Economic Burden of Malaria and Associated Factors among Rural Households in Chewaka District, Bunno Bedele Zone, Oromia Region, west Ethiopia

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Jimma, Ethiopia

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Abstract

***Background**: Malaria is the most serious public health problem in the world, especially in the tropical and sub-tropical regions. It imposes a heavy economic burden on individuals, households and the entire economy. It has also remained as major impediment to both health and economic development, where 75% of the land area is malarious in Ethiopia. However, evidence on the economic burden of malaria in the study area was scanty.*

***Objective:** The study aimed to estimate economic burden of malaria and identify associated factors among rural households in Chewaka District, Bunno Bedele Zone, Oromia Region, west Ethiopia, 2017/2018.*

***Methods:** Community based cross-sectional study design was employed to estimate the economic burden of malaria at the household level. The study included malaria expenditure during one-year period prior to the study period (July 09, 2017 to July 09, 2018) on households using retrospective costing approaches from the households' perspective. The data was collected from 765 selected households computed by using single population proportion formula. It was collected using semi-structured interviewer administered pre-tested questionnaire by face to face interviewing of heads of the households from August 13 to September 02, 2018. Data entry and analysis was made using EpiData version 3.1 and SPSS version 20 statistical software respectively. Descriptive statistics, binary and multiple variable logistic regression analysis were performed. Finally, variables with a P-values <0.05 were considered as statistically significant at 95% CI.*

***Results:** This study finding showed that, an overall average total cost of malaria per households per year was 28.59US$ (±SD=21.70). An average total direct cost to the household was 13.89US$ (±SD=15.65US$) which accounted 48.58 % and an average total indirect cost was 14.71(±SD=8.71US$) which accounted for 51.42 % of the total cost. Also, an average direct medical cost was 6.73US$ (±SD =8.75) which accounted for 48.46% and an average direct non-medical cost was 7.16US$ (±SD=6.93) which accounted for 51.54% of the total direct cost. Household lost an average of 6.83 productive working days with an average wage loss of 10.32 US$. An estimated 50.2% of the household spent more than 5% of their annual income to pay for the treatment of malaria. The most important significant variables that brought influence on the economic burden of malaria were educational status, ill days, fever days, onset of fever and treatment initiation, perceived severity of illness, completion of prescribed drugs and number of patients received prescription only, level of facility visited on second formal treatment, means of transportation and hospitalizations required in the household.*

***Conclusion:** This study found that malaria has been posing a significant economic burden on the households in terms of direct and indirect costs. Although, malaria treatment is supposed to be free in the public health facilities, households in the study area incurred high direct and indirect costs for malaria illness episodes. Also, both individual/patient and availability/accessibility factors influenced the amount of direct and indirect costs. As a result, national malaria program needs to recognize this economic burden and identify mechanisms for ensuring that the community to have uninterrupted easy access for malaria treatment services by engaging the community in to community based health insurance system in addition to preventive services.*

***Key words:** Economic burden; Household; Malaria; Ethiopia*

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Abbreviations

AOR: Adjusted Odd Ratio

CBHI: Community Based Health Insurance

COI: Costs of Illness

COR: Crude Odd Ratio

CSA: Central Statistical Agency

EB: Economic Burden

EFY: Ethiopian Fiscal Year

ETB: Ethiopian Birr

GDP: Gross Domestic Products

HB: High Burden

HCF Health Care Financing

HEMP: Health Economics Management and Policy

HH: Household

HSDP: Health Sector Development Plan

IQR: Inter Quartile Range

IRS: Indoor Residual Spray

LB: Low Burden

MFI: Master Family Index

MIS: Malaria Indicator Survey

NHA: National Health Account

NHE: National Health Expenditure

NLFS: National Labour Force Survey

OOP: Out of Pocket

RBM: Roll Back Malaria

RDT: Rapid Diagnostic Test

SDGs: Sustainable Development Goals

SPSS: Statistical Packages for Social Sciences

SSA: Sub-Saharan Africa

USD: United States Dollar

WHO: World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

Malaria is a life threatening parasitic illness and is one of the world's largest public health challenges(1). It has long been known as a disease of poverty as it is mainly distributed in the poorest regions of the world (2). Despite being a largely preventable and treatable disease, malaria accounts for about 216 million of cases and 445,000 deaths globally in 2016 alone (3). In 2016 it is increased by 5 million and 16,000 cases and death respectively when compared to 2015 in which malaria accounted for about 212 million of cases and 446,000 deaths globally (4).

Sub-Saharan Africa countries bear a disproportionate share of the global burden with more than 90% of malaria cases and 91% of malaria deaths with Ethiopia as one of the hardest-hit countries. According to the 2017 World Malaria Report, more than 1.7 million of microscopically confirmed cases and 510 deaths were reported in Ethiopia (3).

Malaria imposes a heavy economic burden on individuals, households and the entire economy in addition to the huge health consequence. It has also remained being a major impediment to both health and economic development as about 75% of the land area is malarious in Ethiopia (5) and about 68% of the total population are at risk of infection(high +low risk).Whereas of the total population at risk to malaria in Ethiopia, about 27.2% are at high risk in the country in 2016 (3).

Malaria alone reduces the potential economic growth rate by 1.3% per year in some African countries as a single disease in 2001(6). Gallup and Sachs claim that, at macro-level, malaria and poverty are intimately connected, in which malaria is the main contributor to poverty , while at micro or household level, the causal link yet remains unclear(6).Unlike most of the other African malaria endemic countries, malaria follows a unique epidemiological pattern in Ethiopia (7). At the household level, malaria affects productivity of the people and their capacity to acquire assets. The cost of prevention and treatments reduces household's resources as most members spend their productive time caring for those under malaria attack while they themselves seek rescue from the onslaught of the disease (8). Malaria has a direct impact on household's income, labor productivity and labor market participation (9). The economic burden of malaria was unclear at international, regional and local level as local circumstances were differ at different times and places for the households. Thus, assessing the economic burden of malaria and associated factors were essential to alleviate the problem related to malaria on the households.

1.2. Statement of the problem

Malaria is the most serious public health problem in the world, especially in the tropical and sub-tropical regions. It has emerged as one of the top three killers among the vector borne diseases worldwide (10). Globally indigenous malaria cases were reported by 91 countries in 2016. Among them 15 countries are in sub-Saharan Africa, except India and they carried 80% of the global malaria burden (3).

The incidence rate of malaria is estimated to have decreased globally, from 76 to 63 cases per1000 population at risk, between 2010 and 2016. Despite these reductions, between 2014 and 2016, substantial increases in case incidence occurred in the WHO Region of the Americas, and marginally in the WHO South-East Asia, Western Pacific and African regions. In Ethiopia the incidence rate was not as such decreased. WHO world malaria report , 2017 indicated that 213, 662 and 510 malaria deaths were reported in 2014,2015 and 2016 respectively in Ethiopia (3).

Globally, more countries are moving towards elimination. In 2016, 44 countries reported fewer than 10, 000 malaria cases, up from 37 countries in 2010. Kyrgyzstan and Sri Lanka were certified by WHO as malaria free in 2016. However, in a number of countries in the WHO African Region, the reported number of cases confirmed using Rapid Diagnostic Test (RDT) or microscopy in the public health sector alone is greater than the number of estimated cases in 2016. Also, in Ethiopia since 2010 reported number of malaria cases does not show significant decrements , for instance , 2.1, 1.8 and 1.7 million malaria confirmed cases with microscopy was reported from 7, 5.6 and 6.3 million microscopically examined cases in 2014, 2015 and 2016 respectively (3).

Malaria is not only a public health problem but also a developmental problem. At the national level, apart from the negative effect of lost productivity on the major sectors of the economy, malaria has negative effects on the growth of tourism, investments and trade especially in endemic regions. Based on the review of different literature, cost burdens are the product of complex relationships between social, economic and epidemiological factors(11). It was found that costs of malaria vary by the socio-economic status of households and the poor spend a significantly higher proportion of their income on treatment and preventive measures for the disease. Economic burden of malaria at the households' level in some African countries show that direct cost of malaria consumed 28-34% of annual income of poor households and 1-2% of high income households. This also revealed that indirect costs of malaria accounted for a significant portion of households' annual income ranging from 2 to 6%(10).

In Ethiopia, malaria has also remained being a major problem to both health and economic development as about two third of the land area is malarious and more than 68% of the total population is at risk of infection (7). For instance, malaria health expenditure accounted for 15 percent of country's National Health Expenditure (NHE) in 2010/11, an increase of 10 percentage points from 2007/08 (13).

Ethiopia is one of the countries targeted for the elimination plan. The strategy encompasses three major pillars. One of the pillars is to ensure universal access to malaria prevention, diagnosis, and treatment. However, in order to achieve these targets, the country-level malaria prevention and control program need to be precisely designed towards alleviating the demand side barriers, mainly cost to the household, by way of providing financial risk protection to households during the time of illness (14).

Ethiopia is also one of the most malaria epidemic-prone countries in Africa. Rates of morbidity and mortality increase dramatically(15,16) during epidemics. Since 2005, Ethiopia has scaled-up one of the largest and most ambitious malaria control programs in Africa designed to support the country's Health Sector Development Plan (HSDP) (17), ensuring prompt and effective treatment will prevent most cases of uncomplicated malaria from progressing to severe and fatal illness. To avoid this progression, treatment must begin as soon as possible, generally within 24 hours after symptom onset (16).

Few studies have been conducted on the economic burden of malaria in Ethiopia. One of the study conducted in Adami Tullu district, Oromia region revealed that the median cost of malaria per episode was high ($US 5.06), direct cost account for 39%. In addition, socio economic status, distance from patient residence, the health facility visited, incidence of malaria in the last six months, levels of health facility visited and availability of anti-malarial drugs in the health facility significantly influence either direct, indirect costs or both(5). Another study done in Ilu Woreda, Southwest Shoa Zone, has shown that the annual average total cost per household was 7.75 US dollars (18).

The prevalence of malaria in Oromia region is also high that 64% of the land area is malarious, 65.2% of the population of the region is at risk (19). Similarly, prevalence of malaria in Bunno Bedele Zone (where the study district located) is also high as all of the land area of the district (Chewaka) is malarious. One of the study conducted on drug utilization in six district of Ilu Abba Bora zone showed that Chewaka district was one among high prevalent malaria infection observed (31.2%) (15).

However, as far as the knowledge of the principal investigator, there was no study found on the economic burden of malaria in the district as well as in the zone to estimate the direct and in direct costs of malaria and

even if economic costs of malaria was studied in the country they did not address the issue of economic burden and its associated factors at the household level. Therefore, this study was conducted in attempt to close these gaps by assessing economic burden of malaria at household's level and factors associated with it were identified.

1.3. Significance of the study

The finding of this study will help policy-makers to have good information about the magnitude of the economic burden of malaria and associated factors as an input for decision making at various levels.

On the other hand, health managers should rely on scientific data for justification of the resources they need for the malaria control activities in addition to the morbidity and mortality reports. Therefore, this study was conducted in attempt to close these gaps by assessing economic burden of malaria at household levels.

Identifying economic burden of malaria at household levels can enhance the exercise of cost sharing schemes, avails information for attracting donors who are interested to participate in the alleviation of the burden of malaria. The findings of this study will also envisage serving as baseline information for detailed studies, informing policy-makers the extent of economic burden of malaria beyond health burden and death tragedies the disease causes each year; and for prioritizing malaria control interventions.

CHAPTER TWO: LITERATURE REVIEW

Malaria is one of the major public health problems globally. It is disproportionately affecting the populations located in low economic status worldwide. Thus, this section is intended to present the causes and trends, elimination strategies, economic burden and factors associated with the economic burden of malaria. It also presents conceptual framework for determining the economic burden of malaria.

2.1. Definition, Causes and Trends of Malaria

Malaria is an Italian word; 'Mal' means bad; 'Aria' means weather (air). It is an acute febrile illness caused by infection of red blood cells with Protozoan parasites of the genus, Plasmodium. There are four species of Plasmodium, which infect humans. They are Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, and Plasmodium ovale. Recently findings shows there is also human infections with monkey malaria parasite, P. knowlesi. Malaria is a parasitic disease transmitted by the bite of female Anopheles mosquitoes. The word Anopheles is a Greek word an ("not") + ophelos ("benefit") which means harmful. There are About 400 species of anopheles worldwide,30 species are vectors of malaria and among them four species are known in Ethiopia; Anopheles arabiansis (most common),Anopheles pharonsis (second common),Anopheles funestus and Anopheles nili (3,16). In Ethiopia, as other SSA countries, the deadly plasmodium species, plasmodium falciparum, is the dominant (60%) followed by Plasmodium ovale (about 40%) of all malaria cases (3).

World malaria report 2017 shows, that in Africa 146 and 133 million malaria cases were reported in 2016 and 2015 respectively. Also in Ethiopia 1.7 and 1.8 million cases were reported in those year respectively in 2016 and 2015. Reported deaths were decreased in Ethiopia from 1,581 in 2010 to 510 in 2016(3).

The 2015 MIS data indicated that parasite prevalence in Ethiopia was 0.5% by microscopy and 1.2% by RDTs for areas below 2,000 meters and less than 0.1% prevalence above 2,000 meters. Also in Oromia region parasite prevalence was 0.3% by microscopy for areas below 2,000 meters. This shows a remarkable demarcation of malaria risk at an altitude of 2,000 meters, with a 13-fold higher malaria prevalence at lower altitudes compared to higher elevations (7,20).

2.2. Elimination strategies of malaria

The first malaria eradication program was started in Ethiopia in 1959 following the devastating epidemic of 1958 which swept about 3,000 lives and affected other 150,000 individuals (5);however, as the result of World Health Assembly decision, the eradication effort was converted into control program in 1971(21).

Among the main reasons that influenced the decision were the increasing insecticide resistance of mosquitoes and financial constraints in countries and institutions that were supporting the eradication program. Moreover, the fact that majority of the malarious countries are among the poorest in the world has darkened the hope of eradication of the disease; even the control program in place is suffering from deficiency of resources. In 1993 the program was fully integrated into the basic health care services (21).Currently, different initiatives brought about new hope towards a better control of malaria, Roll back malaria (RBM) initiative aims to reduce the burden of malaria by 50% within 10 years' time promoting partnership for malaria control (20).

In Ethiopia, malaria is highly seasonal in many communities but may have nearly constant transmission in some other areas; at the district level, malaria outpatient caseloads may vary several-fold from year to year in an "unstable" epidemic-prone transmission pattern. Peak malaria transmission occurs between September and December in most parts of Ethiopia, after the main rainy season from June to August. Certain areas experience a second minor malaria transmission period from April to June, following a short rainy season from February to March. January and July typically represent low malaria transmission seasons in most communities. Since peak malaria transmission often coincides with the planting and harvesting season, and the majority of malaria burden is among older children and working adults in rural agricultural areas, there is a heavy economic burden in Ethiopia (7,20).

The 2015 MIS data indicated that parasite prevalence in Ethiopia was 0.5% by microscopy and 1.2% by RDTs for areas below 2,000 meters and less than 0.1% prevalence above 2,000 meters (7). For the current high burden of malaria, failure of eradication, or ineffective prevention and control, different authors have different views (22).Yet, most of the literatures agree that malaria does have immediate and long-term economic consequences beside its morbidity and mortality impacts (5).

2.3. Economic burden of malaria: Direct, indirect and total costs

Malaria is a serious public health problem in the world. Many people die of the disease, many more suffer from the disease each year (3). According to world malaria report, malaria account significant increment from the previous year report (4) i.e. five million cases and 16000 deaths were increased globally in 2017 (3). Also it is a major public health problem in Africa (23),because SSA countries bear a disproportionate share of the global burden with more than 91% of malaria cases and deaths with Ethiopia as one of the hardest-hit countries in which three fourth of its landmass is malarious and 68% of the population is at risk(3). Practically, the whole of the population of Sub-Saharan Africa (SSA) is exposed to malaria, with about 75% of its people, living in areas of stable malaria transmission (23). It is the leading cause of mortality in children

under five years, a significant cause of adult morbidity, and the leading cause of workdays lost due to illness. This burden on the health system is significant for a single disease (23).

