

**ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES,  
DEPARTMENT OF MEDICAL MICROBIOLOGY, IMMUNOLOGY  
AND PARASITOLOGY**

**The prevalence of malaria and community knowledge, attitude and  
practice about the transmission and control measures among  
households in Pawe Woreda, North West Ethiopia.**

**By  
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Addis Ababa, Ethiopia.**

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## Master's Thesis

**The prevalence of malaria and community knowledge, attitude and practice about the transmission and control measures among households in Pawe Woreda, North West Ethiopia.**

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## Acronyms

<b>CDC</b>	Centers of disease control and prevention
<b>EPIINFO</b>	Epidemiological Information
<b>FMOH</b>	Federal ministry of health
<b>HF</b>	Health facility
<b>IRS</b>	Indoor residual spray
<b>ITN</b>	Insecticide treated net
<b>KAP</b>	Knowledge, attitude and practice
<b>MIS</b>	Malaria indicator survey
<i><b>P.falciparum</b></i>	<i>Plasmodium falciparum</i>
<i><b>P.vivax</b></i>	<i>Plasmodium vivax</i>
<b>SPR</b>	Slide positivity rate
<b>SNNPR</b>	Southern nations, nationalities and peoples region
<b>SOP</b>	Standard operating manual
<b>SPSS</b>	Statistical Package for Social Scientists
<b>WHO</b>	World health organization

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## Abstract

**Background** - Epidemiological information regarding the prevalence of various parasitic infections in different localities is a key to develop appropriate control strategies. A High Knowledge score about the cause, transmission and habit of practicing the available effective preventive and control measures by the individual households and the community at large could contribute much to the overall reduction of the malaria burden.

**Objectives** - To determine the prevalence of malaria and assess the community knowledge, attitude and practice about the transmission, prevention and control measures among households at Pawe Woreda, North West Ethiopia.

**Methods and Materials** - A community based, cross sectional study was carried out from November to December, 2010. A multi-stage random sampling technique was carried out to select representative households. A pre tested structured questionnaire (n=406) and blood film examination format (n=403) were used for data collection. Data was entered and analyzed using SPSS 16.0. Proportions, Odds ratio and 95% CI were computed.

**Results** - The overall malaria prevalence was 14.7%. Respondents that mentioned at least three symptoms of malaria constitute 71.5%. Fifty six percent of the respondents associated malaria with hunger/skipping meals, as a cause and most (67%), affirmed that mosquitoes transmit the disease. Significant proportions (79.8%) were aware that mosquitoes bite during night. Use of bed net and draining of stagnant water were identified as major malaria preventive measures by 89.7% and 34% of respondents, respectively. About 69.2% reported that they were using bed nets correctly. Over 50% of the respondents stated that they would not seek for malaria treatment in 24 hours. Participants who had many years education ( $\geq 5^{\text{th}}$  grade) and those who received health education reported high malaria Knowledge score, correct use of bed nets and early treatment seeking habits [OR (95%CI) =4.9(1.4-8), 1.8(1.4-2.5), 2.2(1.7-4.1), respectively. Living in areas which would take 60 minutes and longer distances to health facility was found to be associated with delay in treatment (OR=1.3, 95%CI= (1.1-2.0).

**Conclusions and recommendation** - The Prevalence of malaria reported in this study was higher than reports in many areas of the country. Though malaria knowledge score

among the study participants were observed to be more than 50%, the practice of effective preventive and control measures were relatively poor. Hence, a comprehensive health education and promotion of community education should be given with a special emphasis given to assure that individual households use ITNs correctly, adapt integrated vector control approach, avoid misconception about cause of malaria and seek treatment early.

**Key words** - Prevalence, knowledge, attitude, practice, community, early treatment seeking behavior, high knowledge score, correct use of ITNs.

# 1. Introduction

## 1.1. Background information

Malaria is one of the major causes of disease for people living in Tropical and Sub-Tropical areas (Stephen, 2001). Humans are infected through the bite of an infected female *Anopheles mosquito* that inoculates spindle shaped sporozoites into the bloodstream (Kayser, 2005). There are four malaria species that infect and cause disease in humans, *Plasmodium falciparum*, *P. vivax*, *P. malariae* and *P. ovale*.

The first symptoms of malaria are nonspecific; the lack of a sense of well being headache, fatigue, abdominal discomfort, and muscle aches followed by fever are all similar to the symptoms of a minor viral illness (Nicholas *et al.*, 2008)

In malaria endemic areas, factors such as poverty, poor socioeconomic status, poor education, lack of enlightenment and poor environmental sanitation have been attributed to availability of mosquito-friendly environmental conditions which allow for survival and proliferation of the vector and pathogenic parasite (Coker *et al.*, 2001). Also, the emergence and rapid spread of resistance both of vector-mosquitoes to insecticides and of pathogenic plasmodia to anti-malarial drugs are other causes of severe disease and death from malaria in the affected areas (Oyewole and Ibidapo, 2007).

Malaria risk and disease burden is inequitably distributed, not only at global and regional levels but also at household level because poor housing, lack of education and access to healthcare services create a vicious cycle of enhanced vulnerability to malaria due to increased exposure, high household medical costs, reduced ability to pay for treatment, and so on (Pamela *et al.*, 2007).

Factors such as the household socio-economic status, parents' education, the household head's sex and age, the distance to the health facility, and the quality of health care services have all been found to influence people's treatment and provider choices (Claudia *et al.*, 2007). Knowledge of malaria and effective practice of these control approaches is a key factor for the overall reduction of malaria in a particular locality.

## **1.2. Literature Review**

### **1.2.1 Geographic Distribution of Malaria**

The global malaria burden is not evenly distributed with Sub-Saharan Africa accounting for 90% of global malaria cases and a majority of these cases occurring among women and children (Audrey *et al.*, 2008).

Malaria occurs throughout most of the tropical regions of the world. *P. falciparum* predominates in Africa, New Guinea, and Haiti; *P. vivax* is more common in Central America. The prevalence of these two species is approximately equal in South America, the Indian subcontinent, eastern Asia, and Oceania. *P. malariae* is found in most endemic areas, especially throughout sub-Saharan Africa, but is much less common. *P. ovale* is relatively unusual outside of Africa and, where it is found, comprises <1% of isolates (Nicholas *et al.*, 2008).

### **1.2.2. Malaria Ecology and Plasmodia**

The host, insect vectors, the parasite and the physical condition under which transmission occurs determine the distribution of malaria in different malaria endemic zones. Understanding of these ecological factors help control the spread of the parasite. The parasites develop optimally in the vector but cease developing at temperatures 16°C or below. High humidity prolongs the life of the vector and transmission is extended under these conditions. In the human intermediate host, the parasite must function at 37°C or higher, since the infection induces a significant rise in core temperature during the height of the infection (Jaston *et al.*, 2004).

### **1.2.3. Anopheles Mosquito**

Females of most species of mosquitoes require a blood meal before the eggs can develop. Species that usually feed on humans are said to be anthrophagic. *Anopheles gambiae* (African malaria vector) are mainly anthrophagic, endophillic and endophagic. The resting and feeding behavior of malaria vectors is an important consideration in planning control measures (Mike, 2000).

Temperatures from approximately 21°-32°C and a relative humidity of at least 60% are most conducive for maintenance of Transmission. In tropical regions temperature and humidity are often mediated by altitude. In Africa, altitudes above 1,500 m are considered safe from malaria. However, it must be cautioned that with continuing global climate change, these figures may change, extending the range of mosquitoes well above those altitudes as ambient temperatures rise. The mosquito density (number of female mosquitoes per human inhabitants) is a critical determinant of the intensity of infection. The malaria vector requires water to complete its life cycle: egg, larva, pupa, and the adult. Blood-feeding usually starts at dusk and continues until dawn (Jaston *et al.*, 2004)

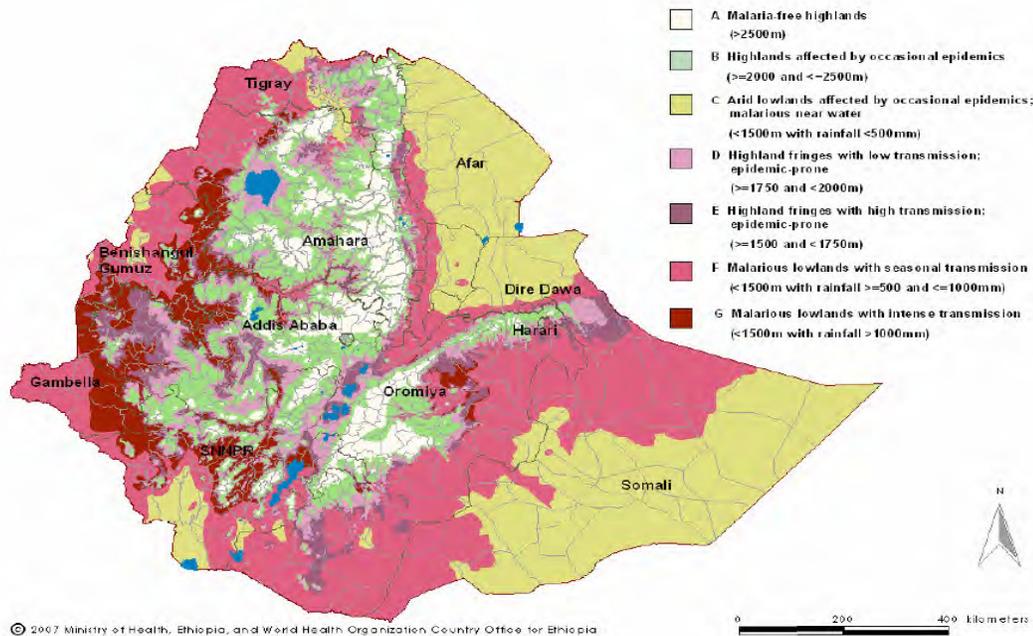
#### **1.2.4. Malaria in Ethiopia**

##### **1.2.4.1. Epidemiology.**

The epidemiological pattern of malaria transmission in Ethiopia is generally seasonal and highly unstable due to variations in topography and rainfall patterns. Marked variations in the level of transmission from place to place or seasonal fluctuations in the number of cases are the main features of malaria transmission in Ethiopia (Tilahun *et al.*, 2009). As a result of the short peak transmission and the relatively long duration of low transmission during the dry season, people are highly vulnerable to malaria due to lack of acquired immunity that comes with frequent exposure to malaria infections, resulting in the occurrence of frequent epidemics (Tilahun *et al.*, 2009).

