Among those 5 years and older, malaria was reported to be the major cause of illness (SZHD 2014).

In conclusion, with 53.3% (n=457) of the respondents with low knowledge levels about malaria, above 50% of the respondents exhibiting low levels of positive perceptions in relation to the HBM tenets, and 38.9% (n=333) demonstrating poor malaria prevention and control practices, the success of the RBM programme in the study area seems to require further efforts in order to reduce the burden of malaria.

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Annexure 1
Information Sheet and Consent Form

Name of the Principal Investigator: Dejene Hailu Kassa
Name of the organization: University of South Africa
Name of the sponsor: Hawassa University, Southern Ethiopia

Information sheet and consent form prepared for respondent selected from three malaria endemic districts in Sidama Zone, Southern Ethiopia.

Title of the research: “Malaria prevention and control in Ethiopia”

Introduction

Hello, I am -------------------. I will briefly introduce you why I am here today. I came to this village to collect research data for Mr. Dejene Hailu Kassa, an academic staff at Hawassa University. He is currently a PhD student at University of South Africa (UNISA) and is conducting a research entitled “M**alaria prevention and control in Ethiopia”** for his PhD dissertation. The conduct of the research has been approved by the local authorities and ethically cleared by the Institutional Review Board of the Hawassa University. The Got (village) in which you currently live was randomly selected. Hence, households in this got are selected candidates to participate in the study.

Purpose: The purpose of this research is to assess the “malaria prevention and control status and prevalence of malaria**”** among the households from nine malaria endemic districts of Sidama Zone, Southern Ethiopia. We believe the findings of this study will contribute a substantial share in improving malaria prevention and control strategies and enhance the overall reduction of morbidity and mortality related to malaria.

Procedure: In order to assess the malaria prevention and control status in this village, we invite you to take part in the research project. You have a full freedom of deciding to participate or not. If you are willing to participate, you need to understand and sign the consent form. Then, you will be asked to give your response by the data collectors.

For this interview schedule-based study, participants are mothers who are 18 years and older from households from randomly selected Gots during the study period.

Risk and/or Discomfort: By participating in this research project you may feel that it has some discomfort specially on wasting your time (about 90 minutes). But this may not be too much considering the potential benefits the study contributes to the overall improvement of the health status of the community. There is no physical or psychological risk in participating in this research project.

Benefits: If you participate in this research project, you may not get direct benefit and you will not be given any incentive. However, your participation is likely to help us in assessing the status of malaria prevention and control activities, its outcome and identify factors affecting these issues in Sidama Zone, Southern Ethiopia. The research results will give an insight about existing challenges the RBM faces.

Confidentiality and Anonymity: The information that we will collect from this research project will be kept confidential. They will be kept anonymous and will be stored using a number-coded file cabinet at Hawassa University whereby no one will have access to them except the research investigator, data collectors.

Right to Refuse or Withdraw: You have the full right to refuse from participating in this research (you can choose not to respond to some or all of the questions). If you do not wish to participate, this will not affect health services you get from any health facilities. You have also the full right to withdraw from this study at any time you wish to, without losing any of your rights as a resident of this site.

Do you have any question about the research at this stage?
Are you willing to participate in the research? 1) Yes 2) No

Consent: The nature of the study entitled 'malaria prevention and control in Ethiopia' and the information described above have been orally explained/read to me in the language I understand well. I believe I can contribute to this study and voluntarily agree to participate.
Name and signature of the participant---
Name and signature of the data collector--

Persons to contact: If you have any question you can contact***: Mr Dejene Hailu Kassa,*** Hawassa University, through the following contact address

Tel: 0916829271/046 221 4254.

E-mail: dejenkassa@yahoo.com

Annexure 2: STRUCTURED INTERVIEW SCHEDULE FOR PHASE I (ENGLISH)

TITLE: MALARIA PREVENTION AND CONTROL IN ETHIOPIA

GENERAL INFORMATION

Date: ________/_________/2013

Research assistant: ________________________Sign:_______________

Respondent number: ___________/___________

Respondent's village: ________________________

Name of the supervisor---------------------------------------Sign--------------------------------

Date the questionnaire was completed --

INSTRUCTIONS: Please read each question to the respondent clearly and slowly. Then, circle the number of choice(s) the interviewee selects carefully. For open-ended questions, write the exact answers of the respondent in the spaces provided.

S.No	Questions	Possible responses	Remarks
SECTION I: Location			
1.	Code of the district	-----------------------	
2.	Number/code of the kebele	-----------------------	
3.	Number/code of the village/Got	------------------------	
4.	Place of residence?	1.Urban 2. Rural	
SECTION II: Socioeconomic and demographic characteristics of the respondents			
5.	Gender	1. Male 2. Female	
6.	How old are you?	--------------------Years	
7.	What is your marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
8.	What is your religion?	1. Christian 2. Muslim 3. Other, specify---------------	
9.	Which ethnic group do you belong to?	1. Sidama 2 Wolayta 3. Amhara	

		4. Gurage 5. Oromo 6. Other, specify-------------------	
10	What is the highest level of education you attended?	1.Never attended school 2. First cycle complete(4 years) 3. Second cycle complete (8 year) 4. High school/preparatory school completed (12 years) 5. Tertiary (diploma/degree) completed. 6. Write the name of the dip/degree): -----------------------	
11	If married what is the highest level of your partner's education?	1.Never attended school 2. First cycle complete(4 years) 3. Second cycle complete (8 year) 4. High school/preparatory school completed (12 years) 5. Tertiary (diploma/degree) completed. 6. Write the name of the dip/degree): -----------------------	
12	How many people live in your house?	---------------------------persons	
13	What is your position in the family?	1. Head of the household 2. House wife 3. Others, specify----------------------	
14	What is your occupation?	1. Has no job 2. Under/over age 3. Farmer 4. Government's employee 5. Trader 6. Has no job 7. Other, Specify-----------------------	
15	What is the estimated monthly income of your family in Birr?	---------------------------ETB	

16	Does the family have any additional source of income in kind?	1. Yes 2. No (skip to Q 18)	
17	If yes, to question No16, what is the source?	1. Cereals:________quintals 2. Grains:_________quintals 3.Cash crop:_____ quintals 4. Vegetables:___________ 5. Other, specify_________	
18	Do you have domestic animals?	1. Yes 2. No(skip to Q 20)	
19	If yes to question no 18, would you tell their number?	1. Number of Cattle_________ 2. Number of Sheep___________ 3. Number of Horse/Donkey___ 4. Other, specify______________	
SECTION III: Respondents housing condition			
20	What is the type of your house?	1. Corrugated roof 2. Thatched roof 3. Others, specify---------------------	
21	Do you have separate bedrooms?	1. Yes 2. No(skip to Q 23)	
22	If yes to question no 21, what is the total number of bedrooms	----------------------------	
23	What is the total number of rooms (excluding bedrooms, shower and latrine) in your home?	---------------------------	
24	Does the family share the house with domestic animals?	1. Yes 2. No	
25	Does the family have a separate Kitchen?	1. yes 2. No	
26	Does the family have a toilet?	1.Yes 2. No	
27	Does your main living room have a window?	1.Yes 2. No (skip to Q 29)	
28	If yes to question no 27, does it have screens?	1. Yes 2. No	

SECTION IV: Knowledge of respondents about malaria.			
29	Do you have a radio	1. Yes 2. No (skip to Q 31)	
30	If yes to question no 29, how often do you listen to the radio?	1. Very often 2. Often 3. Sometimes 4. Rarely 5. Not at all	
31	Do you have Television?(only for those who live in urban)	1. Yes 2. No (skip to Q 33)	
32	If yes to question no 31, how often do you watch television?	1. Very often 2. Often 3. Sometimes 4. Rarely 5. Not at all	
33	Do you get newspaper/posters/ pamphlets of health issues at least once a week?	1. Yes 2. No	
34	Do you know what malaria is?	1. Yes 2. No (skip to 36)	
35	If yes to question no 34, what causes malaria?	1. Exposure to cold weather 2. Exposure to rain 3. Evil sprit 4. Bite of mosquitoes 5. Bad air 6. Drinking bad water 7. A curse from God 8. Other specify--------------------	
36	What are the signs and symptoms of malaria? (more than one answer is possible)	1. Fever 2. Chills and Shivering 3. Headache 4. Backache 5. Joint pain 6. Vomiting	