The incidence rate of malaria is estimated to have decreased by 18% globally, from 76 to 63 cases per1000 population at risk, between 2010 and 2016. The WHO South-East Asia Region recorded the largest decline (48%) followed by the WHO Region of the Americas (22%) and the WHO African Region (20%). Despite these reductions, between 2014 and 2016, substantial increases in case incidence occurred in the WHO Region of the Americas, and marginally in the WHO South-East Asia, Western Pacific and African regions(3).Study conducted in China show that malaria has been posing a significant economic burden on households in terms of direct and indirect costs. In this case the average cost of malaria per case was 1, 691.23 CNY (direct cost was 735.41 CNY and indirect cost was 955.82 CNY), which accounted for 11.1 % of a household's total income (households spent about 13.9 times more on malaria treatment than the average per capita daily income per year) (24). Again globally, different studies have been conducted at different corners of the world on economic burdens of malaria. However, numerous studies have focused on the economic burden on households; for example, an early study from India showed that the major burden comes from lost earnings (75%), while 24% comes from treatment costs. In particular, the loss of work days is quite high for malaria and is likely to impose a high economic impact at the household level as well. The profile of those affected clearly indicates that such work-day losses are going to be felt more severely by the most vulnerable (25).

Even though, Sri Lanka was certified by WHO as malaria free in 2016,previous studies in malaria endemic districts of its nation (Mat ale district) on the short-run economic consequences of 'malaria' on households was examined that on average a household incurred a total cost of Rs 318 (US$ 7) per patient who fully recovered from 'malaria'. 24% of this was direct cost, 44% indirect costs for the patient and 32% indirect costs for the household. Direct costs were greater for those seeking treatment in the private sector. Notably a large proportion of direct costs was spent on complementary goods such as vitamins and foods considered to be nutritional. In this case loss of output and wages accounted for the highest proportion of the indirect cost of the patients as well as the households (26).

A retrospective analysis of secondary data and a cross-sectional household survey conducted in Zimbabwe, Gowanda district showed that the mean monthly household expenditure on malaria was $19.87, which was about 17% of the mean household expenditure. Of the average monthly household direct and indirect general health expenditures of $24, malaria expenditures accounted for 83% of the expenditures. The main malaria

expenditure item was OOP expenditures on inpatient costs for complicated malaria cases. Households spent a monthly average of $3.22 and $56.60 for managing an uncomplicated and a complicated malaria case, respectively. Of all the households that suffered catastrophic expenditures, 12.5% of them had a member of the family hospitalized for more than 10 days per episode. Of the households that had malaria expenditures, 35% suffered catastrophic expenditures. Also the finding show that the number of productive days lost because of malaria ranged from 0 to 30 days. However, the average number of productive days lost because of sickness from malaria was eight days. The mean number of productive days lost while caring for a malaria patient in the household was seven days. The mean number of school days lost by a school going child because of malaria was eight days (27).

One of the cross sectional survey conducted in Ghana revealed that most of those who sought care from formal health facilities were insured 79% and the average direct medical cost of treating malaria was US$2.1 per case with the insured spending less US$1.7 per case than the uninsured US$2.1(28),but in case of study conducted in (27) no household reported having any form of health insurance, which meant they relied on OOP health expenditure.

Another study in Nigeria show that the average direct cost (cost of treatment) was higher than the indirect cost (cost of prevention) in which the cost of drug used for the treatment of uncomplicated malaria had been relatively high (8). However within the same country and the same year, but involving both community and hospital based survey show that indirect consumer costs of treatment were higher than direct consumer medical costs (29).

When we come to our country, study conducted in Adami Tullu district, oromia region, south central Ethiopia showed that the median cost of malaria per episode to the household was USD 5.06 (IQR: 2.98±8.10).The finding also shows that the indirect cost accounted greater than the direct counterpart. In this case indirect cost and direct cost was mainly influenced by the availability of anti-malarial drugs in the health facility and the level of the facility visited in the health system respectively (5).

2.4. Factors associated with economic burden of malaria

There are different factors associated with economic burden of malaria. Different authors' classify them as factors that are directly and indirectly related with economic burden of illness or economic cost of illness. Again, directly related factors are also divided in to medical and non-medical cost. Medical costs include malaria testing cost, drug cost, consultation cost and other items and non-medical costs include transportation, food and other items (5,30). Indirect cost can be divided in to morbidity cost (i.e. resulting from the

absenteeism or the loss of labour productivity caused by illness) and mortality cost (public cost due to death) (30). In addition, the HHs socio economic status, socio demographic characteristics, duration of illness, previous history of malaria episodes, disease severity, and the level of health facilities where the patient visited will have influence on both direct and indirect costs (5).

Study conducted in Zimbabwe, Gowanda district, on the economic burden of malaria in rural households show that the costs of treating a complicated case of malaria were very significant and exerted an economic burden on households. Complications of malaria were assumed to be as a result of delays in seeking treatment at the health facility. The mean cost of treating a complicated case of malaria was very high ($56.60) compared to an uncomplicated case ($3.22). Study conducted in our country Ethiopia show that indirect cost was mainly influenced by availability of the anti-malarial drug in the health facilities. On average, those patients examined and diagnosed with malaria but sent back home with only prescription paper-without a drug-had incurred about USD 2.9 higher indirect cost compared with patient received the drug directly from the public primary health care facilities. Most likely, either these patients had spent long time searching for anti-malaria drug from a private drug store/pharmacy or they stayed at home without any access to treatment. In both cases, these patients were prone to delayed treatment, longer duration of illness, and expensive and counterfactual drugs (5).

Generally, different studies from different corners of the world including our country Ethiopia, show that; even though the economic burden of malaria is high ,it is different from place to place and time to time(direct and indirect cost) in which at one place/time direct cost is greater than indirect cost and at another time the inverse is true and also the lost work days and catastrophic health expenditure to the poor HHs is prominent (8,23,27).As a result of this area specific study is necessary.

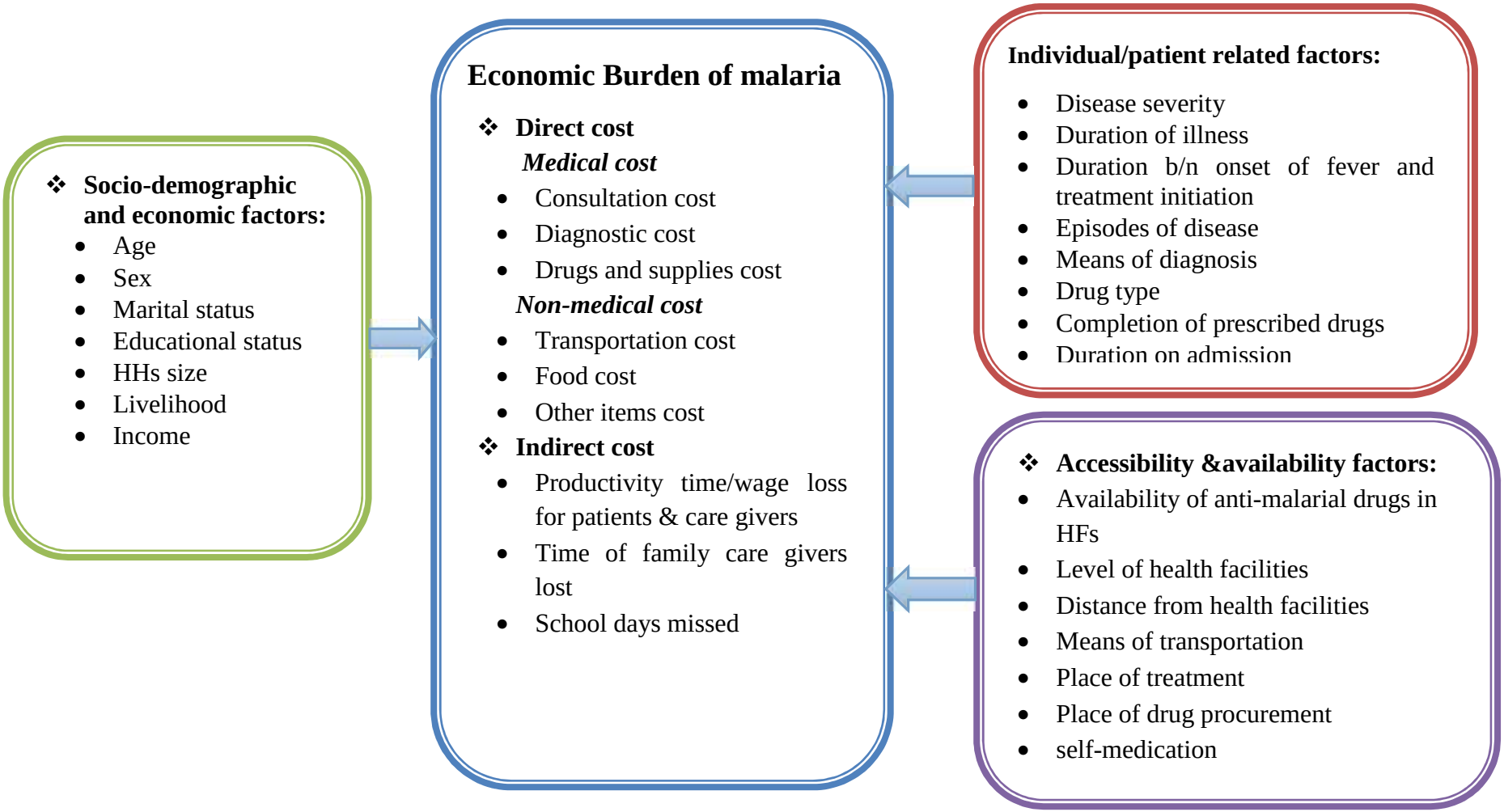

Figure 1: Conceptual framework of Economic Burden of Malaria at the Household level in Chewaka District,Bunno Bedele zone, Oromia Region; west Ethiopia 2017/2018.

(Source: adapted by reviewing different literatures (5,27,31))

CHAPTER THREE: OBJECTIVES

3.1. General Objective

- To determine the economic burden of malaria among rural households and identify associated factors in Chewaka District, Bunno Bedele Zone, Oromia region, west Ethiopia.

3.2. Specific objectives

- To estimate direct cost of malaria at the household level in the study area.
- To estimate indirect cost of malaria at the household level in the study area.
- To determine the economic burden of malaria at the household level in the study area.
- To identify factors associated with economic burden of malaria at the household level in the study area.

CHAPTER FOUR: METHOD AND MATERIALS

4.1. Study area and period

The study was carried out in Chewaka district from August 13 to September 02, 2018. The district is located in Bunno Bedele Zone, Oromia Regional state of west Ethiopia. The capital town of the district, Iluu Harar, is located 72km east of Bedele and 403km west of Addis Ababa. The district has an area of 54.22sq.km with the geographical coordinates of approximately7^{o}40'N latitude and 36^{o}50'E longitude and an altitude of 900-1400m above sea level; temperature range of37- 40 ^{o}c and average annual rainfall of 1000-1200mm^{3}. The district is geographically bounded in the East by East wellega zone; in the West by West Wellega zone and Mako district of Bunno Bedele zone; in the north by East wellega zone and in the south by Daboo Hanna district of Bunno Bedele zone. According to 2010 EFY CSA estimate the total population of the district was 75,111, with male of 39,736 and female 35,375. Among them 73,460 and 1,651 were live in rural and urban respectively (32).

There are 3 health centers, 28 health posts, 9 private for profit clinics and 2 drug stores in the district, which give health services. In the district CBHI was not implemented. Economically, the livelihoods of the population depends on traditional agricultural product and the main crops/products are maize, sorghum, fruits and vegetables, Khat, coffee, and animal husbandry (32).

Administratively the district has a total of 28 kebeles (2 urban and 26 rural). All of them are malarious. All of the population of the district is at risk of infection for malaria. Each of the kebele's are divided in to gotts, garees/group and one to five networks. Generally the district has a total of 84 gotts, 494garees/group, 2248 one to five networks and 15,649 households (32).

4.2. Study design

Community based cross-sectional study design was employed to estimate the economic burden of malaria at the household level. The study was conducted using retrospective costing approaches from the Households (HHs) perspective. A retrospective records review was used at the health facilities for the HHs, on which primary data was collected, in the selected kebeles for the selected period of study to identify all reported and confirmed malaria cases from malaria registration books.

4.3. Population

4.3.1. Source population

All rural households in Chewaka district was the source population for this study.

4.3.2. Study population

All those randomly selected households (777) and involved in the study was the study population for this study.

4.3.3. Study unit

Household was the study unit and the head of the HHs were respondents of the HHs for the study.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

All households who have at least one confirmed malaria case fromJuly09, 2017 to July 09, 2018 and those of HHs who have stayed for more than one year period in the area was included in the study.

4.4.2. Exclusion Criteria

Those of HHs from which HHs head or both HHs head and spouse who were critically ill and unable to respond to the questionnaire because of illness at the time of data collection period was excluded.

4.5. Sample size and sampling technique

4.5.1 Sample size determination

The sample size was determined using a single population proportion formula by considering the following assumptions;

$$n = \frac{z\left(\frac{\alpha}{2}\right) 2 * P(1-p)}{d^2}$$

Where:

⇒ n= is the desirable calculated sample size

⇒ Z α/2= Standard normal variable at 95% confidence level (1.96)

⇒ P = proportion of HHs expected with high burden of malaria (50% considered because of there was no similar studies that show economic burden of malaria in the country).

⇒ d = margin of error (5%)

Therefore, the sample size "n" was calculated as:

$n = (1.96)^{2} * 0.5(1-0.5)/ (0.05)^{2}=384$

Since the population of HHs are less than ten thousand the finite correction formula was used.

$$n_f = \frac{n}{1+n/N}$$

nf = 384/1+384/9846 =370

For design effect of multistage sampling, we multiplied the calculated sample size (i.e. 370) by 2 resulting in740. Then, by considering 5% potential non-response rate, the final sample size became 777.

4.5.2. Sampling technique

From the beginning selection of the district was purposive and malaria prevalence (as 100% of the land area is malarious) among districts of Bunno Bedele zone. For this multi-stage sampling procedure with Primary Sampling Unit (PSU) and Secondary Sampling Unit (SSU) was carried out.

All kebeles (26 rural kebeles) were listed with their HHs size and among them eightkebeles (T/Misoma, Mirgisa,B/Biftu, D/Misoma,Damaksa, Haro Chewaka,Jagan and Waltasis) were

selected for the study by considering 30% (33,34) as representative of the rural kebeles using simple random sampling technique. Then after the selection of the kebeles to be included in the study, records of malaria patients was reviewed from each health facilities in the catchments for each kebeles. Households who can fulfill the inclusion criteria from these records were listed from Master Family Index (MFI) and family folders of Community Health information System (CHIS) registration books and HHs numbers were obtained and used as sampling frame. After identifying this sample size was distributed to each kebeles with proportional allocation of their HHs (T/Misoma- k1=1166, Mirgisa - K2 = 1027, B/Biftu - k3 =1410, D/Misoma - k4 =1216, Damaksa - k5 =1258, Haro Chewaka - k6 =1016, Jagan -k7 =1404and Waltasis - k8 =1398) using the following formula:

$$nj = \frac{n}{N} * N_j$$

Where

- n_j = is sample size of the j^{th} kebele
- N_j=is population size of the j^{th} kebele
- $n = n_1 + n_2 + ...+ n_k$ is the total sample size=777
- $N = N_1 + N_2 + ...+ N_k$ is the total population size=9846

Then, using this formula the sample size distributed to each kebeles (T/Misoma - nk1=92, Mirgisa - nk2 = 81, B/Biftu - nk3 = 112, D/Misoma - nk4 =96, Damaksa - nk5=100, Haro Chewaka - nk6 =80, Jagan -nk7 =112 and Waltasis - nk8 =104) was obtained.