It is estimated that three-fourths of the land below 2000 meters is malarious with two-thirds of the country's population at risk (Kassahun, 2004). The *Dega* zone of Ethiopia (altitude above 2,500 meters) with a mean annual temperature of 10- 15 degree Celsius are malaria-free. Much of the *Woina Dega* zone (Altitude 1500 – 2500 meters) is also malaria free, especially the zone in the 2000 – 2500 meters above sea level. Malaria in Ethiopia often occurs below 2000 meters, with short-lived transmission following the rains. However, malaria epidemics have been recorded up to 2400 meters during periods when increased temperature and adequate precipitation are conducive for both vector survival and parasite development within the vector ( Gebreyesus *et al.*,2006).

Vectors transmitting the disease are mainly *A. arabiensis*. Forty-two *Anopheles* species have been recorded, with distribution varying by altitudinal zone and microhabitat, while most species are confined to relatively small geographic areas, the four malaria vectors (*A. arabiensis*, *A. pharoensis*, *A. funestus*, *A. nili*) are widely distributed (Gebreyesus *et al.*, 2006).



**Figure 1.** Distribution of malaria in Ethiopia.

Malaria shows a strong seasonal pattern “with a lag time varying from a few weeks at the beginning of the rainy season to more than a month at the end of the rainy season (Gabriel and James, 2005).

#### **1.2.4.2. Disease Burden**

The socioeconomic burden resulting from malaria is immense: 1) the high morbidity and mortality rate in the adult population significantly reduces production activities; 2) the prevalence of malaria in many productive parts of the country prevents the movement and settlement of people in resource-rich low-lying river valleys; exposing a large population of the country to repeated droughts, famine and overall abject poverty; 3) the increased school absenteeism during malaria epidemics significantly reduces learning capacity of students; 4) coping with malaria epidemics substantially increases public health expenditures (Deressa, 2010).

#### **1.2.4.3. The role of human factors in the spread of malaria in Ethiopia.**

Human factors in Ethiopia contributing to the spread of malaria include population growth and movements, urbanization, water development schemes, agricultural development, conflicts, and improper use of drugs and the attendant consequences of the emerging drug-resistant malaria parasites (Aynalem, 2008). Seasonal migration from highlands to lowlands for agriculture work has increased since 1991 with the growth of large-scale agricultural development projects. Western lowland district populations have increased by 20-30% with the arrival of tens of thousands of agricultural workers during the harvest season, which is also the high transmission season for malaria. Laborers often work during the cooler evening hours when vector-biting rates are high, and often sleep in the field and land scarcity in the highlands resulted in establishment of new villages for settlement in western malarious lowlands (Gebreyesus *et al.*, 2006).

Large-scale irrigation agriculture has also been in existence for decades as is the practice of damming rivers for the production of hydroelectric power. None of these have been without health consequences, however, and the toll in malaria illnesses and death has been documented in one of the few studies focusing on the subject (Aynalem, 2008).

The low educational level of malaria sufferers most of whom live in the countryside and have never been to school or received adequate guidance regarding dosage, fail to adhere to prescription requirements, or stop medication all together up on feeling well. As is the

case elsewhere where malaria is endemic drug-resistance has been the inevitable outcome in many parts of Ethiopia (Afework, 2005).

The burden of malaria has been increasing due to a combination of large population movements, increasing largescale epidemics, mixed infections of *Plasmodium vivax* and *P. falciparum*, increasing parasite resistance to malaria drugs, vector resistance to insecticides, low coverage of malaria prevention services, and general poverty. Outpatient consultations, inpatient admissions and all in-patient deaths have risen by 21-23% over the last five years (MOP, 2008).

Quantification of the social economic burden of malaria in Ethiopia is problematic since the victims live mostly in rural areas out of sight and out of mind of social scientists and other researchers, but some estimates about the social and economic consequences of the disease are sobering, with a large number of people kept from work by debilitating illness resulting in low productivity. While household malaria burden is likely to be underestimated by institution data, routine health reports clearly reveal the burden of Malaria on the health system(Gebreyesus *et al.*, 2006).

Malaria transmission peaks bi-annually from September to December and April to May coinciding with major harvesting season with serious consequences for the subsistence Economy of Ethiopia's countryside, and for the nation in general(Deressa, 2010).Vector activity peaks in the months often set aside for cultivation, weeding, harvesting and winnowing. Weddings and other culturally important activities also peak at this time. In other words, optimal climatic regimes for socio-economic activities in rural Ethiopia also favor the reproduction, propagation and thereby the preying up human blood of vector mosquitoes (Gabriel and James, 2005).

#### **1.2.4.4. Prevention and Control strategies**

Ethiopia's fight against Malaria started more than half a century ago. "Initially malaria control began as pilot control project in the 1950's and then it was launched as a national eradication campaign in the 60's followed by a control strategy in the70's (CDC, 2004).

Combating malaria is among the eight Millennium Development Goals. Early diagnosis and effective treatment, Vector control, Easy and universal accessibility to ITNs, Residual

periodic spray of dwellings, Environmental management, and continued efforts in epidemic prevention are currently implemented control strategies (Sheleme, 2007). Expanded use of information technologies, education, and communication is among the supporting strategies (Sheleme, 2007).

### **1.2.5. Malaria prevalence and community KAP studies**

Malaria is caused by four known species of plasmodium in humans named as *P.falciparum*, *P.vivax*, *P.ovalae* and *P.malariae*. The afro-tropical region, which is only 8% of the world's population, bears the heaviest malaria burden, with 200 to 280 million cases, over 90% of which are due to *Plasmodium falciparum* (Eholié *et al.*, 2009).

A community based survey conducted in western Sumba district, Nusa province; Indonesia showed an overall prevalence of 6.83 % (95% CI) in the wet season and 4.95% in the dry season. Malaria prevalence varied substantially across the district; prevalence in individual sub-villages ranged from 0–34%. The greatest malaria prevalence was in children and teenagers (Syafuruddin *et al.*, 2009).

A study in 13 endemic districts of Bangladesh shows an overall malaria prevalence of 3.97%, the majority of cases (90%) of which was falciparum malaria (Hague *et al.*, 2009). According to a study in Pacific Island, malaria was seasonal, the parasite prevalence in the population varying from 21% (60% *falciparum*, 40% *vivax*) in the wet season to 11% (15% *falciparum*, 85% *vivax*) in the dry season (WHO, 2008).

As per countrywide malaria survey carried out in Mozambique, malaria parasite prevalence was 58.9%, the majority of blood smears 52.4% were due to *Plasmodium falciparum*. Gametocytes prevalence, only for *P. falciparum* was 5.6 % (Samuel *et al.*, 2008).

Surveys of malaria indicators conducted in 2007 in Countries with high, stable transmission: Niger, Rwanda and United Republic of Tanzania Zanzibar revealed a parasite prevalence rate of 2.4% in 2842 children fewer than 5 years of age. A community-based survey data from two districts indicated parasite prevalence rates of 0.8% (68/8650) overall and 0.4% (9/2123) in children under 5 years of age (Samuel *et al.*, 2008).

According to a study carried out in North-western Tanzania, 453 (90.1%) of the study subjects mentioned malaria as the most important disease in the area. Four hundred and sixty four respondents (92.1%) knew that malaria is transmitted through mosquito bite. A total of 436 (86.7%), 306 (60.8%) and 162 (32.1%) mentioned fever, vomiting and loss of appetite as major symptoms/signs of malaria, respectively and 278 people (87.2%) sought treatment from health facilities (Safari *et al.*, 2010).

Findings of a study conducted in two endemic populations of Bangladesh revealed superficial knowledge on malaria transmission, prevention and treatment by the respondents. Poverty and level of schooling were found as important determinants of malaria knowledge and practices. Majority of the ill persons either did not seek any treatment (31%) or practiced self-treatment (12%). Also, there was a delay beyond twenty-four hours in beginning treatment of malaria-like fever in more than half of the instances (Syed *et al.*, 2009).

According to a study done in Swaziland a substantial number of research participants showed reasonable knowledge of malaria, including correct association between malaria and mosquito bites, its potential fatal consequences and correct treatment practices. Almost 90% (n = 320) of the respondents stated that they would seek treatment within 24 hours of onset of malaria symptoms, with health facilities as their first treatment option. Most people (78%) perceived clinics and vector control practices as central to treating and preventing malaria disease. Indoor residual spraying (IRS) coverage and bed net ownership were 87.2% and 38.8%, respectively. IRS coverage was more than 80% within the targeted communities (Khumbulani *et al.*, 2009).

By a study in Sudan, Khartoum, About 76.6% of household heads reported delayed treatment seeking behavior for malaria (Salwa *et al.*, 2009). A cross sectional survey conducted in a semi urban area of model village Humak near Rawalpindi and Islamabad in 85% of respondents' opinion malaria is a dangerous disease and 97% were in favor of protective measures against malaria. Regarding the protective measures 56% were in favor of mosquito net. By the use of mosquito net or repellent 98% of respondent`s attitude was prevention against the mosquito bite. 70% of respondents recognized the malaria on their

own by recognizing signs and symptoms of malaria, and doctor diagnosed (Sultana and Mohammad, 2001).

An exploratory survey of malaria prevalence and people's knowledge, attitudes and practices of mosquito larval source management for malaria control in western Kenya shows malaria prevalence of (3.2–6.5%) in all sites. Nevertheless, residents perceived malaria as their major health risk. Thirty-two percent (29/90) of all respondents did not know that mosquitoes are responsible for the transmission of malaria. Over two-thirds (69/90) of the respondents said that mosquito breeding site could be found close to their homes but correct knowledge of habitat characteristics was poor (Imbahale *et al.*, 2010).

A study in Kipsamoite, Nandi District, Kenya an epidemic-prone rural highland with unstable malaria transmission showed that, the most frequent initial sources of treatment for malaria in adults and children were medical facilities (66.0% and 66.7%) and local shops (19.0% and 30.3%)(Sumba *et al.*, 2008).

According to a community based a study done on the rural community in Holo-endemic areas of Western part of Kenya, approximately 30% of the participants were aware of malaria signs and symptoms (Ongore *et al.*, 1990)

A study on 187 villages and 25 different ethnic groups in border of China showed malaria knowledge being poor with 19.4% of women and 37.5% of men linking mosquitoes with malaria, although 95.6% knew one or more methods of mosquito control. Virtually all respondents used personal protection at some time during the year; and understanding of malaria transmission was strongly associated with bed net use. The use of bed nets was significantly more frequent among those with higher income, more years of education (Ronal *et al.*, 2006).

According to a community based study done in Nigeria regarding preventive measures, 17 (4.2%), 37 (9.2%), 55 (13.8%), 39 (9.8%), 26 (6.5%), 26 (6.5%), and 45 (11.3%) of the study participants reported sleeping under net, door and window screening, cover cloth, mosquito repellent/insecticides spray, environmental hygiene, herbal decoction and chemoprophylaxis respectively. Self treatment (medication) accounted for 267 (66.8%) compared to a hospital treatment which accounted for 93 (23.3%). Late diagnosis, wrong medications, incomplete doses, lack of knowledge about malaria episode and anopheles

mosquitoes as malaria vector are some of the factors militating against prevention and proper management of the illness (Oyewole and Ibidapo, 2007).