		7.Thirsty 8.Others,ecify________________	
37	Is malaria a transmissible disease?	1. Yes 2. No (skip to Q 39) 3. I do not know(skip to Q 39)	
38	If yes, how is malaria transmitted from person to person?	1. Through bite of mosquitoes 2. Through bodily contact with infected person 3. Through breathing 4. By flies 5. Mother to child 6. Infected blood transfusion 7. Others, specify---------------------	
39	When do mosquitoes mostly bite? (more than once answer is possible	1. Day time 2. At night 3. I do not know	
40	Where do mosquitoes mostly breed? (More than one answer)	1. Stagnant water and swampy areas 2. In the running water 3. In or on waste material 4. Others, specify--------------------	
41	What is the mosquito resting sites during day time? More than one	1.Unclean vegetation 2.In the house 3. I do not know 4. Others, specify-------------------	
42	Who is most vulnerable to malaria in the family?	1. Children less than five years of age 2. Children five years of age and above 3. Pregnant women 4. Breast feeding mothers 5. Adult male 6. Old people 7.Others, specify-----------------------	

43	Is malaria a preventable disease?	1. Yes 2. No (skip to Q 45) 3. I do not know(skip to Q 45)	
44	If yes to question 43, what methods do you know to prevent malaria? (more than one answer is possible)	1. Take drugs/tablets 2. House spray with residual insecticides 3. Drain stagnant water 4. Clear vegetables 5. Use of bed net 6. Boiling drinking water 7. Fumigation 8. Use of Aerosol 9. Closing windows and doors early in time 10. Use traditional medicine 11. Others, specify---------------------	
45	Have you ever heard about Insecticide Treated Net (ITN)?	1. Yes 2. No (skip to Q47)	
46	If yes to question no 45, can you tell us the source of your information about ITN?	1) Mass media 2) Health professionals / at Health services 3) Family/ friends 4) Others, specify-------------------	
47	Have you received any information on malaria from health workers?	1. Yes 2. No (skip to Q 49) 3. I do not remember(skip to Q 49)	
48	If yes to question 47, how often have you received the information?	1. Everyday 2. At least once a week 3. 1-3 times a month 4. Very seldom 5. Have never received	

49	If you have received health information on malaria, was it helpful to you?	1. yes, it was very helpful 2. yes, it was helpful 3. No, it was not helpful	
50	Have you used traditional herbs to prevent mosquitoes?	1. Yes 2. No	
51	Have you been given any orientation about use of ITN?	1. Yes, 2. No	
52	If yes to question no 51, who was trained from the family?	1) Household head 2) House wife 3) Son/daughter 4) Others, specify-------------------	
53	What is the purpose of ITN?	1) Kills mosquitoes 2) Prevent entry of mosquitoes towards family members using them 3) Repels mosquitoes 4) Kills malaria parasites 5) Others (specify-------------------	
SCTION V: Environmental factors related to malaria prevention and control.			
54	Is there a health post in this village?	1.Yes 2. No	
55	Is there a transportation service from your home to the health post?	1.Yes 2. No	
56	How long does (minutes) it takes you on foot to arrive at the health post?	--------------minutes	
57	Was ITN distributed in this village?	1.Yes 2. No	
58	Do you currently have ITN at your home? (If yes, please, ask to show you the net)	1.Yes 2. No	
59	If yes to question no 58, how many bed nets do you have currently?	____________________	

60	Where did you get the ITN from?	1) Freely from the government 2) Purchased 3) Got from NGOs 4) Others, specify----------------------	
61	Is the IRS service regularly provided in this village?	1.Yes 2. No 3. I do not know	

SECTION VI: Perceived susceptibility of respondents to malaria.

Note to the data collector: Please, slowly read the following instruction to the respondent. Then, Please, circle the number corresponding to the respondent's answer in the sections below.

"Now, I loudly read to you the following statements (**questions 62 to 68**). You carefully listen to the statements and tell me your level of disagreement or agreement using the key terms: '***strongly disagree', 'disagree', 'not determined', 'agree' or 'strongly agree."***

1. *Strongly disagree*
2. *Disagree*
3. *Not determined*
4. *Agree*
5. Strongly agree

62	Malaria is a health problem in this village?	1	2	3	4	5	
63	Everybody in this village is at risk of getting malaria.	1	2	3	4	5	
64	Guests coming from other places to our home are at risk of getting malaria.	1	2	3	4	5	
65	Some people are more prone to getting malaria than others	1	2	3	4	5	
66	Malaria causes anaemia in pregnant women	1	2	3	4	5	
67	I am at risk of getting malaria	1	2	3	4	5	
68	My family is at risk of getting malaria.	1	2	3	4	5	

SECTION VII: Perceived severity/threat of malaria.

I loudly read to you the following statements (**questions 69 to 72**). You carefully listen to the statements and tell me your level of disagreement or agreement using the key terms: '***strongly disagree', 'disagree', 'not determined', 'agree'*** *or* ***'strongly agree'.*** Please, circle the number corresponding to the respondent's response.

1. Strongly disagree
2. Disagree
3. Not determined
4. Agree
5. Strongly agree

69	Malaria is a severe disease.	1	2	3	4	5	
70	Malaria is one of the killer diseases in this village.	1	2	3	4	5	
71	Malaria is more severe in children	1	2	3	4	5	
72	Malaria is more severe in pregnant women	1	2	3	4	5	

SECTION VIII: Perceived benefit of practicing malaria prevention and control activities.

I read to you the following statements (**questions 73 to 85**). You carefully listen to the statements and tell me your level of disagreement or agreement using the key terms: '***strongly disagree', 'disagree', 'not determined', 'agree'*** *or* ***'strongly agree'.***

1. Strongly disagree
2. Disagree
3. Not determined
4. Agree
5. Strongly agree

73	ITN effectively protects against bite of mosquitoes.	1	2	3	4	5	
74	The health post in this village provides quality health services.	1	2	3	4	5	
75	Treatment of malaria at health posts is effective.	1	2	3	4	5	
76	ITN prevents infection from malaria	1	2	3	4	5	
77	Health extension workers are capable of	1	2	3	4	5	

	effectively treating malaria.						
78	I have a financial capacity to buy mosquito nets.	1	2	3	4	5	
79	I have the money to take my families to traditional healers when they have got malaria.	1	2	3	4	5	
80	I have the money to take my families to health facilities for treatment when they have got malaria.	1	2	3	4	5	
81	I have a financial capacity to buy anti malarial drugs for my family.	1	2	3	4	5	
82	Insecticide spray in my house kills mosquitoes.	1	2	3	4	5	
83	I want to have additional ITN to minimize risk of malaria infection.	1	2	3	4	5	
84	Use of ITN is safe.	1	2	3	4	5	
85	INT is convenient to use at home.	1	2	3	4	5	

SECTION IX: Perceived barrier to practice malaria prevention and control activities.