Finally, to obtain the final sample size (777) simple random sampling techniques was used to select households based on the allocated sample size of each kebeles and the data was collected from households head or spouses. The first HH was selected using lottery method for each kebeles and the next house was asked and interviewed forward consecutively, according to HH's code order of the MFI folders of CHIS registration books, for those included in the inclusion criteria.

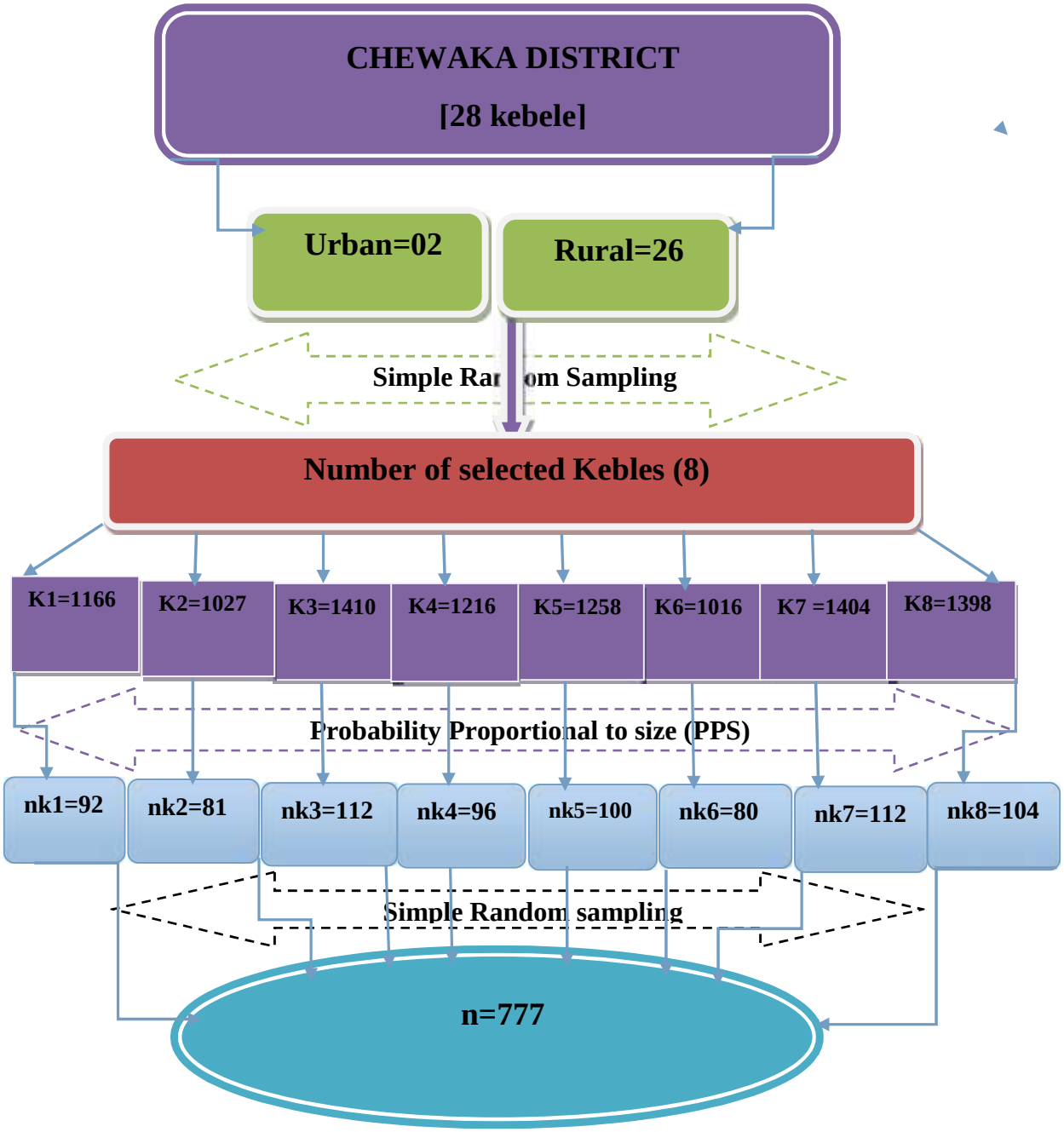

Figure 2: Schematic presentation of sampling procedures for the Household in Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

4.6. Data collection

4.6.1. Data collection tool development

Data was collected using semi-structured interviewer administered pre-tested questionnaire by face to face interviewing of heads of HHs or spouse. The questionnaire was adapted from household costing tool first prepared by Hansen and Yeung (35).The questionnaire was first prepared in English and translated to Afan Oromo and then back translated to English by Afan oromo and English language Bachelor degree holders to check for consistency. The questionnaire has two main sections: general socio-demographic characteristics, direct and indirect cost information. The questionnaire took approximately 30-45 minutes to administer and respondents were interviewed in their own homes.

4.6.2. Data collectors

Four data collectors having diploma in health fields and who can speak, read, and write the local language (Afan Oromo) and one supervisor having first degree in health field were recruited from three health centers. Training was given for data collectors and supervisor by the investigator for two days on the objective of the study, contents of the questionnaire, and issues of maintaining confidentiality and about informed verbal consent and techniques of interview.

4.6.3. Data collection field work

The field work was conducted from August 13 to September 02, 2018 by trained data collectors. Data collectors approached those selected households and obtain both written and verbal consents from either heads of households or spouses. Then, data collection was conducted by face to face interviewing of heads of households or spouses in their own homes.

The supervisor closely monitored all field work alongside with the principal investigator. All the questionnaires were revised by the supervisor each night. Any questionnaire with missing or inconsistent data was returned back to the respective data collector for re-interview. In addition, re-visit was done to those households who were not available on the first day of the interview for at least three times.

4.7. Study variables

4.7.1. Dependent variable

- Economic burden(direct cost, indirect cost)

4.7.2. Independent variables

- Socio-demographic and socio-economic variables
    - Age
    - Sex
    - Marital status
    - Educational status
    - Household size
    - Religion
    - Ethnicity
    - Livelihood
    - Income
- Disease severity
- Duration of illness
- Duration b/n onset of fever & treatment initiation
- Availability of anti-malarial drugs in the health facilities
- Level of health facilities
- Distance from health facility
- Place of treatment
- Place of drug procurement
- Episodes of the disease
- Means of diagnosis
- Drug type
- Completion of the prescribed drugs
- Source of self-medication
- Location of drug procurement
- Means of transportation
- Duration of hospitalization

4.8. Operational definitions

- **Economic burden of malaria:** was defined as the level of expenditure that threatens households' livelihoods due to malaria. All households that spent more than 5% of their annual income to pay for the treatment of malaria were catastrophic payment or high burden and HHs who pay less than this threshold were low burden(31).
- **Malaria case:** Person with complaints of one or more symptoms like: fever, sweating, shivering, headache, vomiting, in addition to those microscopically confirmed at health facility to have malaria cases.

- **Cost:** Resources spent to purchase goods or services or other resources including direct and indirect costs of malaria.
- **Cost-of-illness (COI):** The total costs incurred by a household (directly and indirectly) due to all malaria cases for the one year period.
- **Direct costs:** Costs/expenditures in US dollars ($) borne by the patients and their families in diagnosis and treatment of malaria including both medical and non-medical costs.
- **Indirect costs:** Productive losses in US dollars ($) borne by the patients and their families, and include income losses due to lost workdays, beyond the direct provision of care.
- **Medical cost:** Cost spent to purchase medical goods or services (diagnosis or testing, medical supplies, anti-malaria drugs, other drugs, and consultation) directly.
- **Non-medical cost**: Cost spent to purchase non-medical goods or services (food on the way to the treatment facilities, transportation, other non-medical supplies and services) directly.
- **Severity of disease:** The degree of severity for malaria patients ,febrile, in which it is:
    - **Mild** - when there was loss of appetite and headache.
    - **Moderate**- when there was sitting down and tiredness.
    - **Sever** - when there was fitting and convulsions.
- **Level of health facilities:** Are facilities at primary level health care, according to Ethiopian current health tier system (three tier system), where health services are provided (health centers, health posts and private clinics).
- **Means of diagnosis:** Mechanism by which patients were examined as having malaria to obtain treatment services at the health facilities (microscopically, clinically and self-reporting).
- **Means of transportation:** Means of conveyance or travel of malaria patients or companions to health facilities and back to their home by going certain distances (Km) to obtain treatment services (on foot, motor bike, animal back and the like).

4.9. Approaches to costing

There are different approaches for estimating the burden of the disease; like the production function, cost of illness and willingness to pay approaches. However, by recognizing methodological challenges in attempting to estimate the economic burden of malaria in our case we have decided to use cost of illness approaches (23).The cost of illness approach was attempted to estimate the burden of malaria in an accounting concept using direct cost of malaria and indirect cost of malaria (23).The cost of illness was estimated by identifying, measuring and valuing the forgone resources (economic concept) caused by malaria. We employed prevalence-based retrospective costing approach by measuring the cost per episode of malaria to the patient and to the household. The cost estimation was conducted to the household and the patients in a predefined period (9,36).

Measurement: We have followed an ingredient based bottom-up approach to identify and measure all direct costs at patient level and household level. A direct cost measured in this study was all out-of-pocket expenditures on the course of seeking and obtaining malaria treatment by patients. The direct costs was identified and measured in two groups: 1.Direct medical costs (diagnosis, medical supplies, anti-malaria drugs, other drugs, and consultation), and 2.Direct non-medical costs (food on the way to the treatment facility, transportation, other non-medical supplies and services). All direct cost information was collected in Ethiopian Birr (ETB) and converted to USD to enable meaningful comparisons. An indirect cost was measured in terms of number of forgone working days of the patients due to the malarial illness.

Valuation: Direct cost is the sum of direct medical costs and direct non-medical costs, and at the outset it was estimated in monetary values. Indirect cost was valued using a human capital approach (37).Thus, the value of a labor day (the wage rate) was used to convert the workdays lost into monetary value. For adults older than 18 years, the average daily wage rate for agricultural workers was used (38). According to the 2013 National Labor Force Survey (NLFS) report, the average monthly wage rate for agricultural worker in Ethiopia was 697 ETB, which was divided by 20 in order to obtain the daily wage rate of 35 ETB (38). All costs was converted to USD using the Official National Bank of Ethiopia average exchange rate for 207/2018.The reference year for all cost estimates in this study was 2017/2018 USD.

4.10. Data analysis procedures

Completed questionnaires were checked for completeness and consistency. Variable coding for each question was also performed by the principal investigator. To minimize data errors and ensure data quality, double entry was made using EpiData version 3.1 statistical software. After it was checked, errors were corrected. Then cleaned data was exported to Statistical package for Social Science (SPSS) version 20 for statistical analysis.

MS-Excel was used for some mathematical calculations using different formulas for direct and indirect cost information. In this case for cost estimation/valuations, human capital method was used to estimate indirect cost for lost work days and converted to monitory value (ETB).The total direct and indirect medical costs were summed and divided by the number of households that made expenditure to arrive at the average costs per treatment. Then after costs calculated in Ethiopian Birr it was converted to US dollars using the average exchange rate at the time of the study. A catastrophic payment for malaria treatment was also calculated. Catastrophic payments occur when total an OOP payment for health care exceeds a certain threshold of a household's resources (income or expenditure). Thresholds for calculating catastrophic payments vary, usually ranging from 2.5% to 40% (31,39). In this study we have used a threshold of 5% and all households that had spent more than or equal to 5% of their annual income to pay for the treatment of malaria were considered as high economic burden and less were considered as low economic burden (31).

Both descriptive and analytical statistical procedures were utilized. Data analysis was performed using variety of descriptive statistics such as frequencies, percentage, mean, median and standard deviations. Then, data were presented using tables, graphs and charts. Association between dependent and independent variables was analyzed first using Binary logistic regression analysis. Variables that had p<=0.25 on Binary logistic regression analysis was considered to be candidates for multivariable logistic regression analysis. Multivariable logistic regression was employed to analyze the relationship between the dependent variable and potential predictor variables (independent variables) to control effect of confounding variables. In the regression model, independent variables with a P-values <0.05 was considered as statistically significant. The effect of various variables on the economic burden of malaria was assessed using binary

logistic regression analysis and multivariable logistic regression with backward (LR) variable selection method. Finally, model fitness was seen using Hosmer and Lemeshow test.

4.11. Data quality management

Different measures were undertaken to maintain the quality of the data. Before the actual data collection the questionnaire prepared in English was translated in to the local language, Afan Oromo, and then translated back in to English and the contents of the questionnaires were checked whether both versions are of same content.

Four data collectors having diploma in health fields and who can speak, read, and write the local language (Afan Oromo) and one supervisor having first degree in health field were recruited. Training was also given for all data collectors and supervisor by the investigator for two days on the objective of the study, contents of the questionnaire, and issues of maintaining confidentiality, about informed verbal consent and techniques of interview.

Before the actual data collection, the questionnaire was pre-tested in one of the malarious kebeles out of the study area on 5% of the total samples (39 HHs) , then after the results were discussed and some modification and correction has been made accordingly to the questionnaire. Strict supervision was undertaken by the investigator and supervisor throughout the data collection period. In addition, Problems encountered at the time of data collection were reported immediately and an appropriate action has been taken.

After data collection, each questionnaire were checked for completeness, consistency, accuracy and clarity daily by supervisor and questionnaires that were found to have lots of missing values and inconsistencies were excluded. Furthermore, data entry and check was made by investigator using EpiData version 3.1 statistical software, and exported to SPSS windows version 20 statistical software for analysis was undertaken.

4.12. Ethical consideration

Ethical approval of the research was obtained from the Ethical Review Board of, Institute of Health, Jimma University. A formal letter was written by department of Health Economics, Management and Policy to Bunno Bedele Zonal Health Office, based on that letter Zonal Health Office wrote support letter to Chewaka District Health Office and Chewaka District Health Office also wrote letters to each kebeles selected for the study.

Informed verbal consent was also obtained from each study subjects before the start of an interview. For this purpose a consent form was attached to each questionnaire which explains about the purpose of the study, confidentiality, and the respondent's full right to take part or not to take part in the study.

4.14. Dissemination plan

The final report of this study finding will be presented to department of Health Economics, Management and policy and to Jimma University student research project (SRP) as well as to the concerned bodies from the study area. Then, after it will have got an approval by the advisers, the finding will be disseminated to Jimma university department of Health Economics, Management and policy (HEMP), SRP and concerned bodies from the study area (Chewaka district health office and respective health centers) as well as different stakeholders. Finally, an effort will be made to present in various trainings, seminars and workshops and for publication in peer reviewed reputable journal.

CHAPTER FIVE: RESULTS

5.1. Socio-demographic Characteristics of the Participants

A total of 777 households in the rural households of Chewaka District were included in the study of which 765 responded**,** yielding 98.4 % response rate.

Concerning their socio-demographic features, 425(55.6%) of the respondents were greater than 35 years old and their age ranged between 18 and 85 years. Male constitute 97.4% of the study participants. Majority of participants were belonged to Oromo (98.4%) by ethnicity, Muslim by religion (97.1%), married (98.8%), farmer (95.8%), and unable to read and write (53.0%).Most (49.9%) of them had monthly households' income of between 200 and 400 ETB.

An average households family size was 6 people (± SD =2.69).Out of the total studied households 436 (57%) of them had more than five people per household (Table 1).

Table 1: Socio-demographic characteristics of the participants among rural Households in Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018 (N=765).