A study about Socio-cultural predictors of health-seeking behavior for febrile under-five children in Mwanza-Neno district, Malawi shows that the majority of caregivers were able to recognize fever and link it to malaria. Despite high knowledge of malaria, prompt treatment and health-seeking behavior were poor, with the majority of children first being managed at home with treatment regimens other than effective anti-malarial drugs. Traditional beliefs about causes of fever, unavailability of anti-malarial drugs within the community, barriers to accessing the formal health care system, and trust in traditional medicine were all associated with delays in seeking appropriate treatment for fever (Chibwana, 2007).

Nationally, in Ethiopia, *Plasmodium vivax* and *Plasmodium falciparum* comprise 40% and 60% of malaria infections respectively (Jima, 2010)). A malaria indicator survey, 2007 indicated that parasite prevalence (as measured by microscopy) in Ethiopia and Oromia was 0.7% and 0.3%, respectively (USAID/CDC, 2010). According to this survey 60 out of 7,117(1.0%) were positive for Plasmodium infection by microscopy, with 0.7% and 0.3% due to *P. falciparum* and *P. vivax*, respectively. Of the 6,775 matched individuals, 40 (0.6%) and 5 (0.1%) were positive for *P. falciparum* and *P. vivax*. No individuals tested positive for both *P. falciparum* and *P. vivax*. Prevalence of infection in children U5 was 0.9%. Of 45 positive individuals tested, 37 (87.0%) were children <15 years of age. Overall, 134 (2.0%) surveyed individuals tested positive for Plasmodium infection by RDTs, with 1.8% and 0.2% due to *P. falciparum* and *P. vivax*, respectively(Jima *et al.*, 2007).

Study conducted in Oromia and SNNPR regions of Ethiopia showed the overall malaria parasite prevalence of 2.4% (95% CI 1.6–3.5). Prevalence by cluster varied from 0 to 25%, with 55% of the 64 clusters having no positive cases. The malaria parasite prevalence differed markedly between Oromia, 0.9% (95% CI 0.5–1.6) and SNNPR, 5.4% (95% CI 3.4–8.5) regions ( $p < 0.001$ ). The prevalence was highest in the Eastern and North-eastern zones of SNNPR. The malaria species seen most frequently was *P. falciparum*: 69.4% of positive slides had *P. falciparum* and 30.6% had *P. vivax*. No mixed

infections of *P. falciparum* and *P. vivax* were observed. The overall ratio of *P. falciparum* to *P. vivax* was 2.3; 4.3 in Oromia and 2.1 in SNNPR (Shargie *et al.*, 2008).

According to Retrospective study at the Serbo Health Center, Kersa Woreda, Jimma, Ethiopia *Plasmodium falciparum* constituted the most predominant [64.6% (1946/3009 cases)], while *Plasmodium vivax* confirmed with 34.9% (1052/3009) cases (Karunamoorthia *et al.*, 2009).

In a national representative malaria indicator survey (MIS) conducted in Ethiopia on 5,083 households, 3,282 (65.6%) owned at least one ITN out of which 53.2% of all persons had slept under an ITN the prior night, including 1,564 (60.1%) children <5 years of age, 1,891 (60.9%) of women 15 - 49 years of age, and 166 (65.7%) of pregnant women (Jima *et al.*, 2007). Overall, 906 (20.0%) households reported to have had IRS in the past 12 months and 131 (16.3%) children with reported fever in the two weeks preceding the survey, sought medical attention within 24 hours. Of those with fever, 86 (11.9%) took an anti-malarial drug and 41 (4.7%) took it within 24 hours of fever onset (Jima *et al.*, 2007).

A cross-sectional study conducted in three urban areas of Assosa zone, Western Ethiopia, showed the following results; about 48% of the study participants were aware that malaria can be transmitted by mosquito bites. Thirty percent (30%), of respondents were aware that mosquitoes carry disease causing microorganism, 95% were aware that mosquito's bite during night, and 61% were aware that mosquitoes rest at dark places inside the house. About 58% and 52% of respondents identified sleeping under a mosquito net and eliminating mosquito-breeding sites, respectively, as major malaria preventive measures. Respondents' education and health status were associated with comprehensive knowledge on malaria preventive measures (OR= 2.42, 95% CI: 1.09, 5.4 and OR= 3.89, 95% CI: 1.99, 7.6, respectively) (Legesse *et al.*, 2007).

Another study conducted in the district of Samre Saharti, Tigray, northern Ethiopia showed that most of the respondents (92.7%) were able to mention at least one symptom of malaria. Mosquito as a cause of malaria was recognized by nearly half of the respondents (48.8%). Most of the households had a bed net (85.9%). To have a literate person at home, to belong to the lowland stratum, to have received some type of health education and to own a radio were associated with the knowledge of malaria. A strong

association remained between living in the lowland stratum, to own a radio and to live close to the health post and the use of ITN. Being a housewife, lack of health education and to live further than 60 minutes walking distance to the health post were related to a delay on treatment finding (Paulander *et al.*, 2009).

As per the study conducted in Orrisa, India Majority of respondents (n = 281) sought some sort of treatment e.g. government health facility (35.7%), less qualified providers (31.3%), and community level health workers and volunteers (24.3%). The single most common reason (66.9%) for choosing a provider was proximity. Over a half (55.7%) sought treatment from appropriate providers within 48 hours of onset of symptoms. Respondents under five years (OR 2.00, 95% CI 0.84-4.80, P = 0.012), belonging to scheduled tribe community (OR 2.13, 95% CI 1.11-4.07, P = 0.022) and visiting a provider more than five kilometers (OR 2.04, 95% CI 1.09-3.83, P = 0.026) were more likely to have delayed or inappropriate treatment (Ashis *et al.*, 2010).

A Study done in Butagira, Ethiopia reported fever, headaches, chills and shivering were the most frequently mentioned symptoms of malaria reported by 89.7%, 87.5% and 81.3% of the study subjects, respectively. About 66% of the study community related the mode of transmission to the bite of infective mosquitoes and 43.7% of them believed that malaria could be transmitted from person to person through the bite of mosquitoes. Mosquitoes are mainly believed to bite human beings at night (73.2%), breed in stagnant water (71%) and rest in dark places inside houses during daytime (44.3%). Malaria was thought to be preventable by 85.7% of the respondents. Of them, 62.4% reported chemoprophylaxis, 39.6% mentioned indoor residual spraying and 25% indicated eliminating breeding sites as preventive methods (Wakgari, 1999).

## 2. Statement of the problem

Malaria poses a tremendous public health problems across the globe with an estimated 40% of the world's population living in malaria risky areas. An estimated 190–330 million malaria episodes and at least 1.5 million malaria deaths occur worldwide annually. 90% of all malaria deaths currently occur in sub-Saharan Africa (WHO/UNAIDS, 2009). It is the fourth leading cause of death of children under the age of five years in developing countries (Yared *et al.*, 2007).

Approximately 75% of the land in the country is malarious with about 68% of the total population of 73 million living in areas at risk of malaria. Malaria is reported to cause 70,000 deaths each year. According to Ethiopia's Federal Ministry of Health (FMOH), in 2008/2009, malaria was the first cause of outpatient visits, health facility admissions and in-patient deaths, accounting for 12% of out-patient visits and 9.9% of admissions. However, as 36% of the population does not have access to health care services, these figures probably under-represent the true burden of malaria in the country (USAID/CDC, 2010).

Human factors in Ethiopia contributing to the spread of malaria include population growth and movements, urbanization, water development schemes, agricultural development, conflicts, and improper use of drugs and the attendant consequences of the emerging drug-resistant malaria (Aynalem, 2008). The low educational level of malaria sufferers most of whom live in the countryside and have never been to school or received adequate guidance regarding dosage, fail to adhere to prescription requirements, or stop medication altogether up on feeling well (Aynalem, 2008).

Except for southern Africa, many countries in the continent do not have successful malaria control programmes. The magnitude of the problem is compounded by lack of adequate health infrastructure, as well as financial and human resources (Hlongwana *et al.*, 2009).

Currently in Ethiopia, the national strategy to control malaria consists of three main strategies: early diagnosis and prompt treatment, selective vector control and epidemic prevention and control (Paulander *et al.*, 2009). The knowledge of how these strategies work in the population together with the identification of the main determinants that

influence protective behaviors, related to community knowledge and practices are required to monitor and evaluate the progress of the malaria control efforts.

Few studies have been conducted in Ethiopia regarding the community knowledge, about malaria and how to combat it (Yared *et al.*, 2007; Aynalem, 2008). However, malaria continued to be one of the major public health problems throughout the country, and impose its negative consequences especially in the poor society living under low socio-economic conditions. This is suggestive of further need to focus on the local awareness and practice type of studies since the political, cultural, socioeconomic conditions and access to health services might differ among regions and localities.

According to available reports, almost all (99%) of the Beneshangul Gumuz Region (BGR) is malarious. Pawe is one of the woredas endemic for malaria. The level of community knowledge and belief about seriousness of the disease could be implicated for the observed morbidity and mortality in the woreda. The understanding of the possible causes, modes of transmission, and individuals' preference and decision about adoption of preventive and control measures vary from community to community and among individual households (Yared *et al.*, 2007).

This study is therefore intended to provide information necessary to support and guide the malaria control approaches and policies regionally and locally. The main aim of the study is to determine the current prevalence and the knowledge, attitude and practice (KAP) of the local community about malaria transmission and its control measures in Pawe Woreda, Northwestern part of Ethiopia.

### **3. Objectives**

#### **3.1. General objective**

- To determine the prevalence of malaria and assess the community knowledge, attitude and practice about the transmission and control measures among households in Pawe Woreda, North West Ethiopia.

#### **3.2. Specific objectives**

- To determine the prevalence of malaria in the community by using microscopic identification.
- To assess the knowledge and attitude of community about malaria transmission prevention and control.
- To assess the treatment seeking behavior of the local community for malaria like illnesses.
- To describe the practice of protective measures, reported by community members.
- To identify the determinants of malaria knowledge and practice in the community

## **4. Materials and methods**

### **4.1. Study design**

A community based cross- sectional survey was carried out.

### **4.2. Study area and period.**

The study area was Pawe, woreda which is located in Benishangul Gumuz Regional State (BGRS), Northwest Ethiopia. It has a total area of 643 square kilometers. It is 557 kilometers away from Addis Ababa, capital of Ethiopia. The woreda has one Hospital, 21 private and governmental clinics and 12 health posts. According to the available data the total population of the Woreda is about 42,443 of which 21,588 are males and 20,855 are females, giving a male to female ratio of approximately 1. The dominant groups are individuals under the age 18 years and women (26,539 and 10,229) respectively. The proportion of children under age five is about 16% and that of the women is 24%. The area's height above sea level is between 1050 and 1250m. The climate is 'Kolla', with an annual rainfall of 1150mm and average temperature of 32°C. The area has been highly endemic for malaria. Pawe woreda has a total of 20 villages of which 3 are urban and the rest 17 are rural villages with an estimated 10,610 households. Each village has an average family size of 4 persons per household. The study was conducted from November to December 30, 2010.