Please, carefully listen to the following statements as I read to you and tell me your level of disagreement or agreement using the key terms: ‘***strongly disagree’, ‘disagree’, ‘not determined’, ‘agree’*** *or* ***‘strongly agree’.***

1. *Strongly disagree*
2. *Disagree*
3. *Not determined*
4. *Agree*
5. Strongly agree

86	I have no adequate knowledge to protect myself and my family against malaria.	1	2	3	4	5	
87	I am busy with many other activities and unable to involve in malaria prevention activities such as draining mosquito breeding sites	1	2	3	4	5	

88	I have no skill of using ITN.	1	2	3	4	5	
89	My home is uncomfortable to use ITN	1	2	3	4	5	
90	ITNs cause inconveniencies to people who use them?	1	2	3	4	5	
91	My family do not encourage the use of ITN.	1	2	3	4	5	
92	Some households in this village do not use ITN.	1	2	3	4	5	
93	Insecticide spray irritates the eyes.	1	2	3	4	5	
94	Insecticide spray causes headache	1	2	3	4	5	
95	Insecticide spray has no last long effect	1	2	3	4	5	
96	Insecticide spray harms domestic animals	1	2	3	4	5	
97	There is no a responsible local community health worker to organize the activities of malaria prevention and control.	1	2	3	4	5	
98	There are several diseases of my priorities than malaria.	1	2	3	4	5	
99	There is no access to get information to participate on malaria prevention activities	1	2	3	4	5	

SECTION X: Cues to action

Again, I loudly read to you the following statements **(questions 100 to 106).** You carefully listen to the statements and tell me how frequent the conditions occur using the key terms: '***Not at all', 'rarely', 'sometimes'*** or ***'always'***.

100	My family encourage me to involve in malaria prevention activities.	1. Not at all 2. Rarely 3. Sometimes 4. Always	
101	Health extension workers advice me how to prevent malaria.	1. Not at all 2. Rarely	

		3. Sometimes 4. Always	
102	I practice methods of malaria prevention since when a member of my family had got malaria recently (in the last three months).	1. Not at all 2. Rarely 3. Sometimes 4. Always	
103	I know malaria had killed someone in my village, and therefore, I have to apply malaria prevention methods	1. Not at all 2. Rarely 3. Sometimes 4. Always	
104	I got sufficient information from mass media and thus, I try to apply malaria prevention methods.	1. Not at all 2. Rarely 3. Sometimes 4. Always	
105	We, the residents in this discuss about malaria and intend to participate in malaria prevention activities.	1. Not at all 2. Rarely 3. Sometimes 4. Always	
106	My relatives tell me to actively prevent malaria by using ITN and allowing IRS.	1. Not at all 2. Rarely 3. Sometimes 4. Always	
SCTION XI: Current practices related to malaria prevention and control activities. Please, circle the number of the answer(s) the respondent chooses.			
107	For How long have you used the ITN?	1) for the last six months 2) for the last one year 3) for the last two years 4) for more than two years 5) Not at all	

108	Where do you take a member of your family who has got high body temperature?	1.Hospital 2.Health centre 3.Health post 4.Private clinics 5.Private pharmacies/drug store 6.Purchase drugs from shops 7.Traditional healer 8.Use the left over anti malaria drugs 9.Use traditional remedies at home 10.Others, specify____________	
109	What prevention method(s) do you currently use to protect your family member against malaria? (multiple responses possible)	1.Take tablets/prophylaxes 2. DDT spraying 3.Drain stagnant water 4. Clear the vegetation 5.Use of mosquito net 6. Fumigation 7. Aerosol (mobile) 8. Closing windows and doors early in time 9. Others, specify_____________	
110	What is (are) the reason (s) of preferring the method(s) you mentioned in question 109? (multiple responses possible)	1.Easily available 2.More effective 3.Low cost 4.Others, specify____________	
111	During the previous night, who used ITN? (multiple responses possible)	1. Children <5 year 2. Children 5 – 10 year 3. Wife and Husband 4. Other adult family member 5. others, specify--------------------	
112	Have you ever impregnate the ITN with insecticide	1.Yes (skip to Q 114) 2.No	

113	If no to question no 112, why not?	1.-------------------------------- 2.-------------------------------- 3.--------------------------------	
114	How frequently do you use ITN?	1) Every night 2) Most of the nights 3) Occasionally 4) Only during malaria epidemics 5) Only during rainy seasons 6) Others, specify-----------------	
115	Have you ever washed your ITN?	1) Yes 2) No	
116	Was your house sprayed IRS in the last 12 months?	1.Yes 2.No (skip to Q119)	
117	If yes to question 116, how many months ago was the house sprayed?	------------------------months ago	
118	Who did the spray for you?	1. Government 2. Non-government organisations 3. Private organisations 4. Other, specify-------------------	
119	If you have never allowed insecticide spray to your house before, will you be willing in the future?	1. Yes 2. No 3. Not sure	
120	What are the traditional malaria preventive measures currently used in the community?	1.--- 2.-- 3.--	
121	Have you used traditional medicine for treatment of malaria during the last 12 months?	1. Yes 2. No (skip to Q 123) 3. Not sure (skip to Q 123)	
122	If yes to question 121, how often have you used those traditional preventive measures?	1) Rarely 2) Sometimes when infection from malaria occurs 3) All the time when infection from malaria occurs	

123	Have you ever participated in malaria epidemic control activities	1. Yes 2. No (skip to Q 125)	
124	If yes to question no 123, in which activities did you participate? (multiple responses possible)	1. Filling and drainage of mosquito breeding sites 2.In health education campaigns 3.Reporting problems to local health worker or authority 4.Others, specify---------------------	
SECTION XII: Reported prevalence of malaria			
125	Is there any member of the family who had malaria during the last three months?	1. Yes 2. No (skip to Q 129) 3. I do not know (skip to Q 129)	
126	If yes to question no 125, who was the patient?(multiple responses possible)	1. Child less than 5 years of age. 2. Pregnant women son/daughter 5 years of age and above 3. Relative temporarily resided with the family 4. Others, specify----------------	
127	What was the maximum number of malarial attack that occurred to any of the family members over the last three months?	1.One times 2. Two times 3.Three times 4. More than four times	
128	What is the number of family members that had malarial attacks over the last three months?	1) One 2) Two 3) Three 4) Four and above	
129	Was there any member of your family who died from malaria over the last 12 months?	1.Yes 2.No	
130	If yes to question 129, would you please tell us his/her age and sex	Age= ----------------years Sex: 1) Male 2) Female	

INFORMATION TO BE FILLED BY THE INTERVIEWERS

INSTRUCTION: Please, make careful observation and fill the following information.

131. Is there a mosquito visible in the house?

1) yes 2) no

132. Was the net hanged over the bed/sleeping places?

1) Yes 2) No

133. If yes, what does the condition of the net look? (Circle those applicable)

1) Torn
2) Dirty
3) Not hanged on the appropriate position
4) Others, specify--------------------------------

134. Are there potential mosquito breeding sites (stagnant water) around the residence?

1) Yes 2) No 3) Difficult to identify

135. Do the windows and doors have screening?

1) Yes 2) No

136. Ask the interviewee if he/she knows how to tack net.

137. How do you describe the surface of the walls?

1) Very smooth
2) Smooth
3) Rough
4) Very rough with a lot of cracks

138. Does the house have openings that allow the entry of mosquitoes?

1) yes 2) no

THANK YOU FOR YOUR PARTICIPATION IN THE STUDY

END

Consent Form Sidama Language

Mashalaqete Woraqatanna Sumuu Yaate forme

Umi buuxaanchi Su'ma: Dejene Haayiilu Kaasa

Dirijitete (Universitete)Su'ma: Universite Sauz Afrika

Kaa'laanchu (Wo'maashukaa'laachi su'ma): Hawaasi Universite Sauz Itophphiyu

Mashalaqete woraqati forme qixxaabbinehu Sasu Sidaamu Zoone Woraddara W/D/D/Q/M giddo ikkanna xiinxallote umi "Intophiyu giddonni shekerete dhibagargaranna huna" yitannote.