Socio-demographic and economic characteristics		Frequency	Percent
Gender of the respondents	Male	745	97.4
	Female	20	2.6
Age of the HH head	<=35	340	44.4
	>35	425	55.6
Marital status	Married	756	98.8
	Divorced	5	0.7
	Widowed	4	0.5
Educational status of the HH head	Unable to read and write	406	53
	Read and write only	143	18.7
	Grade 1-8	168	22
	Grade 9 and above	48	6.3
Ethnicity of the household head	Oromo	753	98.4
	Amhara	12	1.6
Religion of the household head	Muslim	743	97.1
	Orthodox	14	1.8
	Protestant	8	1.0
Number of people per HH	<=5	329	43
	>5	436	57
Sex of the HH head	Male	753	98.4
	Female	12	1.6
Livelihood	Farmer	733	95.8
	House wife	13	1.7
	Daily laborer	7	0.9
	Merchant	8	1.0
	Other	4	0.5
Monthly households income	<200ETB	101	13.2
	200-400ETB	382	49.9
	401-692ETB	153	20
	>692ETB	129	16.86

5.2. Economic burden of malaria

5.2.1. Burden of Malaria among Studied Households

Among 765 sampled households, 1466 patients were reported to have malaria in the year considered. The total populations in the studied households were 4642 and malaria prevalence rate among the studied households were 31.6%.

On average, there were 1.92 cases of malaria (± SD =1.06) per the household. Among the identified cases, 856 (58.39%) were male and 825 (56.27%) of them were age ranged between 15 and 64 years old. Also, of the cases identified in the studied household, 1094 (74.6%) had malaria once, 263(18.0%) twice and 109 (7.4%) thrice and more in the year considered.

Table 2:Burden of Malaria and number of patients visit per Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018 (N=1466).

Variables	***Frequency***	***percent***
Age of the patients		
<=5years	265	18
5-14 years	360	24.5
15-64 years	825	56.3
>=65 years	16	1.2
Sex of the patients		
Male	856	58.39
Female	610	41.61
Episodes of malaria illness		
First visit	1094	74.6
Second visit	263	18.0
Third visit	109	7.4

5.2.2. Economic Burden of Malaria at the Household Level: Direct, indirect and total cost

Although, cost of malaria is beyond immediate medical expenditure and lost workdays, for practical purpose, here we limit ourselves to consider only the self-evident costs. That is the direct cost for medical care and related expenses (travel, food and other items) for the non - medical costs. Also, the value of lost workdays due to absenteeism both for the patient and the care givers (companions) associated with the disease was estimated for those who were in the age range of 18-64 years old.

5.2.2.1. Direct cost

From this specific study the total direct cost among studied household was ETB 247,177 (10,635.84 US$) with median cost of 10.54 US$ per each household.

An average total direct cost incurred by the household was 9.54US$ ±9.07SD per year for first visit. While on the second and third visits an average total direct cost incurred by the household was 3.17 US$ (SD= ± 4.92) and 1.18US$ (± SD=3.81) per year respectively.

An average direct medical cost among the studied household was 6.73 USD (± SD=8.75 US$) and ranged from zero to 70.22US$. From the total direct medical cost incurred by the household malaria drug cost had greatest share, having an average cost of 3.92US$ (± SD=4.57US$). Also, direct medical cost constituted consultation cost, diagnostic cost and other drug and supplies cost in which there average cost they incurred were 0.74US$ (±SD= 0.81) ,0.39US$ (±SD=0.83) and1.68US$ (±SD=4.04) respectively. The median diagnostic cost was too low when compared to the other direct medical costs.

An average non-medical cost incurred by the studied household was 7.16 US$ (± SD=6.93) and it was ranged from zero to 43.46 US$. According to this specific study transportation cost to the household was high in which it accounted an average cost of 3.80US$ (±SD=3.84US$). Food cost on the way to the treatment facilities accounted an average cost of 2.27US$ (±SD=2.17) (Table3).

Table 3: Total direct cost of malaria expenditure per visit per yeara mong rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Per visit cost	Median	Mean	SD	Minimum	Maximum	Sum
First visit cost	6.97	9.54	9.07	0.00	68.07	7300.1
Second visit cost	0.00	3.17	4.92	0.00	27.93	2428.92
Third visit cost	0.00	1.18	3.81	0.00	22.07	906.84
Total DC	10.54	13.9	14.8	0.00	96.56	10,635.86

1US$=23.24ETB, September, 2018 Exchange rate

5.2.2.2. Indirect cost

This specific study finding showed that, an average of 6.83 (±SD=3.81) productive work days were lost per households per year. This productive work days lost for the households were ranged from 0 to 11 days. This accounted an average wage loss of 10.32US$ (±SD=5.78) with the median cost of 9.036 US$ per households per year. Households lost an income of between zero to 42.17US$ per year. Also, an average of 1.34 (±SD=0.86) school days were lost for the households per year.

For care givers, an average of 3.40 (±SD=2.04) work days were lost per household per year, which mean that households that had care giver for malaria patients accounted an average wage loss of 5.17US$ (±SD=3.15US$) which was ranged from zero 15.06US$ per year. Similarly, an average of 3.14 (±SD=2.25) work days were lost for patients, when it was translated to monetary value it was equivalent to an average wage loss of 5.15US$(±SD=3.84) per households per year and ranged from zero to 27.11US$.

According to this study finding both patients and caregivers lost an average school days of 1.60 (±SD=1.75) and 3.26 (±SD=2.05) per households per year respectively. The school days lost both for patients and care givers were ranged from zero to 10 days and zero to 8 days respectively per year.

Finally, this study finding showed that, an average of 14.71 US$(±SD=8.71US$) of indirect cost with the median cost of 13.98US$ were lost per households per year. This means that, more than half of the total costs incurred by the households were accounted by the indirect cost of malaria in which an average wage lost for the care givers were prominent as compared to the patients wage lost in the study (Table 4).

Table 4:Indirect malaria expenditures per Household (work day lost, school absenteeism and wage loss) for patients and companions, among rural households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Classification	Median	Mean	SD	Minimum	Maximum	Sum
Patients						
School absenteeism(day)	0.00	1.00	1.759	0.00	10	766
Workdays lost (day)	3.00	3.44	2.55	0.00	18	2629
Wage lost (US$)	4.51	5.15	3.84	0.00	27.11	3940.62
Companions						
School absenteeism (day)	0.00	3.26	2.049	0.00	8	260
Workdays lost (day)	3.00	3.40	2.037	0.00	10	2598
Wage lost (US$)	4.42	5.17	3.15	0.00	15.06	3,959.85
Total school absenteeism (Patients + companions) (day)	0.00	1.34	0.857	0.00	11	1028
Total work day lost (Patients + companions) (day)	6.0	6.83	3.815	0.00	28	5225
Total wage lost (Patients + companions) (US$)	9.03	10.32	5.78	0.00	42.17	7900.47
Total IDC(Patients + companions) (US$)	13.98	14.71	8.71	0.00	59.38	11,256.80

1US$=23.24ETB, September, 2018 Exchange rate

5.2.2.3. Total cost

This study finding showed that, the overall mean total cost of 28.59US$ (±SD=21.70) per households per year. An average total direct cost to the household was 13.89US$ (±SD=15.65US$) which accounted 48.58 % and an average total indirect cost was 14.71(±SD=8.71US$) which accounted for 51.42 % of the total cost. Also, an average direct medical cost was 6.73US$ (±SD =8.75)

with the median cost of 4.73US$ which accounted for 48.46% and an average direct non-medical cost was 7.16US$ (±SD=6.93) which accounted for 51.54% of the total direct cost.

Table 5: Summary of total cost (direct, indirect cost) for malaria patients and their care givers among rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Cost categories	Median	Mean	SD	Minimum	Maximum	Sum
Direct Medical cost						
Consultation cost	0.43	0.74	0.81	0.00	6.45	580.88
Diagnostic cost	0.00	0.39	0.83	0.00	6.97	300.47
Malaria drug cost	3.14	3.92	4.57	0.00	31.9	3002.54
Other drug & supplies cost	0.52	1.68	2.54	0.00	24.88	1,287.39
Total medical cost	4.09	6.73	8.75	0.00	70.2	5,154.1
Direct non -medical cost						
Transportation cost	3.22	3.80	3.84	0.00	24.10	2911.53]
Food cost	1.85	2.27	1.26	0.00	10.97	1740.88
Other items cost	0.30	0.99	1.8	0.00	8.39	829.35
Total non -medical cost	5.37	7.16	6.9	0.00	43.46	5,481.76
Total Direct Cost	10.10	13.89	15.65	0.00	96.86	10,635.84
Total Indirect Cost	13.98	14.7	8.71	0.00	59.38	11,256.80
Total Cost(DC+IDC)	24.08	28.59	24.36	0.00	156.2	21,892.64

1US$=23.24ETB, September, 2018 Exchange rate

Finally, this finding showed that among 765 sampled households assessed in rural households of Chewaka district 384 (50.2%) of them spent greater than or equals to 5% of their annual income (i.e. high burden) (***Fig.3***).

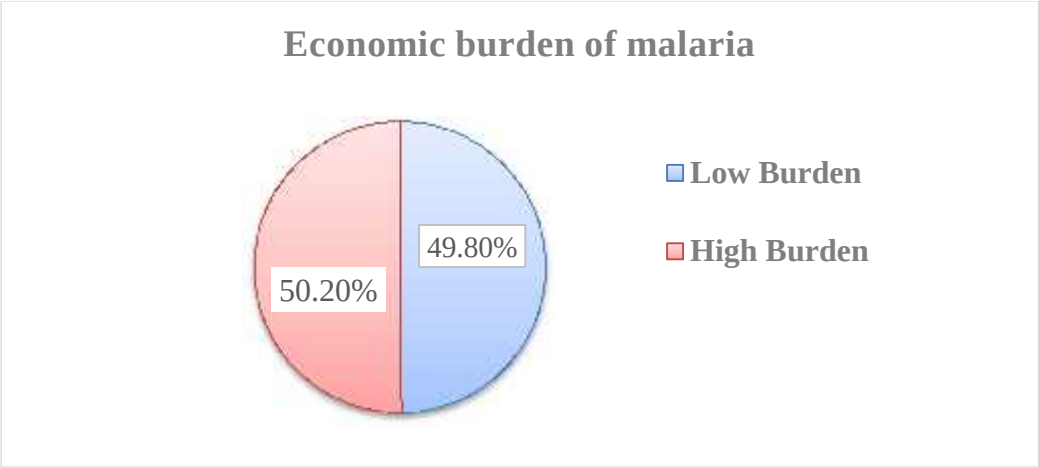

Figure 3: Proportion of Economic Burden of Malaria among rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

5.3. Factors associated with economic burden of malaria

5.3.1. Distribution and associations of selected variables with economic burden of malaria

5.3.1.1. Individual/patient related factors

From the total sampled households 48% of them had malaria once, 37.6% had twice and 14.4% had thrice in the year considered for the studied households. Great variation was seen among the cases regarding the number of ill days with minimum of one day up to 30 days in those households and most (70%) of the households have had malaria ill days of less than or equals to five days in the year considered. Majority (92.5%) of them reported that they had fever like symptom and (62.5%) of fever days were lasted for less than or equals to two days among the studied households. Regarding the days between onset of fever and treatment initiation, most (46.1%) of the patients in the studied households had visited health facilities after one day or next day. Concerning the means of diagnosis for the illness, 94.2% of the patients were examined microscopically, 4.1% of them clinically by health professionals as they were having malaria and 1.7% of them were reported by themselves as having malaria to the health facilities. From assessed HHs 25.5% of them had taken self-treatment at any time in the course of illness before getting treatment from any other source for each /per visit. Among them 52.8% of them had taken any anti-malaria medication for each /per visit in which using of left over drugs was accounted for 75.9% of the households.

Table 6: Individual/patient related factors for the Economic Burden of Malaria among rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Individual/patient related factors:		**Economic Burden of Malaria**		
		Low Burden n=381 (%)	**High Burden** n=384(%)	Total (%) n=765
Number of episodes of malaria sick members in the household	1st episode	219(57.5)	148(38.5)	367(48.0)
	2nd episode	131(34.4)	157(40.9)	288(37.6)
	3rd and above episode	31(8.1)	79(20.6)	110(14.4)
For how many days did you/they have had malaria last year for each /per visit?	<=5 days	330(86.6)	205(53.4)	535(69.9)
	>5days	51(13.4)	179(46.6)	230(30.1)
Did you/they have fever symptoms for each /per visit?	No	47(12.3)	10(2.6)	57(7.5)
	Yes	334(87.7)	374(97.4)	708(92.5)
How long did the fever last for each/visit (days)?	<=2 days	310(81.4)	168(43.8)	478(62.5)
	>2 days	71(18.6)	256(56.2)	287(37.5)
Days between onset of fever and treatment initiation.	The same day	173(45.4)	25(6.5)	198(25.9)
	Next day	178(46.7)	193(50.3)	371(48.5)
	After two days and more	30(7.9)	166(43.2)	196(25.6)
For those who have had fever what is the severity of fever for each /per visit	Mild	136(35.7)	25(6.5)	161(21.0)
	Moderate	164(22.9)	88(22.9)	252(32.9)
	Sever	81(70.6)	271(70.6)	352(46.1)
How was malaria diagnosed for each /per visit?	Microscopically	374(98.2)	347(90.4)	721(94.2)
	Self-report	3(0.8)	10(12.9)	13(1.7)
	Clinically	4(1.0)	27(7.0)	31(4.1)
Did you/they take self-treatment at any time in the course of illness for each /per visit?	Yes	59(15.5)	136(35.4)	195(25.5)
	No	322(84.5)	248(64.6)	570(74.5)
Did you/they take any anti-malaria medication	Yes	26(25.5)	77(74.5)	103(52.8)

for each during self-treatment?	No	56(60.8)	36(39.2)	92(47.2)
Where did you/they take any anti-malaria medication for each /per visit during self Rx?	Left over drugs	50(33.8)	98(66.2)	148(75.9)
	Purchase of drugs	9(23.1)	30(76.9)	39(20)
	Other*	3(37.5)	5(62.5)	8(4.1)
Which kind of drugs you/they took for each /per visit.	Chloroquine	9(23.1)	30(76.9)	39(20)
	Coartem	50(33.8)	98(66.2)	148(75.9)
	Other**	5(62.5)	3(37.5)	8(4.1)
Have you/they completed the prescribed drugs for each /per visit?	Yes	342(89.8)	260(67.7)	602(78.7)
	No	39(10.2)	124(32.3)	163(21.3)
Did you/they get full recovery from self-treatment for each /per visit?	Yes	321(84.3)	244(63.5)	565(73.9)
	No	60(15.7)	140(36.5)	200(26..1)

***** *Traditional source* ** Quinine, Artisunate

5.3.1.2. Accessibility& availability factors

Majority of the cases, 98.4% obtained treatment from formal health services. Out of them 98.2% were treated at government health facilities of different levels (90.6% at health centers and 7.6% at health posts) and 1.8% of them had been treated in other places for the first visit. Also, 82.5%, 30.1% and 14.4% of them had been treated at HC, HP and other private health facilities respectively in the second visit.

For the first formal treatment, 35.3% of the patients in the household had received prescription only and 25.9% of them received both drugs and prescriptions. As a result of this, almost half of them (48.2%) during first visit had received drug from private health facilities. During first visit, 29.7% of them had visited public health facilities because of quality of staffs and 10.7% of them were because of availability of drugs, but availability of drugs only accounted more than half (51.4%) in the second visit as most of them visited private facility.

Most (52%) of them travelled more than 10 km, 11.6% of them 6-9 km and 36.6% of them travelled less than or equal to 5km in the year considered. Also, concerning means of transportation to the facilities and back to home more than two third (66.1%) of them were travelled by motor bike, 29.4% of them were on foot followed by other means of transportation.