### **4.3. Population**

#### **4.3.1. Source population**

All members of the community living in Pawe Woreda

#### **4.3.2. Study population**

Heads of household/adults living in the selected villages (KAP only) and all individual members of the selected households (parasitological examination).

### **4.4. Inclusion criteria & exclusion criteria.**

#### **4.4.1. Inclusion criteria**

The following inclusion criterion was used to recruit the participants for interview: - The participant should be a permanent member in the community, adult (above 18 years old, a women or head of the of house hold). For malaria prevalence study all individual

members of the selected households except those who were on anti-malaria therapy were included in the study.

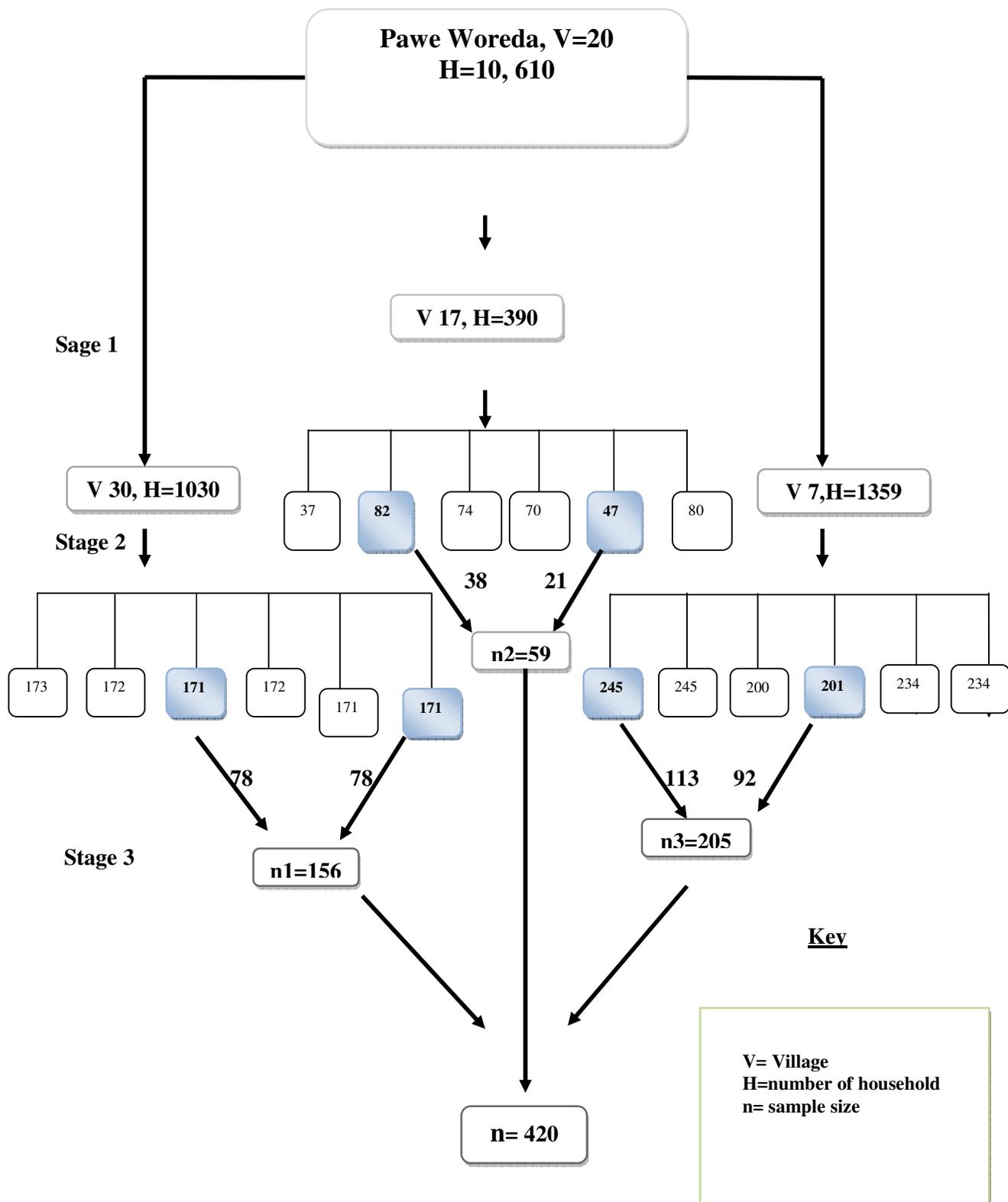
#### **4.4.2. Exclusion criteria:**

For interview, community members who were unable to communicate and mentally handicapped was excluded. Individuals who were taking anti-malarial therapy or who had been treated with anti-malarial drugs within the past 4 weeks were excluded from the study (Forney et al., 2001).

#### **4.5. Sample size & sampling procedures**

EPI INFO stat calc was used, to determine sample size for population survey or descriptive study. Accordingly by taking a confidence interval of 95% (with  $\alpha = .05$ ), expected percent magnitude of malaria to be 10% and worst acceptable value of 3%, a total 384 households was obtained, the addition of 10% for non-response of which gave a total of 420 households. Final sample size that was included in the study was 406 households. Similar size of individuals (one from each household) was tested for malaria.

A multi-stage simple random sampling technique and cluster sampling method (Figure 2) was used to select the representative sample size of households. Accordingly, three (3) villages/menders were randomly selected from the list of total villages. In the second stage, for each of the selected villages, a list of all clusters was made with the assistance of village/sub-village heads from which two clusters from each village was randomly selected, i.e. a total of six clusters were taken from the three villages/menders for the study. Finally, the list of all households was made for each cluster from which households are randomly drawn proportionally to bring a total sample size of 420. Similarly 420 individual subjects were selected randomly from the respective households to test for malaria parasites.



**Figure 2.** Diagrammatic representation of the sampling procedure.

## 4.6. Variables of the study

### 4.6.1. Dependent variables.

- ❖ **Prevalence of malaria**
- ❖ **Knowledge about malaria** (cause, transmission, symptoms and prevention)
- ❖ **Practice of malaria preventive methods**
- ❖ **Early treatment seeking behavior**

### 4.6.2. Independent variables.

- ❖ **Socio demographic factors:** age, sex, marital status, educational status, occupation, residence & source of income
- ❖ **Communication and technology:** access to media, distance from health facilities, health education.

## 4.7. Operational definitions

- ❖ **High knowledge score of malaria-** to correctly mention three or more symptoms of malaria, to correctly mention the cause of malaria and to affirm that malaria could be cured and prevented, and state biting time and resting place of mosquitoes.
- ❖ **Low knowledge score-** to mention less than three symptoms of malaria (or not at all), or to not correctly mention the cause of malaria and not to affirm that malaria is curable and preventable disease, and or not to mention biting time and resting place correctly.
- ❖ **Early treatment seeking habit-** to seek for medical treatment within 24 hours of the onset of a disease
- ❖ **Appropriate nutrition-** not to skip meals (having meals timely and regularly).
- ❖ **Kola-** areas below altitude of 1500m above sea level.
- ❖ **Correct use of bed net-**use of bed net during appropriate season (all year round plus following rainy season involving all family members
- ❖ **Inconsistent use of bed net-** to not sleep under bed net every night ( skipping between days and or seasons)
- ❖ **Use of mass media-** to owe and use any one or more of radio, television, magazines or news paper regularly.

## **4.8. Data collection and management.**

### **4.8.1. Data Collection**

#### **4.8.1.1. Survey questionnaire**

Data was collected using structured questionnaire with closed & open ended type of question by interviewing subjects (house hold heads /women, and or adults above the age of 18 in the absence of heads or inability to respond) for their knowledge attitude and practice about malaria. The questionnaire was first prepared in English, translated to Amharic and then translated back in to English to check for consistency. The questionnaire has three sections, socio-demographic characteristics; knowledge about malaria and preventive methods and practice of prevention and treatment seeking habits. The data was collected from November to January, 2010. Before data and sample collections the respondent's informed consent was taken by data collectors, who have graduated their high school and trained for the particular purpose of conducting this study. Supervisors who have their BSc in medical field were recruited to supervise the data collection activities. Training was given by the principal investigator for both data collectors and the supervisor for two days on procedures, techniques and ways of collecting data, to familiarize with the instrument and regarding ethical issues.

#### **4.8.1.2. Blood collection; - principle and procedure**

After doing the informed consent and getting willingness of each study participant, a small blood volume (capillary blood from finger tip) was collected from a randomly taken household member. Two blood slides each composed of thick and thin films, were taken from each participant by a medical laboratory technician according to the standard operating procedure (SOP) protocol and standards. Slides were labeled and air-dried horizontally in a slide tray in the field, and thin films were fixed with methanol after drying. Slides were stained with 3% Giemsa for 30 minutes at the nearest health facility when the team returned from the field. To ensure complete participation, households which could be absent during the first visit were revisited the next day. Blood slides were read and cross-checked by senior laboratory technologists at the nearest reference laboratory as, either negative for blood parasite, *P. falciparum* positive, *P. vivax* positive, or mixed infection. One hundred high power fields of the thick film were examined at a magnification of 1000×, before reporting a slide as negative or positive. When the slide is found to be positive, the thin film was examined to determine the species. To ensure

validity of the slide test, all positive slides and a random sample of some of the negative slides were re-examined by a separate microscopist, who was blinded to the diagnosis of the first slide-reader. The second slide from each participant was used where the first was broken or unreadable.

#### **4.8.2. Data Management and quality control**

Before going to collection, pre test of the questionnaire were done among 5% of the sample in nearby inhabitants and the necessary correction and structuring of the questionnaire was made. The data was checked for accuracy and consistency on daily basis by the supervisors and principal investigator during data collection. The SOP was strictly followed. The first drop of blood was wiped out to avoid contaminants and interstitial fluid; scratch clean free, new slides were used. The thickness of blood film was monitored, each time a smear was made. Any inappropriately made, stained, fixed or dried slide was discarded and replaced by a newer one.

#### **4.9. Data processing and analysis**

Data was entered and analyzed by SPSS version 16.0. Associations of predictor variables were computed with the dependent variables. Frequencies, proportion and summary statistics were used to describe the study population in relation to relevant variables. Odds ratio and confidence interval was computed to assess the strength of the association and statistical significance respectively. Bi-variate and multivariate logistic regression was performed to analyze the relationships between significant independent factors. Independent variables included in the model were age, sex, household residence, education level of household head, use of mass media, distance travel to health facility, and source of income. Dependent variables were knowledge about malaria, ownership and correct use of mosquito nets, and early treatment seeking behavior.