EO

Balaxe Kerre'ya shiqisheemmo. Su'ma'ya ______________ yinanni'e. Teehcho kawiira dawoommo haja haranchunni eqensiiseemmo, kawa dawoommohu, kalaa Dejene Haayiilu Kaasa yinanni manchira yaano Hawaasi Universite rasiisaanchira xiinxallote hajora ikkizanno mashalaqe (taje) gamb assateeti. Xaa yannara isi "UNISA" Yinanni wodiidi Afrikira noo universtera Doctereetete rosaanchooti. Xiinxallosi umi "Itophphiyu giddonnishekeerete dhiba gargaranna huna" Yitannote. Xiinxallosi hajano Hawaasi Universite giddo noohajo la'annonsa gashshaanonni buuxante fajjantinote. (fajjinoonite). Ati heeratto base tini hixunni doorantinotee konni daafira, tenne basera noo minimaate dawarouyiitara xiinxallote beeqqaano ikkite doorantino.

Mixolhexxo: Tenne xiinxallote mixo umi "Itophyduu giddo, W/D/D/Q/M/Sidaanu zoonenni shekkeerete dhibba gargaranni huna" yaanno. Ninke ammaneemmohu tenne xiinxallo gumulo/gumi/ Itophphiyu giddonni shekeerete dhibba ajishanna huna lainohunninna hattono rewoo ajishate ledo amadame lowonta kaa'lannotaati.

Harinsho: Tenne basera shekeerete gargarooshenne hunate deera xiinxallate, ki.ne tenne xiinxallote kaa'laanonna beeqaano ikkitinanni gede koyiinseemmo. Xiinxallote aana beeqqotenna beeqa hoogatewo'ma fajo unii'neta ikkitinota buuxxine atanoo'ne. Beeqqaano ikka'ne su'mi'nenninna malaatinenni formete aana eqensiisse. Aanteteno mashalaqe (taje) gamba assitannorira dawaro qoltinanni. Afuu xa'ma la'inahunni dawaro uyiitannori 18 diri annuwanna mini maate giddonni dirunni roorannoha ikka noosi. Kuri dawarono hixunni dawaroonnita ikkitinota afanoo’ne.

Qarra/injaa hooga: Tenne xiinxallote projekite aanabeeqakkinni miteekke tashshi yaa hooga’nera dandaannokorkaatuno 90 daqiiqa wo’ma qolatenni sayilssinannihuraati. Ikkollana kayiinne, tini xiintollo ayiitanno gumi (gumulo) woy uyiitanno horo gobbate deerrinni fayyimmate deerra woyeessa la’inohunni hyiitanno horoledo heewinsanni woyite hakeeshshano dibatidhinote. Konnirano tenne xiinxallora beeqakkinni mannimakkiranna sayiikoloojekkira qami diheerannohe.

Horo: Tenne xiinxallote projectera beeqqaancho ikkakkinni rahotenni leeltino horo a fira hoogatora/hoogatara dandaato/ta: Ikkolan a kayiini ate beeqqo teene gobbanera batiranni noo sheekeerete dhibba garaga rooshenna qoropha assete/ owo geeshsha kaalitannonke. Kuni xiinxallote gumi, W/D/D/Q/M, sidaanu Zoone giddo heere konne dhibba koo’linennikki gede assanno qarra baala bade afate kaalanno. Qoleno tenne xiinxallo gumi Konni qarrira taalod awaronna laoosheaanno.

Misxire: Tenne xiinxallo projectenni gamba assinemmo mashalaqe baala misixiretenni. Otoltanneth ikkite Hawaasi Universtera maaxante ayeeno iillaranna kisara danadaannokki bayiicho ofoltena xiinxallo loosannohunnina, tajegamba assannohunni gobbaanni dilannanni.

Giwate qoosso: Tenne xiinxallora beeqqa hoogate wo’ma qoosso noohe (yaano xa’mogama ikko wo’munni wo’ma qolahehoogate qoosso noohe) xiinhellote beeqqa halcho hoogurero, wole umikkira afirato mannimate keeranchimakkiaana qerra Iilisha here didandaiitanno. Qoleno tenne xiinxallora beeqqaancho ikkito gedensaanni ayee yannarano qulate dandaatt O/ta.

- Konni deerira, tenne xiinxallo aana xanimo nooheni?
- Tenne xiinxallora beeqancho ikkate umokki fajato/fajata 1- ee 2- deen’ni

SummuYaa: Tenne xiinxallo umi "Ethyophiyaaho Shekeerete dhibba hoolanna gargadha" yitannota ikkitanna aleenni Xawinsi mashlaqqe afuunni xawinsoonni anera leellanno'e qaalinni seekite xewilie.

Tenne xiin xallora umi'ya fajjonni beeqe kaalo asseemote ama neemmo.

Beeqaanchu sumanne malate: ....

Taje gamba assaanchu Sumanna malaate:..

Taadooshe assitinannihu: Ayee xa'mo heedhuhero kala. Dejene Haayiilu Kaasa, Hawaasi Universite Yite:

E-meele: dejenkassa@yahoo.com

Silke: 0916829271/046 221 4254

Annexure 4

STRUCTURED INTERVIEW SCHEDULE FOR PHASE I

(SIDAMA LANGUAGE)

Forme A-4: Subbino xa'mo yanna uni doychchoru

Hajo: "Shekkeer'te gorgaruudhshena Quxiixire Itiyophiyaho"

Xaphphoomu mashalagge

Barro: ________/_________/2013

Xinxalote kaa'lancho: ________________________Furma:________________

Dawaraanote kiiro: ___________/___________

Dawaraanchuallaa: ________________________

Towataanchu su'ma---------------------------------------Furma-------------------------------

Xa'mo wonshinoonui/barra --

Hajajo:Eeggotena mittemitte xa'mo xawissenna suutunni dawaroancholo coyiishiishi. Hakiinni, dawaraanchu dorsha qurowoteenn doyis. Fano xa'mora, dawaraanchuyita halaalaguguu dawaro fano darga borreesite goli.

T/kiiro	Xa'mo	Dawaro	Hedo
1m kifili:- warga			
1.	Dargu badroshshe	----------------------	
2.	Olluu badooshshe	----------------------	
3.	Goxete badooshishe	-----------------------	
4.	Teesso	1.Raqaxo 2. Baad'ya	
2k kifile:- Dawaraand daguumu, econometena mayimmote okata (gara)			
5.	Tee/Koo	1. Koo 2. Tee	
6.	Dirik' me''eho	------------------Dirooti	
7.	Adhamati gari hiituut'n	1. Qeedhicha/te 2. Adhamoommo/ma 3. Tidhamoomo/ma 4. Gunnichaho/tete	
8.	Amma'nokki maat'n	1. Kirisitiyanoho 2. Isilaamaho 3. Woli, xawisi --------------	

9.	Ea'reki maati n	1. Sidaama 2. Wolaayita 3. Amaara 4. Guraage 5. Oroomo 6. Woli, xawisi -------------	
10	Rosikk' deerru' mageyati?	1. Rose degennoommo 2. Umidoyichcho gudoommo 3. 2k doyichcho gudaammo 4. Aliid/aixaawoti roso gudoommo 5. 3k deera/dipiloma/digire gudoommo 6. Wipiloomu/digireta su'mo borreesi-------------------------	
11	Adhomootto/at ikkiro, galtekk' rosi deer' mageyat'?	1. Rose degennoommo 2. Umidoyichcho gudoommo 3. 2k doyichcho gudaammo 4. Aliid/aixaawoti roso gudoommo 5. 3k deera/dipiloma/digire gudoommo 6. Wipiloomu/digireta su'mo borreesi-------------------	
12	Minikk Meu Mann hee'rionnen	--------------------------Mann	
13	Maatekk giddo noohe darg maat'?	1. Minu anna 2. Minu ama 3. Woli, xawisi ----------------------	
14	Lous'kk' maati ?	1. Loosu dinoe 2. gaaggolo/geevchoholte 3. boatto loo'sire goloommoho 4. Mangisitite loosaasinclot' 5. Dadda lanchoho 6. S'anlar witino 1 7. Woli, xawisi -----------------------	
15	Aganu eokki birrunni me'ehon		