Table 7: Accessibility and availability factors for the Economic Burden of Malaria among rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Accessibility and availability factors:		**Economic Burden of Malaria**		
		Low Burden n=381 (%)	**High Burden n=384(%)**	**Total (%) n=765**
Did you/they receive treatment from a formal source during the course of the illness from malaria for each?	Yes	375(98.4)	378(98.4)	753(98.4)
	No	6(1.6)	6(1.6)	12(1.6)
Distance from treatment centers (Km)?	<=5	171(44.9)	109(28.4)	280(36.6)
	6-9	32(8.4)	55(14.3)	87(11.4)
	>=10	178(46.7)	220(57.3)	398(52.0)
For the first formal treatment where is the location of treatment?	Public health center	316(82.9)	377(98.2)	693(90.6)
	Health post	56(14.7)	2(0.5)	58(7.6)
	Other*	9(2.4)	5(1.3)	14(1.8)
For the first formal treatment did you/they receive drug /prescription only for each?	receive drug	206(54.1)	91(23.7)	297(38.8)
	receive prescription	102(26.8)	168(43.8)	270(35.3)
	receive both drug &prescription	73(19.2)	125(32.6)	198(25.9)
For the first formal treatment where is the location of drug procurement for each?	Pharmacy(in Public hospitals)	0(0.0)	1(0.3)	1(0.1)
	Pharmacy(public HC)	207(54.3)	130(33.9)	337(44.1)
	Health post	55(14.4)	2(0.5)	57(7.5)
	Pharmacy(PF)	118(31.0)	251(65.4)	369(48.2)
For the 2nd formal treatment where is the location of treatment for each?	HC	334(87.7)	297(77.3)	631(57.5)
	HP	18(4.7)	6(1.6)	24(30.1)

	Other*	1(7.6)	81(21.1)	110(14.4)
Number receive prescription only during second treatment	<=2 person per HH	369(96.9)	359(93.5)	728(95.2)
	>2person per HH	12(3.1)	25(6.5)	37(4.8)
Reason for choosing facilities in first visit	Proximity	140(36.7)	75(19.5)	215(28.1
	Good reputation	6(1.6)	4(1.0)	10(1.3)
	Inexpensive	61(16.0)	62(16.1)	123(16.1)
	Good personal experience	31(8.1)	77(20.1)	108(14.1)
	Quality of staffs	86(22.6)	141(36.7)	227(29.7)
	Availability of drugs	57(15.0)	25(6.5)	82(10.7)
Reason for choosing facilities in 2nd visit	Proximity	11(2.9)	9(2.3)	20(2.6)
	Good reputation	12(3.1)	8(2.1)	20(2.6)
	Inexpensive	12(3.1)	10(2.6)	22(2.9)
	Good personal experience	38(10.1)	95(24.7)	133(17.4)
	Quality of staffs	71(18.6)	106(27.6)	177(23.1)
	Availability of drugs	237(62.2)	156(40.6)	393(51.4)
Did the patient travel to procure the drug?	Yes	94(24.7)	32(8.3)	126(16.5)
	No	287(75.3)	352(91.7)	639(83.5)
Did anyone else travel to procure the drug?	Yes	295(77.4)	362(94.3)	657(85.9)
	No	86(22.6)	22(5.7)	108(14.1)
For each individual who traveled (patient) how did you travel to this provider/per visit?	On foot	121(31.8)	20(5.2)	141(18.5)
	motor cycle	220(57.7)	286(74.5)	506(66.1)
	Other**	40(10.5)	78(20.3)	118(15.4)
For those HH members who have had malaria, was hospitalization required?	Yes	5(1.3)	38(9.9)	43(5.6)
	No	376(98.7)	346(90.1)	722(94.4)

Private clinics, Private pharmacy; by car, Donkey/Hors*

5. 3.2.Predictors of Economic Burden of malaria

Regarding the socio demographic characteristics age, educational status and number of people in the household were statistically associated with high economic burden of malaria on binary logistic regression analysis.

Also, from individual/patient related factors and accessibility/availability factors; fever days, ill days, days between onset of fever and treatment initiation, perceived disease severity, completion of prescribed drugs, number of patient received prescription only during first visit, location of second formal treatment**,** means of transportation and hospitalization required in the household were statistically associated with high economic burden of malaria in bivariate analysis.

When adjusted for confounders the following variables were significantly associated in multiple logistic regression analysis after controlling possible confounders. So, the most important significant variables were educational status**,** number of patients, fever days, ill days, days between onset of fever and treatment initiation, perceived disease severity, completion of prescribed drugs, number of patient received prescription only during first visit, location of second formal treatment, means of transportation and hospitalization required in the household.

From this multiple logistic regression analysis, those households whose their educational status is unable to read and write were strongly associated with high economic burden of malaria [AOR and 95% CI=4.19(1.362-12.891)]. This implies that households whose educational status is unable to read and write were almost 4 times more likely to be exposed to high economic burden of malaria than those whose educational status were more than grade nine and above.

Regarding number of ill days, it was statistically associated with high economic burden of malaria in the households [AOR and 95% CI =4.71(2.173-10.226)]. This indicated that those households within which their numbers of ill days are more than five days were 4.7 times more likely to be exposed to high economic burden of malaria than those with less than five days in the households in the year considered and the studied household. In addition to this, those who had total fever days greater than two days in the households in the year considered were also significantly associated [AOR and 95% CI = 6.02 (2.663-13.632)].This showed that, those their number of fever days greater than two days in the households in the year considered were 6

times more likely to be exposed to high economic burden of malaria than those who had number of fever days less than two in the household.

Regarding the days between onset of fever and treatment initiation, those with next day and after two days and more for treatment initiation were strongly associated to the high economic burden of malaria [AOR and 95% CI= 6.85 (3.337-14.10) and AOR and 95% CI=17.85 (7.146-44.63)] respectively. This indicated that, those who had taken treatment on the next day and after two days were almost 6.8 and 17.8 times more likely to lead the household to the high economic burden of malaria than those who had got treatment on the same day of onset of fever.

Concerning the perceived severity of illness, it was strongly associated with the high economic burden of malaria [AOR and 95% CI= 12.47 (5.926-26.267)]. This odd ratio depicts that, those who perceived their illness in the household in average as sever were almost 12.4 times more likely to be exposed to the high economic burden of malaria than who perceived their illness as mild.

This study also showed that, completion of prescribed drugs were statistically significant [AOR and 95% CI= 3.49 (1.620-7.529)].This indicated that, those who did not complete drugs prescribed for them were almost 3.4 times more likely to had high economic burden of malaria than those who had completed the prescribed drugs in the household.

With regard to the first treatment/episode, on bivariate analysis those who had received prescription only and those who had received both drugs and prescription were significantly associated [COR and 95% CI= 9.13(6.036-13.815) and COR and 95% CI= 3.876 (2.651-5.667)] respectively. But, in multiple logistic regression analysis those who had received prescription only [AOR and 95% CI=4.21 (2.090-8.506)] were significant and those who had received both drugs and prescription were not significantly associated [AOR and 95% CI= 1.22 (.598-2.509)].This showed that during first episode of formal treatment at the health facility and households in which number of patients received prescription only (greater than two patients/HH) was almost 4.2 times more likely to had high economic burden of malaria than those with less.

This also showed that level of facility visited on second formal treatment was significantly associated to the high economic burden of malaria [AOR and 95% CI = 2.49(1.090-5.706)].This

means that those who were treated at other facilities (private health facilities) were almost 2.5 times more likely to be affected by the high economic burden of malaria than those who were treated at HC.

According to this specific study finding, means of transportation by motor cycle were strongly associated to the high economic burden of malaria [AOR and 95% CI =5.932(2.471-14.242)]. This means that their means of transportation by motor cycle were almost 6 times more likely to have high economic burden of malaria than those their means of transportation on the way to the treatment facilities and back to home were on foot.

Finally, this study finding showed that those households within which hospitalizations required was strongly associated [AOR and 95% CI =20.01 (5.183- 77.262)].This implied that those households within which hospitalizations required were 20 times more likely to had high economic burden of malaria than those households in which hospitalization was not required. The measure obtained from multivariable analysis to show the relationship between economic burden and several explanatory variables was in general modeled using the equation:

Logit (Y) = a + b1X1+ b2X2+...+ bn Xn + u

Logit(EB)=10.77+1.68X1+1.55x2+1.79x3+2.88x4+2.52x5+1.25x6+1.44x7+0.91x8+1.79x9+2.99x10+ 1.45; where EB is the economic burden, a is a constant number, b1, b2, bn are slope coefficients corresponding to each of the explanatory variables X1, educational status (Unable to read and write); X2, number of ill days >5 days/HH; X3, number of fever days >2 days/HH ; X4, after two days and more before treatment initiation; X5, severity of disease; X6, did not complete drugs prescribed; X7, >2patients/HH receive prescription only during first Rx; X8, treatment at private HFs; X9, transportation by motor cycle ; X10, hospitalization required in the HH and u is the error term. This showed that an R2 of 0.76, means that 76 of the variations on the high economic burden was explained by the model. The fitness of the model was also tested by Hosmer and Lemshow test (sig=0.773).

Table 8: Factors influencing Economic Burden of Malaria among rural Households, Chewaka District, Bunno Bedele zone, Oromia Region, west Ethiopia, 2017/2018.

Variables	Economic Burden		OR[95% CI]	
	LB (%)	HB (%)	COR	AOR
Age of the household head				
<=35	184(48.3)	156(40.6)	1	[1]
>35	197(51.7)	228(59.4)	1.362(1.025-1.817)	0.978(.493-1.940)
Educational status				
Unable to read and write	167(43.8)	239(62.3)	4.293(2.170-8.496)	4.190(1.362-12.891)**
Read and write only	75(19.7)	68(17.7)	2.70(1.309-5.651)	5.397(1.407-20.707)**
Grade 1-8	103(27.1)	65(16.9)	1.893(0.918-3.902)	0.676(0.365-16.018)
Grade 9-12	36(9.4)	12(3.1)	1	1
Number of people in the house				
<=5 people	202(53.0)	234(60.9)	1	1
>5 people	179(47.0)	150(39.1)	0.723(0.543-0.964)	0.725(.404-1.299)
Number of ill days				
<=5 days/HH	330(86.6)	205(53.4)	1	1
>5 days/HH	51(13.4)	179(46.6)	5.650(3.955-8.071)	4.714(2.173-10.226)***
Number of fever days				
<=2 days/HH	310(81.4)	168(43.8)	1	1
>2 days/HH	71(18.6)	256(56.2)	5.614(4.047-7.788)	6.025(2.663-13.632)***
Days between onset of fever and Rx initiation				
the same day	173(45.4)	25(6.5)	1	1
Next day	178(46.7)	193(50.3)	7.503(4.707-11.960)	6.859(3.337-14.100)***
after two days and more	30(7.9)	166(43.2)	38.29(21.614-67.836)	17.858(7.146-44.630)***
Disease severity				
Mild	136(35.7)	25(6.5)	1	1
Moderate	164(22.9)	88(22.9)	2.918(1.772-4.808)	0.970(.468-2.009)
Sever	81(70.6)	271(70.6)	18.20(11.112-29.812)	12.476(5.926-26.267)***
Anti-malarial medication during self Rx				
Yes	26(6.8)	77(20.1)	3.425(2.140-5.480)	0.891(.295-2.691)
No	355(93.2)	307(79.9)	1	[1]
Kind of drugs taken				
Chloroquine	9(2.4)	34(8.9)	4.264(2.013-9.030)	0.085(.000-38.788)

Coartem	21(5.5)	39(10.2)	2.096(1.207-3.640)	0.035(.000-17.808)
Other [a]	351(92.1)	311(81.0)	1	1
Completion of prescribed drugs				
Yes	342(89.8)	260(67.7)	1	1
No	39(10.2)	124(32.3)	4.182(2.859-6.204)	3.492(1.620-7.529)***
Get full recovery from self-treatment				
Yes	321(84.3)	244(63.5)	1	1
No	60(15.7)	140(36.5)	3.070(2.174-4.335)	0.672(.141-3.203)
Distance from treatment center				
<=5 km	171(44.9)	109(28.4)	1	1
6-9 km	32(8.4)	55(14.3)	2.690(1.639-4.435)	1.549(.641-3.747)
>=10 km	178(46.7)	220(57.3)	1.939(5.425-12.646)	1.755(.942-3.267)
Location of first formal treatment				
Public health center	316(82.9)	377(98.2)	2.147(0.712-6.473)	1.274(.219-7.415)
Health post	56(14.7)	2(0.5)	0.064(0.011-0.383)	0.112(.009-1.397)
Other [b]	9(2.4)	5(1.3)	1	1
No of people receive prescription only during first Rx				
<=2 patient/HH	349(91.6)	209(54.4)	1	1
>2patients/HH	32(8.4)	175(45.6)	9.132(6.036-13.815)	4.216(2.090-8.506)***
Location of second formal treatment				
Public HC	334(87.7)	297(77.3)	1	1
Health post	18(4.7)	6(1.6)	0.175(0.147-0.957)	0.421(.072-2.447
Private HFs	29(7.6)	81(21.1)	3.141(1.9994.936)	2.494(1.090-5.706)*
Means of transportation for patients				
On foot	121(31.8)	20(5.2)	1	1
motor cycle	220(57.7)	286(74.5)	7.865(4.748-13.028)	5.932(2.471-14.242)***
Other[c]	40(10.5)	78(20.3)	1.979(6.426-21.659)	0.290(0.140-27.484)
Hospitalization required in the household				
Yes	5(1.3)	38(9.9)	8.259(3.214-21.223)	20.010(5.183- 77.262)***
No	376(98.7)	346(90.1)	1	1

P-value <0.05, ****P-value <0.01, *****P-value <0.001 and 1=reference, a=quinine, b= private clinics, private pharmacy, c=by car, Donkey/Horse

CHAPTER SIX: DISCUSSION

6.1. Economic Burden of Malaria at the Household level

This finding showed that, almost half of (50.2%) of the sampled households spent greater than or equals to 5% of their annual income (i.e. high burden). This finding was high when compared with the study finding of (31) as about 5% (12) households from a total of 255 households who incurred cost for malaria treatment spent more than 5% of their annual household income to treat malaria and were deemed to have catastrophic payment as a result of malaria treatment. Also ,higher than study finding in Zimbabwe ,Gwanda district (27) in which 35% of the households suffered for high economic burden of malaria and in Malawi (40) in which expenditure on malaria by the households was accounted as 32%. This might be due to; difference in sample size (255HHs) in case of Ghana, difference in time period of data collection and type of data used in Zimbabwe i.e. they used secondary data analysis of three years and household survey on minimum sampled households (80) in Malawi. Also, this might be explained by presence of hard to reach site that exposed the households to high transportation cost and different expenses in our finding.

6.2. Direct cost

From this specific study the total direct cost was 247,177 ETB (10,635.84 US$) sharing 48 % of the total cost with the mean cost of 13.9US$ $\pm$ 14.81SD per each HH per year. It was higher when compared with similar study done in south central Ethiopia in which the direct malaria expenditure was accounted as 40% of the total cost with the mean cost of 3.51$\pm$1.58SD per HH(5).

This might be due to, time of determination as cost is time-sensitive, cases included in the study, power of purchase and government concentration on the prevention rather than curative services and especial attention was not given to drug supply on the public health facilities.

Also ,the finding showed direct expenditure ranged from zero to 96.86US$, which is higher when compared with the study in Malawi ranged from zero to $0.21 (5.8% of total costs) (40) and in Nigeria ranged from zero to $8.18 (49.5% of total costs) (29).

According to this study finding, the average total direct medical cost was 6.73 US$ (SD=8.75 US$) with the median cost of 4.73US$.This is higher than the direct medical cost estimated in similar studies conducted in different parts of Ghana.

For instance ,the estimated mean direct medical cost was US$2.76 (41) and also study done on cost of malaria treatment and health seeking behavior in the upper west region of Ghana was US $4.91(31).