## **5. Ethical consideration**

An ethical clearance for the proposed study was obtained from Ethical committee of the Faculty of Medicine, Addis Ababa University and supporting letter was obtained from Regional Health Bureau. The study subjects were clearly informed a about the nature and aims of the study and told that their participation is voluntarily. They were given written and verbal consent to take part in the study after adequate explanation about the significance of the study. In addition, potential harm and benefit of the study was explained to them.

## **6. Results**

### **6.1. Socio-Demographic characteristics**

Of the 420 households and 420 individuals who were planned for participation 14 from interview group and 17 from malaria tested group were excluded from the analysis due to non response. Accordingly, a response rate of 96.6% in interview group and 96% in blood collected group was achieved. Hence, a total of 406 interviewees and 403 individuals who were volunteers to give blood sample for blood film examination were included in the study. Females constitute 280 (66.5%) and 230(56.8%) of the interviewed and blood film examined group respectively. The mean (sd) age for the interviewed and blood collected groups were 40.6(13) and 19.2 (14), respectively. Majority of the respondents were urban residents, Amhara, and Orthodox Christian. More than half of the respondents (67%) had no formal education and are unable to read and write. Above 75% of the interviewed groups were married and most of who are employed at the time of data collection. The average family size of the interviewed households is about 4. The housing condition of most of the households was poor, 55.5% and 29% of the house wall is made up of mud and bare wood respectively, though 58.4% of the roof is made up of Zink. About 66 % of the households have no access to mass media like radio, television and or magazines.

**Table 1.** Sociodemographic characteristics of the respondents Pawe Woreda, Ethiopia, November – December, 2010.

Variables	Household (n=406) N (%)	Individuals tested for malaria (n=403) N (%)
<b>Sex</b>		
Male	126 (31)	173 (42.9)
Female	280 (69)	230 (57.1)
<b>Age</b>		
<5	NA	83 (20.6)
5-17	NA	100 (24.8)
18-24	26 (6.7)	108 (26.8)
25-34	139 (35.6)	53 (13.1)
35-44	78(20)	33 (8.2)
45-54	82(21)	26 (6.5)
> 55	65(16.6)	
<b>Mean ±SD</b>	40.6 ± 13	19.2± 14
<b>Residence</b>		
Urban	264 (65)	261(64.8)
Rural	142 (35)	142(35.2)
<b>Educational status</b>		
No formal education	281 (67)	NA
1-4	71 (16.4)	NA
5-8	45 (10.4)	NA
9-12	17 (4.2)	NA
College/University	5 (2)	NA
<b>Ethnicity</b>		
Amhara	279 (68.7)	279 (68.7)
Agew	48 (11.8)	48 (11.8)
Kambata	68 (16.7)	68 (16.7)
Oromo	5 (1.2)	5 (1.2)
Tigrie	6 (1.5)	6 (1.5)
<b>Religion</b>		
Orthodox	182(44.8)	179(44. <sup>1</sup> )
Muslim	142(35)	145(35.7)
Others	82(20.2)	82(20.2)
<b>Family size</b>		
1-4	230 (56.7)	NA
5-8	153 (37.7)	NA
>8	23 (5.6)	NA
<b>Access to mass media</b>		
Use mass media	138 (34)	NA
Not use mass media	268 (66)	NA

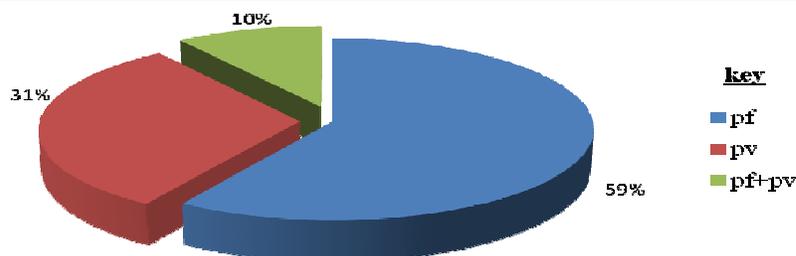
NA Not applicable

## 6.2. Prevalence of malaria

Four hundred three (403) samples were collected from three villages in the survey. The overall prevalence of malaria infection in the study area was 14.7%. *Plasmodium falciparum* accounted for 59.3% of infections and *Plasmodium vivax* for 30.5%. The age and sex wise distribution of malaria parasites in the selected villages is shown below (Figure 3). The greatest malaria prevalence was seen in males of age group 11-40 years (Table 2.)

**Table 2.** Gender and age wise distribution of malaria parasites in peripheral blood film, Pawe Woreda, Ethiopia, November-December 2010.

Age (years)	Total No. of BF examined	BF-ve N (%)	BF +ve N (%)	Female case (26)			Male cases (33)		
				pf	pv	pfv	pf	pv	pfv
<5	81	68 (84)	13 (16)	3	0	1	7	2	0
5-10	47	38 (81)	9 (19)	2	2	0	3	1	1
11-20	113	95 (84)	21 (18.6)	5	3	2	5	4	2
21-30	87	76 (87.4)	11 (12.6)	3	1	0	5	2	0
31-40	37	34 (86.5)	3 (13.5)	2	0	0	2	1	0
41-50	27	25 (93)	2 (7)	1	1	0	0	0	0
≥51	11	11(100)	0 (0)	0	0	0	0	0	0
<b>total</b>	<b>403</b>	<b>344(85.3)</b>	<b>59 (14.7)</b>	<b>13</b>	<b>7</b>	<b>3</b>	<b>22</b>	<b>10</b>	<b>3</b>



2

**Figure 3.** The prevalence of malaria, Pawe Woreda, Ethiopia November - December, 2010.

<sup>2</sup> Pf - *Plasmodium falciparum*  
pv - *Plasmodium vivax*

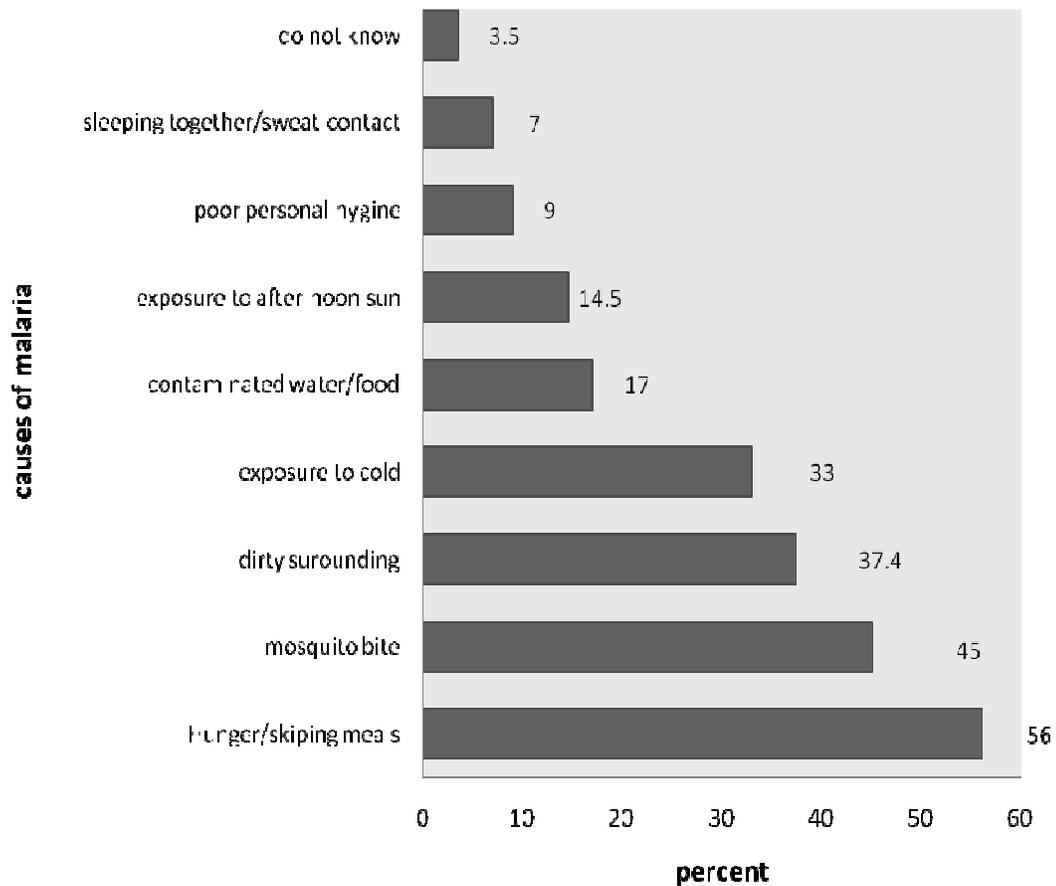
### 6.3. Knowledge and Attitude towards malaria.

Out of 406 research participants 402(98.5%) had stated at least one of the signs and symptoms of malaria and about 71.5% stated at least three symptoms. A substantial number of respondents showed reasonable knowledge of malaria, including correct association between malaria and mosquito bites, its potential impacts and right treatment options. About 344(84.7%) and 341(83%) of the respondents stated fever and headache respectively as the most common primary symptoms associated with malaria. The remaining 233(57.4%), 205(50.5%), 176(43.3%), 156(38.4%), 124(30.5%) and 76(18.7%) stated vomiting, rigor; body or joint ache, reduced appetite excessive sweating and thirsty respectively as important symptoms of malaria (**Table 2**).

**Table 3.** Malaria symptoms of mentioned by the respondents, Pawe Woreda, Ethiopia from November-December, 2010

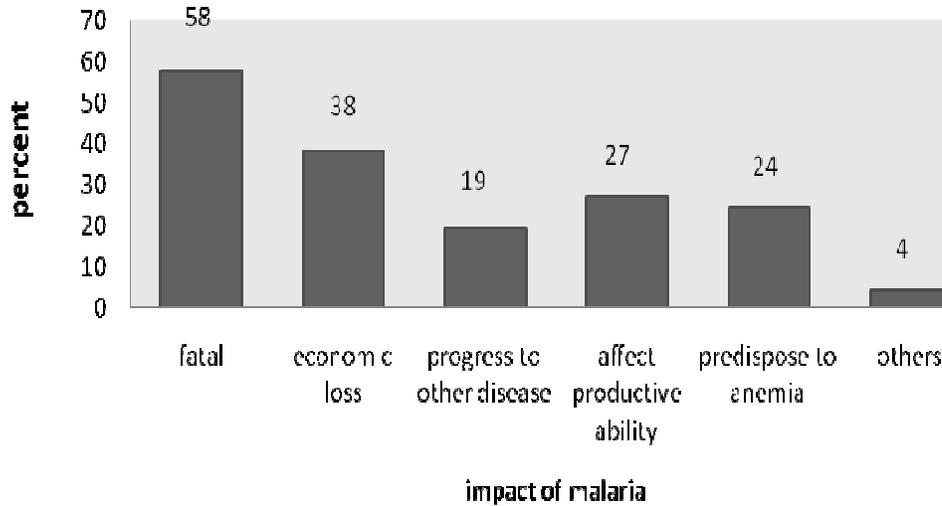
Symptom	N	Percent
Fever	344	84.3
Headache	340	83
Shivering	205	50
Sweating	124	31
Vomiting	233	57
Reduced appetite	156	38
Thirsty	76	19
Body/joint ache	176	43
Others	7	2

Regarding knowledge about the cause of malaria 228 (56.7%), 180(44.6%), 184 (45.3%) stated hunger, fatigue and mosquitoes respectively to be associated with malaria. 137(33%), 90(22%), 66(16%) and 27(7%) of the respondents associated malaria with cold climate, drinking contaminated water, exposure to afternoon sun (*'mich'*) and sleeping together/sweat contact respectively (**Figure 4**).