		--------------------------birra	
16	Maatekkina woli eote buiclcho no?	1. ee 2. Dino (xa’mmo 18 kubbi)	
17	Xa’mo 16 dawaro eet’ro, eote bviclclo maat’ ?	1. gide:________kuatala 2. Atara/bagala:_________ kuatala 3. Buna:_____ kuatala 4. gat kaasho:___________ 5. Woli, xawisi _________	
18	Mini saada noohe?	1. ee 2. Dino (xa’mmo 20 kubbi)	
19	Xa’mo 18 daworo ee ikkituro, kiironsa kuli	1. Lalu k’iro________ 2. Gereewu kiro__________ 3. Faradu/Horrete k’iro___ 4. Woli, xawisi _____________	
3 kk kifli: Dawaraanchu mini gara			
20	Minikki ma danaati?	1. Qorqorrote 2. Buuyyote 3. Woli, xawisi ----------------------	
21	Eonxanni dargi baxxinohu noole?	1. ee 2. Dino (xa’mmo 23 kubbi)	
22	Xa’mo 21 dawaro eetiro gonxann dorg meneho	----------------------------	
23	Eonxanni hayiseshinanminna shumate mine agurranna minikki me’’e kifile a firino?	---------------------------	
24	Mannunno saada mittenni galtanno?	1. ee 2. Dee’ni	
25	Sagale giscinanihu baxxino mini no?	1. ee 2. Dino	
26	Shumate mine noo’ne?	1. ee 2. Dinoi	
27	Boosaalco maskote (furdo) no?	1. ee 2. Dino (xa’mmo 29 kubbi)	

28	Xa'mo 27 dawaro ee ikkitra, furahote magaaraju	1. ee 2. Dino	
4 kki kifili: Shekkenite dh'ba lainohunni Dawaraanch egeno			
29	Raadoone noohe?	1. ee 2. Dino (xa'mmo 31 kubbi)	
30	Sa'mo 29 dawaro ee ikkituro raadoone mamoote mamoote macciisascato?	1. balanka woyiti 2. Duclcla woyite 3. sae sae 4. keeshshe keeshshe 5. Dimacciiseemo	
31	Telivisiome nooli? (Ragaxohe heedlawurira calla)	1. ee 2. Dino (xa'mmo 33 kubbi)	
32	Xa'mo dawarro ee ikkiture, mamoute mamoote lallato?	1. balanka woyiti 2. Duclcla woyite 3. sae sae 4. keeshshe keeshshe 5. Dimacciiseemo	
33	Gazeexa posterenna wole woraqatta fayyimayine coyidhawota asayi ajeenna lamolati giddo mitte higge afiratoo?	1. ee 2. diafireemmo	
34	Shekeerete xibbi maat'ro afoo?	1. ee 2. foommo (xa'mmo 36 kubbi)	
35	Xa'mo 34 dawaro ee ikkituro, shekkeer'te xibba mayi abbano?	1. Qiidu 2. Xeenu 3. Bushu ayyaani 4. Biinne gassuro 5. Busha diilallo 6. Bushawaa aga 7. Maganu rumo 8. Woli, xawisi --------------------	
36	Shekkeirete xibbi malaati maati? (mitte dawaro a leenni dandiinanni)	1. iibbili 2. Qiidisanna huxisa 3. umu damuume	

		4. badhete bodine 5. mikitate xisso 6. tufo 7.goo’ro 8. Woli, xawisi _______________	
37	Shekkeeri Taraawano dlibbaat’?	1. ee 2. Dee’ni (xa’mote kiro 39 kubbi) 3. D’afoommo (xa’mote kiro 39 kubbi)	
38	Dawaro eet’ro, manchunni mancho hiittonni taraawanno?	1. biinne gassuro 2. xissamino manchi leda k’kk’samin 3. Foolunni 4. Teennunni 5. Amatiwiinni gaaquuwa 6. Mundeete widoonni 7. Woli, xawisi ---------------------	
39	Binne roon yanna mamoote gassano?	1. barra 2. hashsha 3. Diafrommo/ma	
40	Biinne roore yanna mama qalantanoo? (mitte dawara alanni)	1. Ga’rino wayi giddonnacaffaho 2. Ha’ranno wayi giddo 3. Ishinu aana woyi giddo 4. Woli, xawisi --------------------	
41	Biinne barra mama ofoltunno (mitte dawaru alanni)	1.dargote g’ddo 2.mine 3. Diafoommo 4. Woli, xawisi -------------------	
42	Maatete giddo shekkeerete reqeccawinohu ayeeti?	1. Onfu dire wori qaaquulli 2. Outunna outu diri al’qaagguull’ 3. godowinni no mancho 4. gansidhanno mancho 5. Jawu manchi 6. geerro 7. Woli, xawisi -----------------------	

43	Shekkeere hoo'la dandiinanni?	1. ee 2. didon diinanni (xa'mo 45 kubbi) 3. D'afoommoo (xa'mo 45 kubbi)	
44	Sa'mo 45 dawaro ee ikkituro gargarooshshu doogo liitte hiittee afootto? (mitte dawaro aleinni gola dandiinanni)	1. xaggatenni 2. xagiclcho k'ifatenni 3. kofamino waa dunatenni 4. subbo shu gunatenni 5. Daallasu'agubere' horoonsiraten 6. Anganni waa bbishaten 7. wiliishshatenni 8. Kiifateenni 9. Waalchonna, furcho yannate cufatenni 10. Budu xaggu horoonsirateenni 11. Woli, xawisi ---------------------	
45	Xagga buurroonni daalasu agoberere macciishshite egennootto?	1. ee 2. Dimacciishshoomo	
46	Xa'mo 47 dawaro ee ikkituro, maminni macciishootorro afootto?	1) Masimidiyunni 2) fayyimmateogeeyyewiinni 3) mini'ya mauninni/jaalla'yaw 4) Woli, xawisi -------------------	
47	Shekkeereti xibbire fayuimate ogeeyyewiinni mashalaqe af'dhe egenootto?	1. ee 2. Diegenoommo (xa'mo 49 kubbi) 3. Digaageemmo/ma (xa'mo 49 kubbi)	
48	Xa]m 47 dawaroee ikkituro mashalagge meikki meikkita afiratto?	1. Barru baala 2. Lamalategiddinitte hige 3. Aganu giddo 1-3 lige 4. Sae sae 5. Afire diegenoommo	
49	Shekkeerete xisso doofiru afiirootto mashalagge kaa'litinohe?	1. ee, lowo geeshsha koo'litinoe 2. ee, kaa'litinoe 3. dee'ni,dikaa'litinoe	

50	Biinne gargadhate haqqu xagga horoonsidhe egennooto?	1. ee 2. D'egennoummo	
51	Algu agobere horoonshinanni gara kolcoonihe?	1. ee 2. D'egennoummo	
52	Xa'mo 51 dawaro ee ikkituro maateine giddonni ayi gajeelino?	1) minaakni 2) minaama 3) qaaqqu/qaaqqo 4) Woli, xawisi -------------------	
53	Algu agobere kaa'lo maati?	1) biinneshitanno 2) biinne e'anota gargartanno 3) biine fa f'ssano 4) shekkeen abbitano roommo shitanno 5) Woli, xawisi -------------------	
5 kk: kifile:- Shekekkeene gargadhatinna guxiixin ledu amadautina gurgaru hajo.			
54	Qar garinera fayyimmate kalino?	1.ee 2. Dino	
55	Minkkinni fayyimati keli geeshisha hodhu kaa'lo no?	1.ee 2. Dino	
56	Fayyimate keella iillate lekkatinn me''e daqiita ha'risone?	--------------doqiiqa	
57	Olli'nera daallasu agobere beenkoonai?	1.ee 2. Dino	
58	Xa'daallasu agobere ikkituro leekishanohe gade xa'mi	1.ee 2. Dino	
59	Xa'mo sodawato ee ikk'ro, xaayannaro me''e daallasu agobere noohi?	___________________	
60	Daallasu agobere maainni afirootto?	1) Mangisitetewinni 2) Hidhoommo 3) NGO tewiani afiroommo	

		4) Woli, xawisi ---------------------	
61	IRS te kaa'lo wo'ma woyiti uyinanni?	1.ee 2. Dino 3. D'afoommo	

6kki: kifile:- Dawaraanchu shekkeerite reqeccimmo deera.