The direct medical cost in our study is relatively high considering the poverty level of the study area and different factors such as availability of drug is the prominent factor .That is why malaria drug cost is high with the average cost of 3.92(±SD=4.57) and median of 3.14 US$ sharing 58.48 % of direct medical cost. This finding was lower when compared with the study done in south central Ethiopia (18),in which the cost of treatment accounted for 89.26% of direct cost. Also, it was almost similar with the study done in Nigeria (42),in which over 60% of the total direct expenditure is attributed to the cost of buying of drugs. But, it was higher when compared with the study done in Malawi (40) in which it accounted 10% of the total direct cost and also in Nigeria (8).This differences might be due to, most of the patients purchased drugs from private drug vendors in our study area.

The average non- medical cost incurred by the studied household was 7.16 US$ (SD=6.93).This study finding is higher than medical cost because the transportation cost has greatest share (53.1 %) of the direct non-medical cost. It was lower than the study finding in Upper West Region of Ghana(31) as about two third (66%) incurred cost on transportation to and from the health facilities. This is almost similar when compared with the study finding in Malawi (40), in which travel cost accounted 48% of it. But it was higher than the study finding of (18) in which transportation cost accounted for 20.92% (43).This might be due to, most of the patient used motor cycle to visit health facilities that incur higher cost especially when they are critically ill. As a result, transportation cost to the household was high in which it accounted as an average cost of 3.80US$ (±SD=3.84US$).

6.3. Indirect cost

This study finding showed that, an average of 14.71 US$ (±SD=8.71US$) of total indirect cost with the median cost of 13.98US$ were lost per households per year. This indicated that, more than half (51.42%) of the total cost incurred by the households were accounted by the indirect cost of malaria in which an average wage lost for the care givers were prominent as compared to the patients wage lost in the study. This study was lower when compared with the study conducted by (18), in which indirect cost to the households accounted for 72% of the cost and

the remaining 28% covering both treatment and transportation costs. This might be due to, most of the money spent by the patients was for the indirect cost than medical services & the inverse is true for our study because of time difference.

This also showed that, an average of 6.83 (SD=3.81) productive work days were lost per households per year. This productive work days lost for the households ranged from 0 to 11 days. This study was almost similar with the study finding of (5) in which the average number of productive days lost because of sickness from malaria was eight days. But, the work day lost for the households range from 0 to 30 days. Also ,lower when compared with the finding in Malawi (40) in which each malaria episode resulted in a mean loss of 8.5 productive days and in Nigeria (42) the average number of loss days per malaria episode by household was 16 days for the agrarian households. This might be due to, the environmental situation, the character and health seeking behavior of the community.

The finding of current study showed an average wage loss of 10.32 $\pm$5.78 US$ for the households. This finding was almost similar with the study finding of (40), in which the mean lost productivity cost of $9.90 per episode was observed.

It showed that, for care givers and patients, an average of 3.4 and 3.44 work days were lost respectively. This finding was lower than finding of (5), as productive days lost for patient was eight days & for care giver it was seven days. This might be due to, in our study area most of their family (care givers) spent their time caring malaria patient and so many people spent their time because of the characteristics of the community and also data was for full one year period retrospectively.

Also, work day lost for patents were greater than study done in Vietnam (43) in which work day lost for patient accounted 0.14 days and in Zimbabwe 2 work day was lost for care giver (27). But, lower as compared with the study finding of (18) as it showed that, an average of 6.79 days per person was lost for both patients (6.82 days) and caretakers (6.7 days). This might be explained by difference in case prevalence rate.

The finding of current study showed, that household that had care giver for malaria lost an average wage loss of 5.17US$ ($\pm$SD=3.15) ,which was ranged from zero 15.06US$. Similarly, for patients average wage loss of 5.15($\pm$SD=3.84) which was ranged from zero to 27.11US$.This

study finding was almost similar with study finding of (18)that showed as, the average cost for patients and companions was Birr 94.93($10.97) and 47.22 ($5.46) respectively.

This study also showed, both patients and caregivers lost an average of 1.6 & 3.26 school days respectively. This finding was lower when compared with the study done in Zimbabwe(27) in which an average number of school days lost by a school going child because of malaria was eight days.

Generally, more than half (52.25%) of the time lost due to malaria is a loss to patients because economically productive population is mostly affected in our finding and this was similar with the study finding of (18) in which it accounted (57.65%) of the time lost due to malaria.

6.4. Total cost

This study finding showed that, the overall total median cost of malaria to the household was 24.22US$ and mean total cost of 28.61US$ (±SD=21.70) per households per year. An average total direct cost to the household was 13.90US$ (±SD=14.81US$) which accounted 48.58 % and an average total indirect cost was 14.71(±SD=8.71US$) which accounted for 51.42 % of the total cost. Also, an average direct medical cost was 6.73US$ (±SD =8.75) with the median cost of 4.73US$ which accounted for 48.46% and an average direct non-medical cost was 7.16US$ (±SD =6.93) which accounted for 51.54% of the total direct cost.

This study finding was lower than the study finding of (18), in which the total cost was Birr 443.83 ($51.31), of which direct costs comprised 58%. This is in line with the study finding in Sri Lanka (26), in which loss of wages accounted for the highest proportion of the indirect cost of the households. But, it was higher than the study finding of(5),that showed as that the overall total median cost of malaria to the household was 5.06US$ and mean total cost of 6.1US$. The direct cost of 2.39US$ accounted for 39% and the indirect cost of 3.76US$ accounted for 61% of the total cost.

6.5. Predictors of Economic Burden of malaria

According the study findings, households whose educational status unable to read and write were strongly associated with high economic burden of malaria [AOR and 95% CI=4.19 (1.362-12.891)]. This implies that households whose educational status unable to read and write were almost 4 times more likely to be exposed to high economic burden of malaria than those their educational status were more than grade nine. This finding was in line with the study finding in Nigeria (44).

Regarding number of ill days, they were statistically associated with high economic burden of malaria in the households [AOR and 95% CI =4.71(2.173-10.226)]. This indicated that their numbers of ill days greater than five days were 4.7 times more likely to be exposed to high economic burden of malaria than those with less per household. This study finding was in line with the study finding of (5)in which for every additional days of illness the patients suffered and the cost they incurred became increased. This might be due to, most of the patients diagnosed and sent back home with only prescription. So, either they spent long time searching for anti-malaria drugs or they stayed at home without any access to treatment. Thus, they were prone to delayed treatment, longer duration of illness, expensive and counterfactual drugs.

In addition to this, those who had total fever days greater than two days in the households in the year considered were also significantly associated [AOR and 95% CI = 6.02(2.663-13.632)].This showed that, those their number of fever days greater than two days in the households in the year considered were 6 times more likely to be exposed to high economic burden of malaria than those whose their number of fever days were less than two days in the household. This was higher when compared with the finding of (5) in which the average fever day was lower than our finding(mean of 1.3 and 1.1SD).This might be due to, patients perceived they did not get anti-malarial drugs from health facilities and delayed to visit health facilities.

Regarding the days between onset of fever and treatment initiation, those with next day and after two days and more for treatment initiation were strongly associated to the high economic burden of malaria [AOR and 95% CI= 6.85 (3.337-14.10) and AOR and 95% CI=17.85 (7.146-44.63)] respectively. This indicated that, those who had taken treatment on the next day and after two days of onset of fever were almost 6.8 and 17.8 times more likely to lead the household to the high economic burden of malaria than those who had got treatment on the same day of onset of fever. This was higher than the finding of (5).

Concerning the perceived severity of illness, it was strongly associated with the high economic burden of malaria [AOR and 95% CI= 12.47 (5.926-26.267)]. This odd ratio depicts that, those who perceived their illness in the household in average as sever, regardless of their immunity status, were almost 12.4 times more likely to be exposed to the high economic burden of malaria than who perceived their illness as mild. This study finding was in line with the finding of (45) and not with the study finding of (5) in which its finding was not significant but cost of sever and complicated malaria is hugely larger than mild cases. This might be due to, the severity became worsened as they were searching for the drugs or staying at home and again this would have lead them to greatest expense.

This study also showed that, completion of prescribed drugs were statistically significant [AOR and 95% CI= 3.49(1.620-7.529)].This indicated that, those who has not completed drugs prescribed for them were almost 3.4 times more likely to had high economic burden of malaria than those who had completed the prescribed drugs in the household. This finding was similar with the study done in Ilu Aba Bora Zone (15) in which 44.8% were irrationally or incorrectly used drugs prescribed for them.

This study revealed that , during first episode of formal treatment at the health facility households in which number of patients received prescription only (greater than two patient/HH) were almost 4.2 times more likely to had high economic burden of malaria than those with less [AOR and 95% CI=4.21 (2.090-8.506)] . This finding was higher than the study finding in south-central Ethiopia(5) where 83% of the patients received the anti-malaria drug directly from the public facility. This might be due to, gov't concentration on the preventive services than curative services and did not supply enough drugs or inappropriate and on time stock out of drugs in the health facilities.

This also showed that, level of facility visited on second formal treatment was significantly associated to the high economic burden of malaria [AOR and 95% CI = 2.49(1.090-5.706)]. This means that those who were treated at other facilities (private) were almost 2.5 times more likely to be exposed to high economic burden of malaria than those who were treated at public health center during their second visit. This was higher when compared with the study finding of (5), as majority preferred health center. This was due to, most of them visited private health facilities because they might perceived as they couldn't get anti-malarial drug from public health centers, availability and other factors like quality from private health facilities.

According to this present study finding, means of transportation by motor cycle were strongly associated to the high economic burden of malaria [AOR and 95% CI =5.93(2.471-14.242)]. This means those their means of transportation on the way to the health facility and back to home by motor cycle were almost 6 times more likely to had high economic burden than on foot. This study was in line with the finding in south-central Vietnam (43) where 33% by motorbike were contributed to the economic burden of malaria. This might be due to lack of access to other means of transportations options in our set up and difference in setup, study period and study subjects.

Finally, this study finding showed that those households within which hospitalizations required was strongly associated [AOR and 95% CI =20.01 (5.183- 77.262)].This implied that those households within which hospitalizations required were 20 times more likely to be exposed to high economic burden of malaria than those households within which hospitalization was not required. This study was in line with the study finding in Malawi (40) and in Zimbabwe (27), in which duration of hospital stay was significant drivers of overall costs.

6.6. Limitation of the study

The study populations were not comfortable to disclose their income. They reserved their income regardless the confidentiality we have given them, probably due to fear of property and income tax increment by government. This compromised the comparison of malaria expenditures and actual income. That is why most of our findings were overestimated.

In our study children less than18years and elderly greater than 65 years were not included in the valuation of lost work days as these segments of the population do not have market value, but these groups can reduce the indirect cost. Additionally, in this study we only considered costs associated with the current episode of malaria to the household, and we haven't take into account long-term cost implications from complications, such as anemia, neurological sequel, cognitive loss and the like.

Also, intangible costs due to pain suffering, inconvenience and grief from the family members were not included in this study. Finally, there might be a recall bias as participants were asked to recall over a period of one year and due to retrospective questions. There might be a possibility of either underestimation because children and elderly were excluded or overestimation as they might report expenditure verbally without providing receipts. As much as possible, in order to minimize this bias we have asked them in their own home where their family presented as certain people might remember the money they have paid while they have been ill.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1. Conclusion

Generally, this particular study showed as that the disease imposed potentially significant effect on economic burden among rural households and individuals both through out-of-pocket payment and person-days lost.

Although, malaria treatment is supposed to be free in public health facilities, households in the study area incurred high direct and indirect costs for malaria illness episodes**.** In addition to the direct expenditures of malaria, the indirect losses due to absenteeism from work and school both for patients and care givers were high. Due to the fact that, the disease affected considerable members of the households, workdays lost either by family members or by outside of the family members were also great. Therefore, the value of foregone work time was great which invisibly affect the economy of the households as a whole.

Yet, the fact that, greatest number of malaria patients had purchased anti-malarial drugs from private institutions, shows that there might be shortage (insufficiency) of supplies which could contributed to the high burden of the disease because most of the patients were diagnosed with malaria but sent back home with only prescription paper-without drug from public health facilities. So, either these patients had spent long time searching for anti-malaria drug by going longer distance from a private drug store/pharmacy or they stayed at home without any access to treatment. In both cases, these patients were prone to delayed treatment, longer duration of illness, expensive and use of reserved and counterfactual drugs. Also, both individual/patient and availability/accessibility factors influenced the amount of direct and indirect cost. An implication is that reducing malaria burden could contribute also to poverty reduction as well. As a result, national malaria program needs to recognize this economic burden and identify mechanisms for ensuring that the community have uninterrupted easy access to malaria treatment services.

7.2. Recommendation

From the study findings, we suggest that;

Federal Ministry of Health/Regional Health Bureau/Zonal Health Department:

- Should ensure health services needed to be delivered at primary health facilities as they are in fact delivered with regard to malaria cases treatment.
- Should improve supply of adequate drugs and supplies to capacitate health facilities to provide adequate services for malaria treatment in order to reduce receiving prescription only from health facilities.
- Should have to engage the community in to CBHI scheme to reduce direct medical cost incurred by the households.

District Health Office:

- Should effectively monitor and evaluate private HFs and identify sources where they obtained anti-malaria drugs for sale.
- Should have to convince road and transportation offices to put tariff for each distance as transportation cost had significant influence on the households.
- Should effectively M&E stock-in and stock-out drugs in the HFs, as they reach to the service user because receiving prescription only is prominent factor for the cost incurred.

Health Facilities:

- Should create awareness in the community ;
  - To visit HFs early when they are sick for their any health problems to reduce disease severity.
  - To complete of drugs prescribed for them and refrain from use of left over drugs as it expose them to drug resistance and prone to long duration of illness.
  - To effectively use their productive working days instead of extra people came with the patients as the care givers incurred cost.

- Strengthening HEWs to ward malaria diagnosis and treatment at HP to reduce transportation cost and severity of the disease.
- Should strengthen effective HCF system by applying fee waiver system and utilization of exempted services.
- Strengthening drug therapeutic committee (DTC) and selecting teams to do medical audits with regard to malaria case treatment and anti-malarial drugs to ensure availability of drugs.

NGOs:

- NGOs working on malaria prevention should also support facilities in supplying different drugs and supplies to minimize shortage of drugs and supplies in order to alleviate the burden.

Researcher:

- Further study on economic costs need to be done with regard to long term complication of malaria as well as long-term effect of malaria on health and education.

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ANNEXES

Annex I: Malaria Patients Registration Form

Name of Facility: _____

SNo	Patients full name	Date of Register	Age	Sex	Kebele	Zone at kebele level (01, 02,03)	Name of HHs head	HH's code from MFI

Annex II: English Version Questionnaire

Introduction

Good Morning/Good Afternoon. My name is _____ I come here just to collect a data for a thesis title named "Economic Burden of Malaria and Associated Factors Among rural Households in Chewaka district, Bunno Bedele Zone, Oromia region, west Ethiopia 2017/2018". The aim of this study is to estimate economic burden of malaria to rural households.

You are selected for this study randomly and participation in this study is based on Voluntariness. You have full right not to participate in this study however we encourage you to participate since your responses are very crucial to look at the economic burden of malaria. During our stay we will ask you some questions. These questions include socio-demographic variables, direct and indirect cost information's. In the study there are no procedures and questions that may harm or give you a feeling of discomfort. We would like to assure you that your personal identifications will not be written in the questionnaire. Your response will be kept confidential. If findings of this study are ever presented in a workshop or seminar your name or other personal identification will not be mentioned.

If you agree to participate in this study, our questionnaire interview may take us 30-45 minutes. If you feel discomfort or want to withdraw in the middle of our interview, it is your right to discontinue without any penalty. It is also your right not to give a response to some of our question if you don't want to respond.

May I have your permission to proceed to the interview?