**Figure 4.** Causes of malaria reported by the study participants, Pawe Woreda, Ethiopia, November-December, 2010.

Regarding, knowledge of modes of malaria transmission 274(67%) of the study participants correctly associated the disease with bite of mosquitoes, 304(74.9%) stated stagnant water as the major breeding sites of mosquitoes, while only 129 (31.8%) of the respondents correctly stated the ecology of female anopheles mosquitoes and 324(79.8%) of the respondents had said mosquitoes bite during night and twilight (data not shown in table/figure). Out of 403 respondents (89%) perceived malaria as one of serious disease in the area that imposes different spectra of bad consequences, most of the respondents (58%) believed that malaria could cause death unless proper treatment is sought, followed by 156(38%) who stated loss of family income as important impact of malaria.



**Figure 5.** Impact of malaria mentioned by the study subjects, Pawe Woreda, Benishangul Gumuz Regional State, Ethiopia, November-December, 2010.

#### **6.4. Malaria prevention and control measures.**

Over (97%) of the study participants believed that malaria can be prevented and almost all (99%) stated that malaria is curable. Bed net use (89.7%) and drying stagnant water (33.7%) were the most commonly mentioned malaria prevention measures (**Table 4**).

**Table 4.** Malaria preventive measures reported by the respondents, Pawe Woreda, Benishangul Gumuz Regional State, November-December, 2010

Prevention measures	N	%
Bed net use	364	89.7
Residual spray	82	20.2
Drying stagnant water	222	33.7
Personal hygiene	45	11
Traditional practice	56	13.8
Appropriate nutrition	17	4.1
Take no action	31	7.5
Others	14	3.4

By this study about 373(91.8%) of the respondents answered that all family members used ITNs and <10% answered only children under the age of five and women. Over 50% of

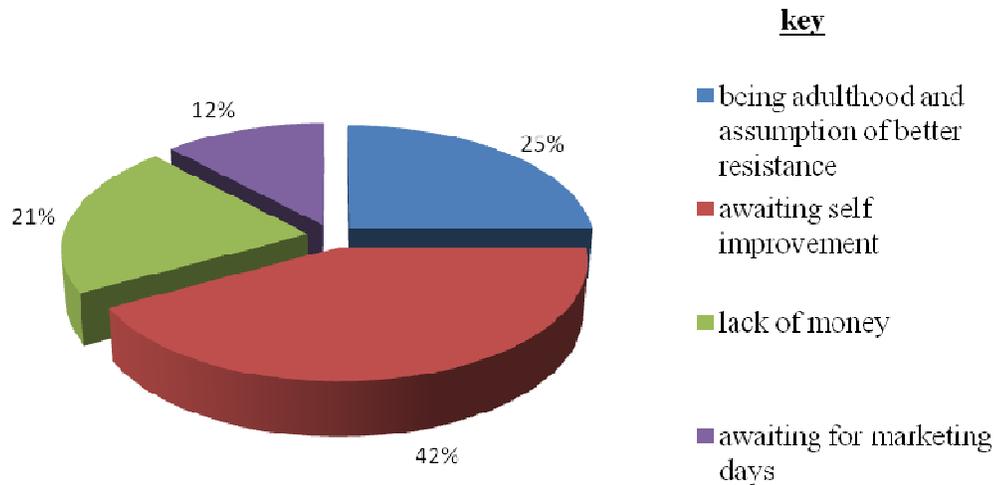
the respondents mentioned the correct use of ITNs both in terms of season (throughout the year and following the rainy season) and family member (all).

**Table 5.** Pattern of bed net use, in Pawe Woreda, Pawe-Ethiopia, November-December, 2010.

<b>Family member who use bed net</b>	<b>N</b>	<b>%</b>
All	373	91.8
Children	19	4.7
Women	6	1.5
Pregnant	2	0.5
<b>Time of bed net use</b>		
Consistent (every day use)	255	70
Inconsistent	109	30
<b>Consistent use of bed net</b>		
Rainy season	19	5.2
Following rainy season	117	32.1
Throughout the year	228	62.7
<b>Correct use of ITNs</b>		
(All year round and all family members)	281	69.2

### **6.5. Treatment seeking behavior of the study participants**

Most people (71%) perceived early diagnosis and prompt treatment and good nutrition as important measures to treating and preventing malaria. 234(57.6%) of the research participants stated that they would seek treatment within 24 hours of onset of malaria symptoms. Delays of 2 or more days in seeking treatment for malaria at health services were mentioned by (42.4%) of respondents especially adult members of households. Among those who seek treatment after 24 hours of delay 42.2%, 25%, 21% and 12.3% reasoned out awaiting self improvement, being adulthood and assumption of better resistance, lack of money and awaiting for marketing days respectively.



**Figure 6.** Reasons given for treatment seeking delay reported by the respondents, Pawe Woreda, Ethiopia, November- December, 2010.

Over half of the respondents (62%) stated health facilities (both government and private clinics) as their first treatment option. 43(10.6%) stated only self treatment as their first action. Reasons given for seeking treatment self include knowledge of malaria symptoms from previous experience (48%), desire to get treatment quickly (37%), affordance factors (13%) and others. Only 2(0.5%) of the respondents cited faith healing as their first choice of treatment. No household head/wife has reported seeking care from traditional remedies.

## 6.6. Predictors of KAP

**Table 6.** Predictors of malaria knowledge and practice in Pawe Woreda, Pawe, Ethiopia, November- December, 2010. Logistic regression analysis showing the adjusted OR for all variables and their 95% confidence intervals (95% CI)

variables	Malaria knowledge score		Correct use of ITN		Treatment seeking within 24 hours.	
	(a)		Crude OR(95% CI)	Adjusted OR(95% CI)	Crude OR(95% CI)	Adjusted OR(95% CI)
	Crude OR(95% CI)	Adjusted OR(95% CI)				
<b>Age</b>						
18-24	1		1		NA	NA
25-34	0.82 (0.2-3)		0.6 (0.07-4.3)			
35-44	0.71 (1.2-2.7)		1.1 (0.3-3.5)			
45-54	0.4 (0.1-1.4)		0.8 (0.2-3.4)			
> 55	0.5 (1.1-2.2)		0.3 (0.06-2.0)			
<b>Level of education</b>						
No education	1	1	1	1	1	1
1-4 <sup>th</sup>	1.6 (1.2-4.1)	1.7 (0.7-1.8)	0.5 (0.08-2.7)	0.2 (0.1-1.7)	0.5 (0.2-1.7)	0.5 (0.1-2.5)
5-8 <sup>th</sup>	2 (0.6- 2.2)	2.9 (1.1-4.6)	1.7 (0.05-2)	1.8 (1.39-2.5)	1.4 (1.1-3.4)	2.2 (1.7-4.1)
9 <sup>th</sup> and above	6.2 (1.9-10.2)	4.9 (1.4-8.0)	3.1 (0.04-2.8)	2.1 (1.09-4.3)	1.5 (1-6)	5.1 (2.9-6.2)
<b>Residence</b>						
Urban	0.7 (0.4-1.2)	1.5 (1.2-4.5)	1.1 (0.4-3.2)	1.2 (0.4-3.7)	2.2 (1.4-3.4)	2.1 (1.2-3.6)
Rural	1	1	1	1	1	1
<b>Source of income</b>						
Variable	1	1	NA	NA	1	1
Constant	1.3 (0.5-2.2)	1.8 (1.08-3.8)			1 (0.5-1.9)	1.7 (1.1-2.2)
<b>Health education</b>						
Yes	1	1	1	1	1	1
No	0.6 (0.3-1.1)	0.2 (1.9-3.2)	0.5 (0.1-1.8)	2.5 (1.2-1.7)	2 (1.09-3.30)	2.3 (1.3-4.1)
<b>Use of mass media</b>						
Yes	1.5 (0.8-2.6)	1.7 (1.3-4.2)	1.4 (0.4-3.2)	1.3 (0.5-3.7)	2.3 (1.5-3.6)	1.9 (1.2-3.4)
No	1	1	1	1	1	1
<b>Distance travel to HF(min)</b>						
<60	NA	NA	0.9 (0.3-2.7)	1 (0.3-2.7)	1.6 (1-2.4)	1.3 (1.1-2.0)
≥60			1	1	1	1

**HF**

*Health facility*

The results of multivariate analyses showed that the households knowledge of malaria was not significantly associated with their age. However the level of education was significantly associated with high score of malaria knowledge. To be 9<sup>th</sup> grade and above was 4.9 times more likely to report a high score of malaria knowledge than those who had no formal education. Respondents from urban setting are more likely to report high score [OR= 1.5, 95%CI= (1.2, 4.5)].

Source of income was another factor associated with comprehensive knowledge of malaria. High malaria knowledge score were more frequently mentioned among those who have constant source of income [OR=1.8, 95%CI= (1.08, 3.8)]. To not have received some type of health education regarding malaria was significantly associated with low score of malaria knowledge [OR=0.2, 95%CI= (1.9-3.2)].

Similarly to use some kind of mass media (like radio, television or magazines) was significantly associated with high score of malaria knowledge [OR=1.7, 95%CI= (1.3, 4.2)]. There was no statistically significant difference, in malaria knowledge score and living further than 60 minutes distance walking to any of the health institution [OR=1.3, 95%CI=(0.7, 2.4)].

It is indicated that those who use ITNs correctly constitute 69.2% and those who do not 31.8%. Age was not found to be significantly associated with correct use of ITNs [OR=1.2 95%CI= (0.3-5.0)]

However, It is identified that 110(90%) of the educated respondents and 220(77.2%) of those who had no formal education use ITNs correctly. And this was significantly associated. To have a formal education is significantly associated with correct use of ITNs [OR=1.8, 95%CI= (1.39-2.5)].