Qaagishsha mascalaqqi gambarissa hura:- Eeggutenna hasaso daworooncho'ho suutunni coyishiishisi. Hakk'inni,dawaraanchu dawaro amaddno k'iro xaax'i (doyisi).

Xa, goonqiya gott'asse xa'mo 62-68 geeshsha coyishishimo. Xa'mo garunni macciishite sumuu yaakkna yaa hoogakk' deera kule. Lowogeeshsha sumuu, summu,Dhedrommo, summu yoommo, lowo geeshsha summu yoommo, diyoommo diyoommo.

1. *Kaajjishe giwoommo*
2. *giwoommo*
3. *Dihedoommo*
4. *Summu yoommo*
5. Kaajjishe summu yoommo

62	Shekkin kunn olliira fayyimmate qarraat?	1	2	3	4	5	
63	Kookiira baalunku shekeewteamadama doudano	1	2	3	4	5	
64	Woluwiinnininkewa daanno wosini roore shekkeerite amadamano.	1	2	3	4	5	
65	Mitu mana wolunn roore shekkeeretena amadomanno	1	2	3	4	5	
66	Eodowinni nomonclo shekkine mundeeteanse abbitano	1	2	3	4	5	
67	Shekkeere amaddoera dandiitana	1	2	3	4	5	
68	Mine'ya manna shekeere amada dandiitano.	1	2	3	4	5	

7kki kifile: shekkeerete x'so kaassini

Xa'mo 69-72 geeshsha qaali'ya got assecoyishisheemmohe. Earinn maccishite sumo yaakkno sumu yaa hrogakki deerro konn woroonn no qaallo horoonshishi kuli. Lowo geeshsha , summudiyommo, dihedoommo, summu yoommo, low geeshsha sumuu yoommo. Dawaro amaddinikiin qoqqowi summu diyoommo.

1. *lowo geeshsha giwommo*
2. *qiwoommo*
3. *Dihedoommo*
4. *Summu yoommo*
5. lowo geeshsha summu yoommo

69	Shekkeere kaasado xibbaati	1	2	3	4	5	
70	Shekkere ollinnkira shanno xibbi giddo mittho	1	2	3	4	5	
71	Shekkeeri gaaquullu aano roore kaassano	1	2	3	4	5	
72	Shekkeere godowinn no meenti aano roore kaajjano	1	2	3	4	5	

8kki kifili:- shekkeeriti gargarooshli na quxiixini loos’aano core.

Xa’mo 73-85 qouqu’ya got assecoyishiisheemmohe. Earunn amaccishite summu yaakkiinna summu yaa loogakki deerra kunni woroona no qaalla loroonsidhi kule. Lowo gashsha giwoommo, dihedoommo, summu yoomma, lowo geeshsha summu yoommo giwoommo.

1. *lowo geeshsha giwommo*
2. *qiwoommo*
3. *Dihedoommo*
4. *Summu yoommo*
5. lowo geeshsha summu yoommo

73	Dallasu agobere b’inne qassannota hooltanna	1	2	3	4	5	
74	Oliinkera no fayyimmate keelli gare fayyimmate kaa’lo aanno	1	2	3	4	5	
75	Fayyimmati keelli giddo uyinanni shikkeerite likkimnni garaho	1	2	3	4	5	
76	Daallasu agobere shekkeerite xibbinni gargartano	1	2	3	4	5	

77	Fayyimmat lalashshignloosaasini shekkeere akkama dandiitanno	1	2	3	4	5	
78	Daalasu agobere hidhate woxu woiga nooe.	1	2	3	4	5	
79	Min'ya maan shekkeeretenn xissamiro budu xagisaanowu massate woxu nooe.	1	2	3	4	5	
80	Maate'ya shekkeretinn xissanturo fayyimmate uurrinshuwara mosse akkomishisate woxu nooe.	1	2	3	4	5	
81	Shekkeerete xaga miniya manniro hidhate woxu woila nooe.	1	2	3	4	5	
82	Bookke shaanno xagichcho mine'yu k'ifa bookke shaanno	1	2	3	4	5	
83	Shekkeirete xibb yaaddo asishate ledote daallosu agobine hasiissanoe	1	2	3	4	5	
84	Daallasu agobini horoonsira garro diafidhino	1	2	3	4	5	
85	Daallasu agovere mine horoonsirate insiitano	1	2	3	4	5	

9kki kifile: shekkeereti xibbi gargarooshshina quxixine guffa.

Konni woroonn noo hedo coyishiisheemmo woyite garonn maccishite hedote aana summu yaakkna yaa hoogokki drera woroonn no qaallo loroonsidhe kul'e.

1. *lowo geeshsha giwommo*
2. *Summu diyoommo*
3. *Dihedoommo*
4. *Summu yoommo*
5. lowo geeshsha summu yoommo

86	Uo'yanno mikilya manna shekkeerete xibbninni agadhate egenno dinoe.	1	2	3	4	5	
87	Loosu bat'irannoe daafo shekkeene gargadhate loosire bnigga dedandeemmo.	1	2	3	4	5	

88	Daallasu agobene loononsirate ogimma dinoe	1	2	3	4	5	
89	Mini'ya daallasu agobere horoonsirate d'injano	1	2	3	4	5	
90	Daallasu agobere horoonsirano mannira diinsiitana	1	2	3	4	5	
91	Maate'ya daallasu agobere horoonsira di-jawaachchshano	1	2	3	4	5	
92	Olinkera mittu manni daallasu agobere dihoroonsiranna	1	2	3	4	5	
93	Kiinfanni xagchch ille giiranno	1	2	3	4	5	
94	Bookkite kiin fannixagchch umo damuunsanno	1	2	3	4	5	
95	Bookkete kintanni xagichch aanno gumi dikkishshano	1	2	3	4	5	
96	Bookkete knfann xagchch mini sada godaasanno	1	2	3	4	5	
97	O'llnkera shekkeerite gargarooshshi looso jauaachchshanote fayyimat' ogeeyye dino	1	2	3	4	5	
98	Shekkeretenn baloxisiisemmo xibuwa loolootu no	1	2	3	4	5	
99	Shekkeerete gargaroshsh loosira beeqqate masha loffodiaf'nanni	1	2	3	4	5	

10kki kifile:- Daafo adhate hajo

Xa'mo 100 -106 geeshsha qunqo'ya gett'asse coyishiisheemmohe. Gawna hawnsite horontanni coyubba magann hodhanoro kul'e. Keeshite, sae sae, wo'ma woyite.