Yes …….. (Continue)

No…….(Stop)

House/HH code: _____

Instruction: Circle the number/code for the appropriate answer provided and where applicable write the required responses in the spaces provided

Section one: General socio-demographic characteristics				
Q. No	**Question**	**Response Code**	**Answer**	**Skip to**
1.	What is the sex of interviewee?		1.Male 2.Female	
2.	How old are you?		_____(in Year)	
3.	What is your marital status?		1. Single 2. Married 3. Divorced 4. Widowed	
4.	What is your educational status?		_____	
5.	What is your ethnicity?		1. Oromo 2.Amhara 3.Tigire 4.Gurage 99.Others(specify)_____	
6.	What is your religion?		1. Muslim 2.Orthodox Christian 3.Protestant Christian 99.Others_____	
7.	Number of people living in your family?		_____	
8.	Who is the head of the house?		1.Male 2.Female	
9.	What is your main livelihood (One year)?		1. Farmer 2. House wife 3. Daily laborer 4.Merchant 5. Student 6.Unemployed 7. Government employed 99. Other (specify)_____	
10.	If for question 8 answers is farmer what is your farm land holding in hectares?		_____	
11.	What is your average monthly HH income?		_____	
Section Two: Direct and Indirect cost Information				
12.	Age, sex & episodes of malaria sick members?	Sex: Male…...01 Female…02	Person code age(year) sex episodes _____ _____ _____ _____ _____ _____ _____ _____ …….. ……. ……/…… ……./……../…….	

13.	For how many days did you/they have had malaria last year for each /per visit?		No of ill days _____ _____/_____/_____ _____	
14.	Did you/they have fever symptoms for each /per visit?	YES ……01 NO ……..02	_____ _____/_____/_____ _____ _____/_____/_____	
15.	For those who have had fever for how long did the fever last for each for all visit (days)		No of fever days Total _____ _____/_____/_____ _____ _____	
16.	For those who have had fever what are the days between onset of fever & treatment initiation for each /per visit (days)?	The same day……..01 Next day……..…02 After two days &more…03	Person code No of days _____ _____/_____/_____ _____/_____/_____	
17.	For those who have had fever what is the severity of fever for each /per visit (as reported by the patient)?	Mild (loss of appetite & headache...01 Moderate (sitting down & tiredness)...02 Sever (fitting & convulsion…..03	Severity _____ _____/_____/_____ _____ _____/ _____/_____	
18. .	How was malaria diagnose for each /per visit 18.1 Microscopically confirmed by Technician? 18.2 Self-report? 18.3Clinically diagnosed by health professionals?	Yes----------01 No----------02	18.1 18.2 18.3 _____ ____/____/___ ___/___/___ ____/____/_____ _____ ____/____/___ ___/____ /___ ____/____/_____	
19.	Did you/they take self-treatment at any time in the course of illness before getting treatment from any other source for each /per visit?	Yes ……01 No. ……02	____ _____/_____/_____ ____ _____/_____/_____	If No ..26
20.	If the individual took any self-treatment, did you/they take any anti-malaria medication for each /per visit?	Yes----------01 No----------02	_____ _____/_____/_____ _____/_____/_____	If No26
21.	If yes, where did you/they take any anti-malaria medication for each /per visit?	Use of left over drugs from previous treatment….01 Traditional sources……...…02 Purchase of drugs from private stores.....03 other(specify)_____	_____ _____/_____/_____ _____ _____/_____/_____ _____/_____/_____	

22.	State which kind of drugs you/they took for each /per visit. NB: If took more than two kinds of drugs, indicate in the next column	Drug Codes: Chloroquine…01Coartem...02 Artisunate…...03Quinine...04 Other (specify).99	kind of drugs ____ _____/____/____ ____ _____/____/____	
23.	Have you completed the prescribed drugs for each /per visit?	Yes….....01 No….....02	_____ _____/_____/_____ _____/_____ _____/_____	
24.	Did you/they get a full recovery from self-treatment for each /per visit?	YES……...01 NO ……02	_____ _____/_____/_____ _____/_____ _____/_____	
25.	What was the total cost (in Birr) of self-treatment for each /per visit?		Amount in Birr ____ _____/_____/_____ _____	
26.	Did you/they receive treatment from a formal source during the course of the illness from malaria for each /per visit? 26.1 yes/no26.2 If yes, distance to treatment centers (Km)?	YES …… 01 NO. …...……...02	26.1 (01/02) 26.2 Dist.to HI (km) ____ ____/____/____ ____/____ ____/____/____/____	If No to 52
27.	For the first formal treatment where is the location of treatment for each?	Location code: Public hospital...01 Public HC…02 Health post...03 Other (specify).99	Location of treatment _____ _____ _____ _____	If did not seek 2nd for mal Rx skip to 45
28.	For the first formal treatment did you/they receive drug /prescription only for each?	Receive drug ……..01 Prescription …….……..02 Both drug and prescription...…..03	(01/02) _____ _____ _____/_____	
29.	For the first formal treatment where is the location of drug procurement for each?	Location of drug procurement: Pharmacy (public hosp)…01 Pharmacy (public HC)…02 At health posts……03 Pharmacy in private facility.04 Other (specify)……99	Location of Procurement ____ _____ ____ _____	
30.	For the first formal treatment what is Cost of drugs to patient for each?	Free...01	Cost of drugs ____ _____ _____ _____	
31.	For the first formal treatment what are the other related ***medical costs*** **(consultation, diagnostic, malaria drug & other drugs**	Consultation……..01 Diagnostic……....02 Malaria drug……....03	(1) (2) (3) (4) ___ _____ _____ _____ _____ _____ _____ _____ _____	

	and supplies) for each?	Other drugs &supplies…..04	_____	
32.	For the first formal treatment what are ***non-medical costs*** **(transport, food and other items**) for each?	Transport……..…01 Food……....02 other items……...03	**(1) (2) (3)** ____ _____ _____ _____ ____ _____ _____ _____ _____ _____ _____ _____	
33.	For the 2nd formal treatment where is the location of treatment for each?	Location code: Public hospital ….01 Public HC……..…02 Health post……....03 Other(specify)……99	Location of treatment _____ _____ _____ _____	If did not seek 3rd formal Rx skip to 45
34.	For the 2nd formal treatment did you/they receive drug /prescription only for each?	Receive drug ……01 Prescription …….....02 Both drug and prescription...03	(01/02) ____ _____ ____ _____/_____	
35.	For the 2nd formal treatment where is the location of drug procurement for each?	Location of drug procurement: Pharmacy (public hosp)...01 Pharmacy (public HC).…02 At health posts……03 Pharmacy in PF……...…...04 Other (specify)……99	Location of Procurement _____ _____ _____ _____	
36.	For the 2nd formal treatment what is Cost of drugs to patient for each?	Free...01	Cost of drugs _____ _____ _____ _____ _____	
37.	For the 2nd formal treatment what are the other related ***medical costs*** (**consultation, diagnostic, malaria drug & other drugs and supplies**) for each?	Consultation……...……1 Diagnostic…….....2 Malaria drug……...3 Other drugs &supplies…...4	(1) (2) (3) (4) ____ _____ _____ _____ _____ ____ _____ _____ _____ _____ _____	
38.	For the 2nd formal treatment what are ***non-medical costs*** (**transport, food and other items**) for each?	Transport……...1 Food……..2 other items…….3	(1) (2) (3) _____ _____ _____ _____ _____ _____ _____ _____ _____	
39.	For the 3rd formal treatment where is the location of treatment for each?	Location code: Public hospital ...01 Public HC……...02 Health post……..03 Other(specify)….99	Location of treatment _____ _____ _____ _____	

40.	For the 3rd formal treatment did you/they receive drug /prescription only for each?	Receive drug …….....01 Prescription …….....02 Both drug and prescription....03	(01/02) _____ _____ _____ _____
41.	For the 3rd formal treatment where is the location of drug procurement for each?	Location of drug procurement: Pharmacy (public hosp)…01Pharmacy (public HC).….02 At health posts……..03 Pharmacy in PF…….04 Other (specify)…….99	Location of Procurement _____ _____ _____ _____
42.	For the 3rd formal treatment what is Cost of drugs to patient for each?	Free...01	Cost of drugs _____ _____ _____ _____ _____
43.	For the 3rd formal treatment what are the other related ***medical cost*** (**consultation, diagnostic, malaria drug & other drugs and supplies**) for each?	Consultation……...…….…01 Diagnostic…….....02 Malaria drug……...03 Other drugs &supplies…...04	(1) (2) (3) (4) ___ _____ _____ _____ _____ ___ _____ _____ _____ _____ _____
44.	For the 3rd formal treatment what are ***non-medical costs*** **(transport, food and other items)** for each?	Transport……...…1 Food…….….2 other items…….3	(1) (2) (3) ___ _____ _____ _____ _____ _____ _____ _____
45.	What was/were the most important reason/s for choosing those facilities provider? 45.1.First visit 45.2.second visit 45.3.third visit 45.4.toal visit	Proximity…….....01Good reputation...……...02 Inexpensive…….03Goodpersonalexperience.....04 Qualification of staff....05 Availability of drugs...06 Can get treatment on credit...07Other (specify)…99	45.1 45.2 45.3 45.4 _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
46.	For each individual who took formal treatment, 46.1 How far was the location for procurement (In km)? 46.2 Did the patient travel to procure the drug? (Yes/No) 46.3 Did anyone else travel to procure the drug? (Yes/No). 46.4.Number of <u>work day lost</u> for patients for all visits(day)	YES ……01 NO.…….02 Reason for absenteeism: Ill due to malaria…01 To care for malaria patient…02 To work for malaria patient....03 To attend funeral	46.1 46.2 46.3 46.4 46.5 46.6 46.7 ____ _____ _____ _____ _____ _____ _____ _____ ____ _____ _____ _____ _____ _____ _____ _____ ____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

	46.5. Income lost(***wage loss***) for patients for all visits(ETB) 46.6.Absenteeism from school for patients for all visits 46.7. Reason for absenteeism?	ceremony…04		
47.	For each individual who traveled to procure drugs, indicate travel costs in Birr. Travel costs include transportation, food and any associated lodging expenses. 47.1 Travel cost of patient; 47.2 Person code of companion; 47.3 Travel cost to companion(for all companion) 47.4.Number of work day lost for companion for all visits(day * no of companion) 47.5. Income lost(***wage loss***) for companion all visits(ETB* no of companion) 47.6.Absentism from school for companion(day * no of companion) 47.7 For person (s) who traveled with patient(s) out of family member give code starting from 20.		47.1, 47.2, 47.3, 47.4, 47.5, 47.6, 47.7 ____ ____ ____ ____ ____ _____ _____ _____ ____ ____ ____ ____ ____ _____ _____ _____ ____ ____ ____ ____ ____ _____ _____ _____ ____ ____ ____ ____ _____ _____ _____	
48.	For each individual who Traveled (patient) how did you travel to this provider/per visit?	On foot…….……01 Motorcycle……02 Bycar…….03Public taxi/bus…....04 Donkey/Horse……..…05 Other (Specify)…....99	Person Mode of travel _____ _____/_____/_____ _____ _____/_____/_____	
49.	For those HH members who have had malaria, was hospitalization required at any time course of the illness?		YES……..……..01 NO…….02	If no to 52
50.	If yes, what were the total days of hospitalization for all visits (hr)?		_____	
51.	What was the total cost of hospital stay including travel, food, and lodging and associated expenses for the HH?		Total cost _____	
52.	Total number of people unable to work caring for the sick household members for all visits?		_____	
53.	Number of days prevented from assuming normal duties.		_____	
54.	For those household members who have had malaria in the last year did you/they stop going to work or to school because of malaria?		YES……01 NO……...02	If NO ...57
55.	If yes, did another household member replace them at work?		YES …… 01 NO ……. 02	If NO ...57

56.	If, yes total no of days replaced for all visit for all (including out of the member of the HH).		_____	
57.	If NO, replacement was used, please indicate why per patient /visit?	Reason for no replacement. Too expensive……...01 Not avail……02 Not necessary……03 Other (specify)……99	Reasons: _____ _____/_____/_____ _____ _____/_____/_____	
58.	Regarding the HH member who replaced the sick HH member for all visits. 58.1 Did the replacement cut back on his/her duties to work for you/them? 58.2 Was the replacement paid to work for you/them or given anything in return (indicate value in birr)?	YES …… 01 NO …,…. 02	58.1 58.2 ____ _____ _____ ____ _____ _____ _____/ _____	
59.	Did the people in this house take any prevention action to prevent malaria last year?		Yes……01 No …….02	If NO …62
60.	If yes, what the HH has done to prevent malaria?	Spray …….01 Bed nets…….02 Repellents…..03 Other (specify)_____	_____	
61.	How much (in Birr) was spent in this year on: 61.1 Spray (IRS? 61.2 Bed nets (ITN)? 61.3 Repellants? 61.4 Other (specify)? 61.5 Total?		61.1 61.2 61.3 61.4 61.5 _____ _____ _____ _____ _____	

Annex III: English Version Informed Consent

CONSENT FORM

I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered to my satisfaction. I understand that I may Withdraw myself (or any information I have provided) from this Project (before data collection and analysis is complete) without having to give reasons or without penalty of any sort.

I understand that any information I provide will be kept confidential to the researcher and the supervisor. The published results will not use my name, and that no opinions will be attributed to me in any way that will identify me. I agree to take part in this research

Address of principal investigator: - Mr. DUFERA RIKITU

Tel: +251922260706/+251923043878 E-mail: duferarikitu24@gmail.com

Participant's signature: _____ date: _____

Respondent's number/ code _____

Annex IV: Afaan Oromo Version Questionnaire

SEENSA

Akkam Oltaan /Bultaan. Ani maqaan koo……..jedhama kanaan isiin bira dhufeef qorannoo wa'ee "Economic Burden of Malaria Among Rural Households in Chewaka District, Bunno Bedele Zone, Oromia Region,west Ethiopia 2017/2018" jedhamuu irrattii ragalee sassaabuudhaafii . Kayyoon qorannichaas basiiwwaan Kara dhibee busaan kallattiifi al-kallattiidhaan sadarkkaa mattiiti bahu tilmaamufidha.

Isiniis qorannooo kanaaf kan filatamtaans caarranidha, akkasumas itti hirmachunis feedha keesan irrattii hundaa. Hirmaana keesaniif fayyaddamnii kalatiin argataan hinjiru.Haa ta`u malee, odeefannoon qo'annoo kana irra argamuun wa'ee basii busaadhaan walqabate irrattii fuula durattii jirachuu hindandaa. Qorannoo keenya keessati gaafilee tokkoo tokkoo isiin gafana. Isaanis wa'ee gaafii waligalaa haala Hawwaassa fi ummaata akkasumas odeefannoo baasii kallattiif al-kallattii dhukkuba busaattiifiidha. Hicitiin hirmatoota gutumaan gututii haala seera jiruun eegamadha. Deebiwwan keessan bu`ura qo`annoo kootitti, innis haala hin beekamneen gaabasa keessatti bareefama. Tuutaan waan baraa`ee gabafamuuf eenyumaa keessan addan baasuun hindanda'amu. Feedha keesan yoota'ee qorannoon keenya daqqiiqaa 30-45 caalaa hinfudhatu. Feedha keesan hintane taanaan bakka hinbarbanetti addan kutuufi yaada laachuu dhiisuu hindandeesu.

Kanafuu gafii keenya itti fuufnuu?