From 113 respondents who report that they would get health education (from health institution and community health workers) 96(85%) use ITNs correctly and out of 293, 247(84%) who did not receive health education use ITNs correctly. Getting health education was significantly associated with correct use of ITNs [OR=2.5, 95%CI= (1.2, 1.7)].

Among 138 respondents who reported to Use mass media like (radio, TV, and or magazines), 120(87%) use ITNs correctly. But 83% of those who do not use mass media use bed net correctly. There was no significant association between use of mass media and correct use of bed nets [OR=1.3, 95%CI= (0.5, 3.7)].

Multivariate analyses showed that age of respondents was not significantly associated with early treatment seeking behaviour. However the respondent's educational level was significantly associated with treatment seeking within 24 hours of the onset of malaria like symptoms [OR=5.1, 95%CI= (2.9-6.2)]. 9<sup>th</sup> grade complete and or college/university level respondents were five times more likely to seek treatment within 24 hours than those who do not have formal education.

It is identified that 68% of the urban and 48.6% of the rural population seek treatment within 24 hours of the onset of malaria symptoms. This was found to be significantly associated [OR=2.1, 95%CI= (1.2, 3.6)].

Source of income was another predictor identified to be associated with early treatment behaviour, respondents who have a constant source of family income are more likely to seek treatment earlier than those who earn from variable source of income[OR= 1.7, 95%CI=(1.1, 2.2)].

It is shown that 72.9% of those who receive malaria related health education and 56.4% of those who do not get health education do seek treatment within 24 hours of the onset of malaria symptoms. Respondents who receive some kind of health education are more likely to seek treatment earlier than those who do not [OR=2.3, 95%CI= (1.3, 4.1)].

Out of 135 respondents who own and use any of mass media like (Radio, television or magazines), 99(73.3%) reported that they would seek treatment early. Only 54% of those who do not use mass media seek treatment within 24 hours of the onset of malaria symptoms. Use of mass media is significantly associated with early treatment seeking behaviour [OR= 1.9, 95%CI= (1.2, 3.4)].

However, it is shown that 160 (65%) of the respondents who live further than 60 minutes of walking to health institution and 76(54.3%) of those who live close to any of the health institution reported that they would seek treatment within 24 hours of the onset of malaria

symptoms. There was no statistically significant association between living further than 60 minutes of walking to health institution and delay in treatment seeking [OR= 1.3, 95%CI= (1.1, 2.0)].

## 7. Discussion

According to the present study, the overall prevalence of malaria in Pawe, Woreda was 14.7%. This was higher than reports in Indonesia (Syafuruddin *et al.*, 2009), Bangladesh (Haque, 2009), Pacific Island (WHO, 2008) and Kenya (Imbahale, 2010,). Similarly it was higher than previous reports from Ethiopia (USAID/CDC, 2010), Oromia and SNNPR (Shargie *et al.*, 2010) which showed 0.7%, 0.9%, 5.4% respectively.

It is much less than that reported in Kersa Woreda Jimma and Khagrachari district, Bangladesh which is 43.8% and 15.25% respectively (Haque *et al.*, 2009 and Karunamoorthia *et al.*, 2009). The observed difference might be due to nature of study settings, seasonality of malaria, and method of detection.

Majority of the cases reported in this study are due to *P.falciparum* (59%), this is similar with most other reports (Syafuruddin *et al.*, 2009; Haque, 2009; Shargie *et al.*, 2010; Karunamoorthia *et al.*, 2009). Moreover higher prevalence was seen among 11-40 age groups. This is consistent with the findings reported in Kersa Woreda, Jimma (Haque *et al.*, 2009). This might be due to greater exposure to the mosquito vectors.

This study indicated that most people (98.5%) are aware of at least one symptom of malaria and 71.5% mentioned at least three symptoms. And only (45.3%) associated malaria with mosquito bite as a cause, 58 % perceived malaria would cause death unless treated and 97% believed that it could be prevented. Similar results were found in other studies (Safari, *et al.*, 2009; Legesse *et al.*, 2007 and Paulander *et al.*, 2009). This could be due to similarity in study setting and the role of health information and communication.

The level of awareness regarding malaria signs and symptoms, as well as the perceived importance and seriousness of the disease reported in this study were higher than the findings by (Ongore *et al.*, 1990) in holo-endemic areas of Western Kenya. This could probably be due to the fact that people in malaria endemic areas are more likely to be aware of the disease.

Only a small proportion (31.8%) of the respondents stated that mosquitoes would rest indoor dark areas and 78% stated that mosquitoes bite during night. This was lower than a study done in Asossa (Legesse *et al.*, 2007).

A substantial proportion of the study subjects (89.7%) mentioned that they were in favour of bed net use to prevent malaria. This was higher than the results reported in different studies (Safari *et al.*, 2009; Khumbulani *et al.*, 2009; Sultana *et al.* 2001; Oyewol and Ibidapo, 2007, Legesse *et al.*, 2007 and Paulander *et al.* , 2009). This may be due to increased health promotion by the government and time reference of the study. It may also possibly imply that the campaign of the Ministry of Health to reach 100%ITN coverage by 2010 was being successfully implemented.

Regarding the pattern of bed net use, 281(69.9%) of the respondents reported correct use of ITNs (both season wise and all family members included). This was higher than the result reported in Tigray (Paulander *et al.*, 2009). This may be due to difference in study setting and sampling method and time reference of the study.

It is indicated that 42.4% of the study participants seek treatment after 24 hours delay of the onset of malaria symptoms. This was higher than that reported in Swaziland (Khumbulana *et al.*, 2009) and lower than the result reported in Bangladesh and Sudan (Syed *et al.*, 2009 and Salw *et al.*, 2009). Access to health facility, availability of anti-malaria drugs, and exposure to health information might explain the observed variations.

Findings of the present study show that approximately 10% and 71% of the study participants were in favour of self-medication using modern anti-malarial drugs and health facilities as their first treatment choice respectively. This was similiar with the study result in Swaziland (Khumbulana *et al.*, 2009; Sumba *et al.*, 2008 and Chibwana *et al.*, 2009).

No household has reported treatment from traditional remedies. This result contrasts reports from many settings where traditional medicine plays important role (Syed *et al.*, 2009; Oyewole and Ibidapo, 2007 and Chibwana, *et al.*, 2009). This could be explained as a reflection of issue of accessibility and quality of health care in the health facilities and effectiveness of modern drugs.

In this study being 5<sup>th</sup> grade and above was significantly associated with high score of malaria knowledge than those who had no formal education. This finding was consistent with the study done in Assosa and Tigray regions of Ethiopia (Legesse *et al.*, 2007; Paulander *et al.*, 2009). This similarity may be explained by the fact that educated communities had better access to multiple source of information such as magazines, radio, and television and from their school education.

This study showed that urban residents were more likely to report higher comprehensive knowledge of malaria than the rural people. This could be due to the fact that large proportions of literate participants in the study were from the urban settings. In addition, invariable accessibility of health materials and infrastructure might explain the observed difference.

Respondents who had not received health education were less likely to report a high score of malaria knowledge. This was similar with study done in Tigray Region of Ethiopia (Paulander *et al.*, 2009) and could be due to similarity in the study design and sampling technique. This may imply that health education had played a role by increasing the people's comprehensive knowledge in both settings.

Those who own and use radio and or television were more likely to mention a high malaria knowledge score than those who do not use any of mass media. Similar results were reported in other studies (Paulander *et al.*, 2009). This could be due to similarity in the study design and socioeconomic status of the study participants in both settings and may imply that use of mass media and promotion of health education supplement the sources of malaria information.

It is showed in this study that to have formal education and receive health education were associated with correct use of ITNs. This was in line with a study done in other settings (Legesse *et al.*, 2007; Paulander, *et al.*, 2009). However to live close (less than 60 minutes walking) to health institution was not associated with correct of bed nets. This contrasts the findings reported by (Paulander *et al.*, 2009) in Tigray.

In this study the use of mass media like radio was not associated with correct use of ITNs. This finding was in contrast with a study done in Tigray region of Ethiopia (Paulander *et*

*al.*, 2009). This may be explained by difference in study setting and frequency of radio use.

Regarding treatment seeking behaviour of the respondents, to have formal education, and to engage in a job with constant income, were significantly associated with early treatment seeking habit within 24 hours of the onset of malaria symptoms. This finding was consistent with the study done in other study (Paulander *et al.*, 2009 and Ashis *et al.*, 2010).

However, in this study it is shown that those who did not receive health education and live further than 60 minutes of walking to any of the health institution were more likely to report a delay in treatment seeking than those who live close to any of health facilities. A similar result has been reported in other studies (Paulander *et al.*, 2009; Ashis *et al.*, 2010). This may be due to similarity in socioeconomic status of study participants, study design and accessibility of health facilities in both settings.

## 8. Conclusions

- The prevalence of malaria in the community was high (14.7%). No significant difference was found between male and female malaria prevalence, however, there was significantly higher prevalence of infection among 11-40 aged population.
- Knowledge score on malaria cause, transmission, early symptoms and preventive methods was high however; there were misconceptions about the cause and transmission of the disease and the resting places, biting time and control measures of the vector.
- Sleeping under bed net was the single most common malaria prevention method, in the community however, not all households use bed nets correctly.
- A significant proportion of the study participants would not get treatment within 24 hours of the onset of malaria symptoms, most of which stated awaiting of self improvement as a reason.
- To not have a formal education was strongly associated with low score of malaria knowledge. To be illiterate and not to have received some type of health education were significantly associated with low score of malaria knowledge, incorrect use of ITN, and delay of treatment seeking within 24 hours of disease on set.
- To be rural resident and not to owe radio/television was associated with low malaria knowledge score and delay of treatment seeking at a health facility within one day of onset of malaria symptoms.
- Lack of health education and to live further than 60 minutes distance walking to the health facility were factors associated with a delay in treatment seeking.

## **9. Recommendation**

### **To Health Bureau**

- Identify target groups, such as children and youth irrespective of their sex for malaria prevention and control and bring down the observed disease burden in this particular community.
- There is a need to strengthen community education. On top of this introduce integrated malaria vector control strategy, since most of the respondents use only ITNs as a single most common preventive measure.
- The community should have access to any of a health institution within less than one hours walking distance and get health education because remoteness and lack of education were associated with delay to seek health.
- There is a need for Subsequent health education regarding malaria and promote general education of the community to suit the economic circumstances in the target population in this area.

### **To Health Care Providers and community health workers**

- Monitoring habit of using available effective preventive and control measures by the individual households and the community could contribute much to the overall reduction of the malaria.
- Health care provision and advice should include education to increase community awareness and practice about the transmission and prevention methods of malaria.
- Advice correct use of ITNs and promote integrated malaria vector control approaches. Health education regarding early diagnosis and prompt treatment should be given on a regular basis.