100	Shekerite gargarooshi loosira beeqeemmo gedininiiya mina jawaachchishawoe	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo'mo woyiti	
101	Fayyimmate halilishsh loosaasine shekken' gargadhemmo gara amaaltanoo	1. horontanni 2. keeshshe keeshshe 3. sae sae	

		4. wo’mo woyiti	
102	Mini’ya maate shekkeeretenn xissantu kawa shekkeeri gargadhate loono loosa hanafoommo (sasu agani kawa)	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo’mo woyiti	
103	Shekkeere ollii’yara mana shitino daa fira gargarooshu looso loosa nooe	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo’mo woyiti	
104	Massi midiyunni ikk’tano masha lage afiroommo daafro shekkeer gargadhate loose loosimmo	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo’mo woyiti	
105	Minke konni oliira heenoommo manni shekkeerete xissure hassaan be gargarooshshu loos’ra beeggate ka’noommo.	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo’mo woyiti	
106	Fiixiiya daallasu agobeni horoonsiratinni shekkeeni gargadhinemmo gede kultinoe	1. horontanni 2. keeshshe keeshshe 3. sae sae 4. wo’mo woyiti	
11kki kifil: Xaa yannara shekkeere gargadhate loondonni hee’noonni looso. Eeggotina dawaraanchchu dawarino dowaro amoddno kiiro gogowi.			
107	Daallasu agobere mageeshshi yannara horoonsirootu?	1) Sai 6 aganira 2) Sai mittu dirira 3) Sai lamu dirira 4) Lamudiri aliiani 5) Horoonsire diegennommo	

108	Maatekki giddonni bisiibbabl'no ha mamira mamira massato?	1.hosipitalee 2.fayyimate mereersha 3.Fayyimate keella 4.gikete kilinixe 5. gilete xagga mine 6.xagichcho suugetenni hidheemmo 7.budu xagisaanowo hareemma 8.Tungoonni xagga horoonsineemmo 9.mine uni'ya xagga horoonsineemmo 10.wole, spec'fy____________	
109	Xaa yannara maatikki shekeerite xibinni agarate maa assitanii nooto?	1.kinine adheemmo 2. Filitee k'ifeemmo 3.kofamino woa doneemmo 4. Ishine huneemmo 5.Daallosu agobin looroonsireemmo 6. wiliishsheemmo 7. K'ifeemmo 8. Waalado yannatena cu feemmo 9. wole, xawisi _____________	
110	Xa'mo 109 aana no gargarooshshi doogo doorootto korkaatti maati?	1.afamanno daafira 2. wuxeetammo ikkino daafira 3.Rakasino daafira 4. wole, xawisi____________	
111	Sai hashsha, daallasu agobere ay' horoonsirino?	1. outu diriwuri gaaquulli 2. 5-10 dirimereero no qaaqquuli 3. Minaamanna ainaanni 4. Woli jajjaba minimanni 5. wole, xawisi --------------------	
112	Daallasu agoberera xagichcho burte egennootto?	1.ee (xa'mo 114 sai) 2.Diegennoommo	

113	Xa'mo 112 dawaro dee'ni ikkituro, mayirat?	1.------------------------------- 2.------------------------------- 3.-------------------------------	
114	Daallasu agoberi mamoote mamoote horounsiratto?	1) Hashshu baala 2) Doore hashsha 3) Sae sae 4) Shekkeere ka'anno 5) Xeena gananno yannara 6) wole, xawisi -----------------	
115	Daallasu agobere haashshite egennootto?	1) ee 2) Diegenoommo	
116	12 agani kawaninikki xagchcho buurame egennino	1.ee 2. Diegenoommo (xa'mo 119 sai)	
117	Xa'mo 116 dawaro ee ikkituro, meu again asbaanni buuranino?	------------------------agana	
118	Xagichcho ayi buurihe?	1. Mangiste 2. Mangistiti gobbanninoo uuminsha 3. Gillete uurrinsha 4. wole, xawisi-------------------	
119	Konni albaanni minekk magichcho kefisisati fajjutukkikkiro konnalbira fajjatto?	1. ee 2. Difareemmo 3. Diafoommo	
120	Xaa yannara dagoomu horoonsirannino budu shekkeen'te gargarrosh. Dooggu hiitaiti?	1.--- 2.-- 3.--	
121	Sai 12 aganigido shekkeere xagisirate budo xagga adhite egenootto?	1. ee 2. D'egenoommo (Xa'mo 123 sai) 3. Diafoommo (Xa'mo 123 sai)	

122	Xa’mo 121 dawaro ee ikkturo budu gargaroshsh qaa to meeligge adhootto?	1) Keeshshe keeshshe 2) Sae sae shekkeere amaddonoe woyit 3) Shekkeere amaddanno wo’ma woyite	
123	Shekkeenite dliba hunate gaadiro beeqqite egennootto?	1. ee 2. Deigennoommo (xa’mo 125 sai)	
124	Xa’mo 123 dawaro ee ikkituro mayimayi loosira beeqqoutta?	Kofamino waa dunatenna bayichcho wonshati loosira 2.roso aati gaadira 3.garramuling wayyimati loososinena kulate 4.wole, xawisi---------------------	
12 kki kifile:- kulanino shekkeeriti x samaano			
125	Sai sasu again giddominekki shekkeerite dhiwaminohuno?	1. ee 2. Dino (xa’mo 129 sai) 3. Diafoommo (xa’mo 129 sai)	
126	Xa’mo 125 dawarooee ikkiture ayi dhiwaanino?	1. 5 diriwori gaaggi 2. gudowinnino macho 3. haranni doyino wosin 4. wole, xawisi ----------------	
127	Sai sasu again giddoo maatekki giddo mittu manchi me’’e hige dhiwommo?	1.mitte hige 2. lame hige 3.sase hige 4. shoolu a leenni	
128	Sai sau again giddo maatekki giddo meu manni xissamino?	1) mitte 2) lamu 3) sasu 4) shoodunna lakiyi al’	

129	Sai din kawa maatikk giddo shekkeerite dhibbnni wyinohunoo	1.ee 2.Dino	
130	Xa'mo 129 dawaro ee ikkturo dirosinna koo/tasi kula dandaatto	Diro= ----------------years Koo/tee- 1) lobaho – 2) merate:	

Xa'maanchunni wo'mitanno mashalaqqe

Hajajo: Eegotena gavi buuxo assit'aante noo masha laqqe wonshi

131. Mine bookke leelhtanno?

1) ee 2) Dileesitannoo

132. Daallasu agobere gonxaniwa sutantino?

1) ee 2) Disutantino

133. Dawaroee ikkturo, daallasu agobere akotimaa lawanno (dawaro doyisi)

1) dadhamino
2) xurino
3) Dargasidisutamino
4) Wole, xawisi --------------------------------

134. Bookke galama daudiitanno dorguwa (garino wayi) mino gargarira noo?

1) ee 2) Dino 3) badate garrisanno

135. Waalcho lonna furchote maggaarajuno?

1) ee 2) Dino

136. Daallasu agoere daallasu lodo hito amadiinsaniro xa'ni

137. Linu gidigida magarinni la''atto?

1) Low geeshsha taalinoho
2) Taalinoho
3) Ditaalino
4) Liinxanoosi

138. Mineho biine eessitano xulluwanoosi?

1) ee 2) dino

Xiintallote beeggakkira galaxeemmo

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Annexure 6: Consent form (Amharic Version)

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Annexure B-4: STRUCTURED INTERVIEW SCHEDULE FOR <u>PHASE II</u> (Amharic **Version**)

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31.3	[illegible]	1	2	3	4	5
31.4	[illegible]	1	2	3	4	5
31.5	[illegible]	1	2	3	4	5
31.6	[illegible]	1	2	3	4	5
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42	[illegible]?	1. [illegible] 2. [illegible]([illegible] 44 [illegible])
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44	[illegible]-[illegible]?	1. [illegible] 2. [illegible] 3. [illegible]
45	[illegible]-[illegible]?	1. [illegible] 2. [illegible] 3. [illegible] 4. [illegible]
46	[illegible]?	1. [illegible] 2. [illegible] 3. [illegible]
47	[illegible]-[illegible]	1. [illegible]

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66.2	□□□	1. □□ □□ □□□□□ □□ 2. □□□ □□□ □□□□□ □□ 3. □□ □□ □□
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permission letter written from Sidama Zonal Health Department to nine Woredas(Districts)

Sidaamu zoone Gashshooti
sidaamu zoone fayyimmate
Biddishsha
በሲዳማ ዞን አስተዳደር
የሲዳማ ዞን ጤና መምሪያ