### **To Researchers**

- Further investigation should be done to determine socio-cultural and economic predictors that are associated with knowledge and practice issues.

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## 11. Annexes

### 1. Research subject information sheet and consent form

#### **Title of the Research Project:**

The prevalence and knowledge, attitude and practice about malaria in community, Pawe North West Ethiopia.

**Name of Investigator:** Habtamu Bedemo

**Name of the Organization:** Addis Ababa University, school of medicine, department of Microbiology, immunology and parasitology

#### **Introduction**

You are invited to participate in a research study conducted by MSc candidate, from the AAU, school of medicine. You must be the head of the house hold or 18 years or older to participate in the interview and of any age to provide blood sample. Your participation is voluntarily. This research team includes one principal investigator, 2 laboratory personnel and trained personnel as data collectors, one supervisor who has BSc holder and two advisors from AAU. Please take as much time as you need to read/listen the information sheet.

#### **Purpose of the Research Project**

You are asked to take part in the study so that we are able to determine the magnitude of malaria in the community and assess your knowledge about malaria and how to prevent and control it. Your knowledge, perceptions and practice towards malaria, will be assessed in detail, so that necessary measures must be taken by responsible bodies. The blood sample will be used to determine, whether you have been infected by malaria or not and ultimately to determine the prevalence of the problem in the community.

#### **Procedure**

In order to determine the prevalence and assess the knowledge, attitude and practice about malaria; we invite you to take part in this project. If you are willing to participate in this project, you need to understand and give your consent. The interview will be held by medical personnels and trained person. Then, you are requested to give your response to the data collectors. Blood collection will be performed by, experienced laboratory technicians.

The interview will take approximately 20-30 minutes and the place of interview will be in the field at the homes of inhabitants. You will be asked some questions regarding the knowledge, attitude and practice about malaria, and or provide blood specimen from your finger tip.

### **Potential Risks and Discomforts**

There are no anticipated risks to your participation, except a minor pain you might experience during collection of blood sample. When you feel some discomfort at responding some questions or experience pain during finger prick, please tell freely. There is no special treatment or service you get by participating in this research and also if you don't want to participate, you can get all the services you got previously.

### **Potential benefits to subjects and/or to the society**

You might not directly benefit from your participation in the study. The overall goal is to determine the prevalence and your knowledge, attitude and practice about malaria. The findings may provide better understanding of the presence and magnitude of malaria problem and your knowledge, attitude and practice about it. You may also be advised to take anti-malarial drugs, where you are confirmed to have malaria. In addition it may help responsible bodies, to develop better intervention to alleviate the problem and adopt newer, prevention and control measures, to eliminate the problem in the community at large.

### **Payment /compensation for participation**

You will not receive any payment for your participation in this research study.

### **Confidentiality**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential. The information collected about you will be coded using numbers. The data will be kept in the investigator office in pass word protected computer. When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity.

## **Participation and withdrawal**

You can choose whether to be a part of this study or not. If you are unwilling to take part this study, you may withdraw at any time without getting permission from any of the investigators and this will not have consequences of any kind. You may also refuse to answer any questions you are reluctant to answer and still remain in the study.

**1. Patient consent form**

I the undersigned individual / person has been well informed about the objective of the study entitled **“The prevalence of malaria and community knowledge, attitude and practice about the transmission, prevention and control measures in Pawe, Northwest Ethiopia.”**. I am also told that all information obtained at any course of the study is to be kept confidential. Moreover I have also been well informed of my right to keep hold of, decline to cooperate and drop out of the study if I want and none of my actions will have any bearing at all on my overall health care and health facility access.

Therefore, with full understanding of the situations I agree to give the entire necessary information (for the interviewers) or blood sample for laboratory analysis.

**Name .....**

**Signature .....**

**Date.....**

## **Person to contact:**

This research project will be reviewed and approved by the ethical committee of the AAU, faculty of medicine, institutional review board (IRB). If you want to know more information, you can contact the committee through the address below. If you have any question you can contact any of the following individuals (Investigator and Advisors) and you may ask at any time you want.

1. **Habtamu Bedemo(BSc, MSc fellow):**

Cell phone: +251- 09 13 21 28 87.

E-mail: [habtish1976@gmail.com](mailto:habtish1976@gmail.com)

2. **Mr. Nigus Fikrie (BSc, MSc, PHD fellow):** Addis Ababa University, faculty of medicine, department of microbiology, immunology and parasitology

Cell phone: +251-09 11 66 37 28

E-mail: [fikrienigus2000@gmail.com](mailto:fikrienigus2000@gmail.com)

3. **Asrat Hailu (prof. PHD):**. Addis Ababa University, faculty of medicine, department of microbiology, immunology and parasitology

Cell phone:

E-mail: [hailua\\_2000@yahoo.com](mailto:hailua_2000@yahoo.com)



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### 3. Questionnaire

This is a questionnaire for assessing the knowledge, attitude and practice about malaria, in Pawe, North West Ethiopia.

**Introduction:** My name is.....; I am working as data collector in this research project run by Addis Ababa University, School of medicine, Department of Microbiology, Immunology and Parasitology. We are interviewing the community members to assess your knowledge, attitude and practice towards malaria. I kindly request you to participate in the survey that will be appreciated & so much useful for the region and country for future planning and evaluating the existing prevention and control measures of malaria.

**Confidentiality & consent:** I am going to ask you some questions that you are going to answer freely. Your answers are completely confidential.. You do not have to answer any question that you do not want to answer, and you may end this interview at any time you want to. However, your honest answers to these questions will help us better understand your knowledge of malaria. We will greatly appreciate your help in responding to this survey. The interview would take about 20-30 minutes. Would you be willing to participate?

*If yes continue the interview*

*If no, stop here.*

Write:

Date of interview -----

Name of interviewer -----

Signature of interviewer -----

Checked by Supervisor: Name -----Sig. ----- Date ---

Q101	sex of the respondent	Male ----- 1 Female ----- 2
Q102	Residence	Urban kebele-----1 Rular kebele..... 2
Q103	What is your educational status?	No formal education ----- 1 1-4 <sup>th</sup> grade ... ----- 2 5-8 <sup>th</sup> ----- 3 Grade 9-12 <sup>th</sup> ----- 4 College/university----- 5
Q104	To which ethnic group do you belong?	Amhara ----- 1 Shinasha ----- 2 Gumuz-----3 Berta----- 4 Oromo ----- 5 Tigirie ----- 6 Others, specify -----
Q105	What is your religion?	Orthodox ----- 1 Muslim ----- 2 Protestant ----- 3 Catholic -----4 Other, specify -----
Q106	What is your current marital status?	Married -----1 Single -----2 Widowed-- -----3 Divorced -----4
Q107	What is your occupation?	Gov't employee -----1 Private employee -----2

		Farmer ----- 3 House wife -----5 Daily laborer ----- 6 unemployed ----- 7 Merchants -----8 Other, specify -----
Q108	What is your average estimated monthly income?	----- ETB.
Q109	Your family size?	One ----- 1 Two-five----- 2 Six to-nine----- 3 Ten and above----- 4
Q110	Your house structure? -Wall make up  -type of roof	Cement block ----- 1 Mud and clay ----- 2 bamboo 3 Grass 1 Zink 2
Q111	Do you have access to media	Yes 1 No 2
Q112	If yes for Q14, what kind?	Radio 1 TV 2 News papers 3 Other-----

## Part II- Households Heads Knowledge, about malaria

Q201	Have you heard of malaria?	Yes -----1 No -----2
Q202	How far are you from the health care facilities?	Hospital Health center Clinic

		health post
<b>Q203</b>	Where you get malaria information?	Health facilities-----1 Radio, TV/ news papers-----2 Community health workers-----3 Family and relatives Friends-----4 Community meetings-----5 Neighbor-----6 Others(specify)-----
Q204	What are the signs and symptoms? Of malaria	Fever,headache,body ache,shivering.....1 Others..... -2
Q205	What is the cause for malaria	Mosquito-----1 Cold/climate change--2 Contaminated water--3 Malnutrition----4 Sleeping outside----5 Other--- Donot know-----88
Q206	What is/are the impact/consequences	-----
Q207	What is/are modes of malaria transmsion	Mosquito bite..... 1 Others.....2 Do not know-----88
Q208	What is the role of mosquitoes?	bite and transmit malaria ---1 Other (specify)..... Donot know-----88
Q209	Do you know the Breeding site for mosquito vectors?	Yes -----1 No -----2

Q210	If yes for Q209, where is the breeding site?	water body---1 -other (specify)..... -donot know---88
Q211	Do you know the Biting time of mosquitoes?	Yes -----1 No -----2
Q212	If yes to Q212, when is the biting time?	Day-----1 Night-----2 Any time----3
Q213	Do you know the resting places of the female anopheles mosquitoes	Yes-----1 No-----2
Q214	If yes for Q210, where?	Dark places -----1 On house walls.....2 Forest tree holes and shadings.....3 Other..... Donot know-----88

### Part III- perceptions and practice of protective measures about malaria

Q301	Is malaria treatable/ preventable?	Yes 1 no 2
Q302	Which Preventive measure/s Do you use to get protected from malaria?	Use of ITN----1 Environmental manipulation----2 Indoor residual spraying----3 Screening windows----4 Use of repellents and coils----5 Keep house clean----6 Take traditional medicine----7 Good nutrition----8 Cover withclothes----9 Avoid cold----10 Others (specify). -----
Q303	If you use ITN, answer the following. Which age group/s use it?	all ages----1 Children(<5)---2 Women----3 Pregnant---4
Q304	When you use ITN	Rainy season-----1 After rainy season---2 Other
Q305	Where is your first choice of Treatment for malaria	Health facilities----1 Traditional medicine---2 Family---3 Self----4 Private drug vendors---5 Faith healing---6 Others (specify).....
Q306	In how many hours of the onset of malaria signs and symptoms do you seek treatment	Within 24 hours of onset---1 After 24 hours of onset----2

## Declaration

**Thesis title** ‘The prevalence of malaria and community knowledge, attitude and practice about the transmission and control measures among households in Pawe Woreda, North West Ethiopia’.

I the undersigned declare that, this M.Sc. thesis is my own original work and has not been presented for a degree in any other University, and that all sources of materials used for the thesis work have been duly acknowledged.

### **Investigator:**

#### **Habtamu Bedemo**

Signature \_\_\_\_\_

Date \_\_\_\_\_

Addis Ababa, Ethiopia \_\_\_\_\_

### **Advisors:**

#### **Professor Asrat Hailu**

Signature \_\_\_\_\_

Date \_\_\_\_\_

Addis Ababa, Ethiopia \_\_\_\_\_

#### **Ato Nigus Fikrie**

Signature \_\_\_\_\_

Date \_\_\_\_\_

Addis Ababa, Ethiopia \_\_\_\_\_