ቁጥር ሙs/ሐ-1184/1
ቀን 15/07/05

ለ፣ አለታ ጩኮ ወረዳ ጤና ጥበቃ ጽ/ቤት
ወንዶገነት ወረዳ ጤና ጥበቃ ጽ/ቤት
ሸበዲኖ ወረዳ ጤና ጥበቃ ጽ/ቤት
ቦርቻ ወረዳ ጤና ጥበቃ ጽ/ቤት
ዳሌ ወረዳ ጤና ጥበቃ ጽ/ቤት
ሎካ አባያ ወረዳ ጤና ጥበቃ ጽ/ቤት
ዳራወረዳ ጤና ጥበቃ ጽ/ቤት
በአለታ ወንዶ ወረዳ ጤና ጥበቃ ጽ/ቤት
ሀዋሳ ዙሪያ ወረዳ ጤና ጥበቃ ጽ/ቤት
በያሉበት

ጉዳዩ ፡ **ትብብር እንዲደረግ ስለመጠየቅ**

የሀዋሳ ዩኒቨርስቲ ህክምናና ጤና ሳይንስ ኮሌጅ ባልደረባ የሆኑት አቶ ደጀኔ ኃይሉ ካሳ በ"UNISA" የPhD ተማሪ መሆናቸውን በመጥቀስ ለትምህርቱ የመመረቂያ የምርምር ፅሁፍ "Malaria prevention and control in Ethiopia" በሚል ርዕስ በዞናችን ወባማ ወረዳዎች ላይ ለመስራት ማቀዳቸውን ኮሌጁ በቁጥር ሕጤሳኮ/6039/03 በቀን 15/08/05 በተፃፈ ደብዳቤ ገልፀው ትብብር እንድናደርግላቸው ጠይቀውናል፡፡

ስለዚህ ከወረዳችሁ መረጃ መሰብሰብ እንዲችሉ አስፈላጊው ትብብር እንዲደረግላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

Sidaamu zoone ... Biddishsha
የሲዳማ ዞን ...

Imala Lammacha Qunaasa
ኢማላ ለማቻ ቁናሳ
Dhibbu gar/fayyi/Lati/Qaru Loosi
ha'r/Qineessaancho
የበሽታ መከ/ጤናን/ማጎ/ቁ/የሥራ
ሂደት አስተባባሪ

ግልባጭ፣
ለአቶ ደጀኔ ኃይሉ
ህጤሳኮ

permission letter written from Sidama Zonal Health Department to nine Woredas(Districts)

Sidaamu zoone Gashshooti
sidaamu zoone fayyimmate
Biddishsha
በሲዳማ ዞን አስተዳደር
የሲዳማ ዞን ጤና መምሪያ

ቁጥር ጤ/14-1184/1
ቀን 15/07/05

ለ፣ አለታ ጨኮ ወረዳ ጤና ጥበቃ ጽ/ቤት
ወንዶገነት ወረዳ ጤና ጥበቃ ጽ/ቤት
ሸበዲኖ ወረዳ ጤና ጥበቃ ጽ/ቤት
ቦርቻ ወረዳ ጤና ጥበቃ ጽ/ቤት
ዳሌ ወረዳ ጤና ጥበቃ ጽ/ቤት
ሎካ አባያ ወረዳ ጤና ጥበቃ ጽ/ቤት
ዳራወረዳ ጤና ጥበቃ ጽ/ቤት
በአለታ ወንዶ ወረዳ ጤና ጥበቃ ጽ/ቤት
ሀዋሳ ዙሪያ ወረዳ ጤና ጥበቃ ጽ/ቤት
<u>በያሉበት</u>

ጉዳዩ ፡ <u>ትብብር እንዲደረግ ስለመጠየቅ</u>

የሀዋሳ ዩኒቨርስቲ ህክምናና ጤና ሳይንስ ኮሌጅ ባልደረባ የሆኑት አቶ ደጀኔ ኃይሉ ካሳ በ"UNISA" የPhD ተማሪ መሆናቸውን በመጥቀስ ለትምህርቱ የመመረቂያ የምርምር ፅሁፍ "Malaria prevention and control in Ethiopia" በሚል ርዕስ በዞናችን ወባማ ወረዳዎች ላይ ለመስራት ማቀዳቸውን ኮሌጁ በቁጥር ሕጤሳኮ/6039/03 በቀን 15/08/05 በተፃፈ ደብዳቤ ገልፀው ትብብር እንድናደርግላቸው ጠይቀውናል፡፡

ስለዚህ ከወረዳችሁ መረጃ መሰብሰብ እንዲችሉ አስፈላጊው ትብብር እንዲደረግላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

Imala Lammacha Qunaasa
ኢማላ ላማቻ ቁናሳ
Dhibbu gar/fayyi/Lati/Qaru Loosi ha'r/Qineessaancho
የበሽታ መከ/ጤናን/ማጎ/ቁ/የ ሥራ ሂደት አስተባባሪ

Sidaamu zoone ...
sidaamu zoone ...
Bidd...
የሲዳማ ዞን ...

ግልባጭ፣
ለአቶ ደጀኔ ኃይሉ
<u>ህጤሳኮ</u>

ሀዋሳ ዩኒቨርስቲ
ህክምናና ጤና ሳይንስ ኮሌጅ
የህ/ስብና አካባቢ ጤና አጠባበቅ ት/ቤት

Hawassa University
College of Medicine and Health Sciences
School of Public & Env'tal Health

ቁጥር PEH/158/2013
Ref. No.
ቀን 15/01/2013
Date

To: Ethical Review Board

From: School of Public and Env'tal Health

Tarekegn Solomon

Hawassa University College of Medicine & Health Science
School of Public & Environmental Health

Subject: **<u>Ethical Clearance of Research</u>**

Mr. Dejene Hailu Kassa is a PhD student enrolled at university of South Africa (UNISA). The title of his thesis project is "Malaria prevention and control in Ethiopia", and is tentatively scheduled for implementation during the second semester of 2012/13 academic Year.

Hence, the purpose of this letter is to kindly request the office to review the proposal and give the applicant an ethical clearance.

With regards!

CC

- Mr. Dejene Hailu Kassa

☎ +251 0 46 820-92-78
Fax: +251 046 2208755
✉ : 1560 *Awassa, ETHIOPIA*

ሀዋሳ ዩኒቨርስቲ

ህክምናና ጤና ሳይንስ ኮሌጅ

Hawassa University

College of Medicine and Health Sciences

ቁጥር ሕክ/ገ/ሄ/ዓ/1 6040/05
Ref. No.
ቀን 15/3/05
Date

permission letter to Hawassa City Administration

ለ፣ ሀዋሳ ከተማ አስተዳደር
<u>ሀዋሳ</u>

ጉዳዩ ፣ <u>ትብብር ስለመጠየቅ</u>

የኮሌጃችን ባልደረባ የሆኑት አቶ ደጀኔ ኃይሌ ካሳ በ"UNISA" የPhD ተማሪ መሆኑን እየገለጽን ለትምህርቱ የመመረቂያ የምርምር ፅሁፍ "Malaria prevention and control in Ethiopia" በሚል ርዕስ በሀዋሳ ከተማና በሲዳማ ዞን ወባማ ወረዳዎች ላይ ለመስራት አቅደዋል፡፡

ስለዚህ በሀዋሳ ከተማ ~~ቶላ~~ ክ/ከተማ መረጃ መሰብሰብ እንዲችሉ ለተጠቀሰው ክ/ከተማ የትብብር ደብዳቤ እንዲፃፍላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

ሩሁን ወልዴ ገ/ሚካኤል(ዶ/ር)
ኮሌጅ ዲን

The Federal Democratic Republic of Ethiopia Hawassa University College of Medicine & Health Sciences

ግልባጭ፣
- ለህብ/አካ/ጤና አጠባበቅ ት/ቤት
- ለአቶ ደጀኔ ኃይሌ
  <u>ህጤሳኮ</u>

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