Eyyee……. (Ittii fufaa)

Lakkii……. (Dhaabaa)

Kutaa:1ffaa: Gaafii waligalaa haala Hawwaassa fi ummaata

Lakk.	Gaafi	Koodii deebii	Deebii	Garagaafii--ttii darbi
1.	Saalii gaafatamaa malidha?		1.Dhiira 2.Dhaalaa	
2.	Ummuriin kee Meeqa?		_____(waggadhaan)	
3.	Haali fuudha/heeruma?		1. Hin fuune/heerumne 2.Fuudhera/heerumtetti 3. Walihiktetti4. jala kan du`e/dute	
4.	Sadarkkaan Barnoota?		_____	
5.	Qomoon kee malidha?		1.Oromoo2.Amaara3.Tigiree4.Guragee 99.kan biro	
6.	Ammantaan kee malidha?		1. Islaama 2. Ortodooksii 3. Protestanitii 99. Kan biro____	
7.	Maatiin keesan nama meeqa?		_____	
8.	Abban mana eenyuudha?		1.Dhiira 2.Dhalaa	
9.	Dalagaan/hojiin kee malidha?		_____	
10.	Debiin gaafii 9 qonnaan bulaa yoo ta`e bal`in lafa keetti Heektaraan meqa?		_____	
11.	Gaaliin ji`a tokko keessaatti maatiin kee /san argatu/taan meeqa?		_____	

Kutaa 2ffaa: Odeefannoo Baasii kallattiif al-kallattii dhukkuba busaattiifii

12.	Namoonni bara/waggaa darbe keessa busaan qabaman umurii(waggaan) ,saala fi marsaa isaan dhukkubsataan ibsaa	Saala Dhiira……..…01 Dhaalaa……...02	Koodii, umurii(waggaan), Saala , marsaaa namaa _____ _____ _____ _____ …….. …….. ……/…… ……./……../…….	
13.	Bara darbe keessa,yoom (yeroo kam/meeqa) Busaadhan dhukkubssatte/tan?		Guyyaa _____ _____/_____/_____ _____	
14.	Namoonni bara/waggaa darbe busaan dhukkubsatan keessaa qaama -gubaan kan qaban jiru?	Eeyyee……01 Lakki……..…02	_____ _____/_____/_____ _____ _____/_____/_____	
15.	Namoota qaama gubaa qabaan irraa guyyootan meeqa ture (guyyaan)?		Guyyaa Idda'ama _____ _____/_____/_____ _____ _____	

16.	Namoota qaama gubaa qabaan guyyoota isaan gubaan jalqabeef yaalii argataan gidduu jiru meeqa ture (guyyaan)?	Guyyaadhuma ……01 Guyyaa itti …….02 Guyyaa 2fi isaa ol...03	Guyyaa _____ _____/_____/_____ _____/_____/_____	
17.	Namoota qaama gubaa qabaan cimiinii qubaa qamma isaanii akkammii (deebii isaanii irrattii hunda'ee)?	Gadii bua'aa……...01 Giddu galeesa…….02 cimaa…….…….03	Ciminaa _____ _____/_____/_____ _____ _____/ _____/_____	
18.	Namoonni (maqaa) busaan bara darbe dhkkubsatooni akkamiinqoratamaan? 18.1 qormaata-dhiigaa, 18.2 mallattoo- qofaan(ogeessa fayyaatiin), 18.3 qormaata-dhiigaan ala.	Eeyyee……01 Lakki……..02	18.1 18.2 18.3 _____ _____/_____/____ ___/___/___ ____/____/_____ _____ _____/_____/____ ___/____ /___ ____/____/_____	
19.	Yeroo dhukkubsatan/te/tte keessa, osoo yaalii gara biraatii hin argatin dura offif-of yaaltanii/ltee turanii/turtee?	Eeyyee……01 Lakki……...…...02	_____ _____/_____/_____ _____ _____/_____/_____	Lakki...26
20.	Yoo of-yaaltan/lte ta'e, dawaa/qoricha busaa kam iyyuu fudhatanii/ttee turanii/turtee?	Eeyyee…….01 Lakki…….....02	_____ _____/_____/_____ _____/_____/_____	Lakk...26
21.	Yoo eyyee ta'ee eessaa fudhataan/tte?	Kan irra hafee…….....01 Kan aadaa……...02 Dhuunfaairran bitee…03 Kan boroo(ibsaa)_____	_____ _____/_____/_____ _____ _____/_____/_____ _____/_____/_____	
22.	Gosa dawaa/qorichaa kam Fudhattan/tte ibsa/si.	Koodii qorichaa: Chloroquine…….....01 Coartem…….…..02 Artisunate…….…...03 Quinine……04 Kan biraa (ibsaa)…(99)	Gosa qorichaa _____ _____/_____/_____ _____ _____/_____/_____	
23.	Dawa isiniif kenname xumurtanittuu?	Eeyyee…….01 Lakkii……..02	_____ _____/_____/_____ _____/_____ _____/_____	
24.	Offif-of yaalun guututti fayyitanii/fayyitee turtanii/turtee?	Eeyye……..01 Lakki……..02	_____ _____/_____/_____ _____/_____ _____/_____	
25.	Gatiin ofii-of yaalii Qr.n meeqa ture?		Amma Qr. ____ _____/_____/_____ _____	

26.	Mana yaalii idleetti yaalamtanii/tee turtanii/turtee? 26.1.Eyyee/Lakkii 26.2.Eyyee yoo ta'ee hangaam fagata(km)	Eeyyee……01 Lakki……..….02	Eeyyee. /lak. (01/02) _____ ____/____/____ ___/____ ____/___ Fageenya (Km) _____/_____/_____	Lak...52
27.	Kanneen yaalii idlee yeroo1ffaatiif argatan Bakki yaalii eesa?	Kodii idoo: Hospitaalmotumma.01 Buufata fayyaa……02 Keellaafayyaa…….03 Kan biro……..99	Iddoo _____ _____ _____ _____	Yoo Yaalii Idlee yeroo 2ffaa tiif hin barbaann e ta'e, gara 45 tti darbi
28.	Kanneen yaalii idlee yeroo1ffaatiif argatan qorrichcha argatanii/waraqaa qorichaa qofaa(01/02)?	qorrichcha argataan.01 waraqaqorichaqofaa02 Lamaan isaa……03	(01/02) ____ _____ _____/_____	
29.	Kanneen yaalii idlee yeroo1ffaatiif argatan bakkii qoricha argatan eesa?	Bakka qorichaargatan: Hospitala M ……....01 Buufatafayyaa …....02 Keellaafayyaa ……03 Manaqorichaa ……04 Kan biro ……99	Bakka qorichaargatan ____ _____ ____ _____	
30.	Kanneen yaalii idlee yeroo1ffaatiif argatan gatii qorichaa?	Tola….01	Gatii qorichaa _____ _____ _____ _____	
31.	Kanneen yaalii idlee yeroo1ffaatiif argatan baasii medikalaan walqabate hunda:	Baasii medikalaan Gorsa……..01 Laboratorii…….02 Qoricha……...03 Kan boroo……...04	(1) (2) (3) (4) ____ _____ _____ _____ _____ _____ _____ _____ _____ _____	
32.	Kanneen yaalii idlee yeroo1ffaatiif argatan baasii medikalaan alaan walqabate hunda:	Baasii medikalaan alaa Geejiba……...…01 Nyaata ……...02 Itemoota hunda..……..03	(1) (2) (3) _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	

33.	Kanneen yaalii idlee yeroo2ffaatiif argatan bakkii qoricha argatan eesa?	Bakka qorichaargatan: Hospitala motumaa 01 Buufata fayyaa …...02 Keellaa fayyaa ……03 Mana qorichaa ……04 Kan biro …….99	Bakka qorichaargatan _____ _____ _____ _____	
34.	Kanneen yaalii idlee yeroo2ffaatiif argatan Qorrichcha argatanii/waraqaa qorichaa qofaa (01/02)?	Qorrichaargataan…...01 Waraqaaqorichaqofaa.02 Lamaan isaa……..03	(01/02) _____ _____ _____ _____/_____	
35.	Kanneen yaalii idlee yeroo2ffaatiif argatani Bakkii qoricha argatan bittani eesa?	Bakka qorichaargatan: Hospitala motumaa ...01 Buufata fayyaa ……..02 Keellaa fayyaa ……..03 Mana qorichaa ……..04 Kan biro ……....99	Bakka qorichaargatan bitani _____ _____ _____ _____	Yoo Yaalii Idlee yeroo 3ffaa tiif hinbarbaa nneta'e, gara 45 tti darbi
36.	Kanneen yaalii idlee yeroo2ffaatiif argatan Gatii qorichaa?	Tola……..01	Gatii qorichaa _____ _____ _____ _____ _____	
37.	Kanneen yaalii idlee yeroo2ffaatiif argatan baasii medikalaan walqabate hunda:	Baasii medikalaan Gorsa……...……01 Laboratorii…...……02 Qoricha……..…….03 Kan boroo……...04	(1) (2) (3) (4) ____ _____ _____ _____ _____ ____ _____ _____ _____ _____ _____	
38.	Kanneen yaalii idlee yeroo2ffaatiif argatan baasii medikalaan alaan walqabate hunda:	Baasii medikalaan alaa Geejiba……01 Nyaata ……....02 Itemoota hunda…...03	(1) (2) (3) _____ _____ _____ _____ _____ _____ _____ _____ _____	

39.	Kanneen yaalii idlee yeroo3ffaatiif argatan Bakkii qoricha argatan eesa?	Bakka qorichaargatan: Hospitalamotumaa..01 Buufatafayyaa ……02 Keellaa fayyaa ……03 Mana qorichaa ….....04 Kan biro ……99	Bakka qorichaargatan _____ _____ _____ _____	
40.	Kanneen yaalii idlee yeroo 3ffaatiif argatan Qorrichcha argatanii/waraqaa qorichaa qofaa (01/02)?	qorrichcha argataan....01 Waraqaaqorichaaqofa.02 Lamaan isaa……03	(01/02) _____ _____ _____ _____	
41.	Kanneen yaalii idlee yeroo3ffaatiif argatan Bakkii qoricha argatan eesa?	Bakka qorichaargatan: Hospitalamotumaa …01 Buufatafayyaa ……...02 Keellaa fayyaa ……..03 Mana qorichaa ……..04 Kan biro ……..…….99	Bakka qorichaargatan _____ _____ _____ _____	
42	Kanneen yaalii idlee yeroo 3ffaatiif argatan Gatii qorichaa?	Tola……..01	Gatii qorichaa _____ _____ _____	
43.	Kanneen yaalii idlee yeroo 3ffaatiif argatan baasii medikalaan walqabate hunda:	Baasii medikalaan Gorsa……..01 Laboratorii……..02 Qoricha…...……03 Kan boroo...……04	(1) (2) (3) (4) ____ _____ _____ _____ _____ ____ _____ _____ _____ _____ _____	
44.	Kanneen yaalii idlee yeroo 3ffaatiif argatan baasii medikalaan alaan walqabate hunda:	Baasii medikalaan alaa Geejiba……01 Nyaata …….…...02 Itemoota hunda…...03	(1) (2) (3) ___ ____/____/____ ____/___/___ ____/___/___ _____ _____ _____ _____	
45.	Sababiin isiin dhabilee kana filataan maaliif? 45.1.marsaa 1ffaa 45.2. marsaa 2ffaa 45.3. marsaa 3ffaa 45.4. marsaa hunda	Dhi’eenya…..……..01 Deebiigariinuuflaata02 Rakasaa……...03 Muxannoo qabuu…04 Dandeettii qabuu ....05 Qorichaaga’haqabu.06	45.1 45.2 45.3 45.4 ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____	

		Liqiinuuflaachudanda07 Kan biro…….99	
46.	Namoota yaali idlee argatan tokko-tokkoo isaanitiif: 46.1 Fageenya bakka yaalii(km), 46.2 dhukkubsataan deemee bakka dawaa argatan (Eyyee/Lakkii)? 46.3.Namooni biroon waliin demaniruu(eyyee/lakkii Gatii/Baasii qorichaa, 46.4.Guyyootan dhukkuba kanaaf dhukkubsataan gubee(marsaa hunda) 46.5. Baasii kanaan walqabate dhukkubsataan Hunda(QE) 46.6. Guyyootan mana barumsaa hafee hunda 46.7. sababa hafeef	Eyyee …….01 Lakkii.…….……02 Saboota Hafeef: Dhukkubeetii……...01 Dhuk.gargaruf/yalu.02 Dhuk.hoji gargaruf..03 Du'aa gaii demeen..04	46.1 46.2 46.3 46.4 46.5 46.6 46.7 ____
47.	Kanneen qoricha argachuu deeman tokko-tokkoo isaaniif baasii deemichaa Qr.n (geejibaaf, nyaataf, Bullmastiff, kkf.) ibsaa: 47.1. Basii hadeemsa dhukkubsataa, 47.2. Koodii nama wajjin deemee, 47.3. Baasii nama wajjin deemee, 47.4. Namoonni dhukkubsataa wajjin deeman guyyaa hojii meeqa gubaan(guyyaa*namoota) 47 .5. Basii namoonni dhukkubsataa wajjin deemanbasaan(QE* namoota) 47.6. Namoonni dhukkubsataa wajjin deeman guyya isaan mana barumsaa irra hafaan(guyyaa* namoota) 47.7.Namoonni dhukkubsataa wajjin deeman maatii keessaa hin taane lakk.'20' eegalii koodii keniif		47.1, 47.2, 47.3, 47.4, 47.5, 47.6, 47.7 ____ ____ ____ ____ ____ ____ _____ _____ ____ ____ ____ ____ ____ ____ _____ _____ ____ ____ ____ ____ ____ ____ _____ _____ ____ ____ ____ ____ ____ _____ _____
48.	Kaneen deeman akkamiin deeman (dhukkubsatootaf)?	Milaan…….…..….01 Saykilaan……..……..02 Konkoolata ……....03 Konkoolata ummata...04 Harree/gangoo ……...05 Kan biroo……..…..99	Haala geejiba _____ _____/_____/_____ _____ _____/_____/_____

49.	Kanneen dhukkubsatan kessaa waggaa darbe, Hospitaala ciisanii kan yaalaman wayi turanii?		Eeyyee……01 Lakki……...02	Laki52
50.	Eyyee, yoo ta'ee guyyaa meeqa ciisan (sat.)?		_____	
51.	Miseensa maatii keessaa namni ciisee yaalame yoo jiraate,baasii dimshaashaa yeroo turtii hospitaalaa (geegiba, nyaata, bulmaata,kkf.) walitti dabalaatii ibsaa		Amma baasii(Qar) _____	
52.	Miseensa maatii keessaa namni dhukkubsataa kununsuuf hojii idle irraa dhaabbate yoo jiraate guyyoota hojii dhaabe/hike wajjin ibsaa.		_____	
53.	Guyyootaan hoillee iddlee irraa hafe		_____	
54.	Miseensa matii keessaa kan baradarbe qabamesababa busaatiin hojii ykn mana barumsaa dhaquu dadhabee turee?		Eeyyee……....01 Lakki…….....02	Laki Ta'ee ... 57
55.	Eyyee tanaan miseensa maatii keessaa namni bakka bu'ee hojjatee firaa?		Eeyye----------01 Lakki----------02	Lak ta 57
56.	Eyyee yoo ta'ee guyyaa waligalaa bakka buamee(mattiin ala dabalatee)		_____	
57.	Bakka bu'iisni yoo hin danda'amne ture,maaliif akka ta'e sababa isaa ibsaa.	Gatiin isa mi'a ture.01 Hin argamu…….02 Barbaachisahinturre03 Kan biraa(ibsaa)…..99	Sababa: _____ _____/_____/_____ _____ _____/_____/_____	
58.	Miseensa maatii kan busaan dhukkubsate ilaalchisee: 58.1. Nama dhukkubssate bakka bu'uuf jechuu isaatiif/ishiitiif jechuu hojii isaa/ishii irraa dhaabatee/ttee turee/turtee? 58.2.Namni bakka bu'e/buute nama dhukkubsatee hojjachuu isaaf/ishiif gatiin humnaa kaffalameefiraa? Yoo kaffalameef Qr.n ibsaa.	Eeyyee……01 Lakki……...02	58.1 58.2 ____ _____ _____ ____ _____ _____ _____/ _____	
59.	Namoonni mana kana keessa jirratan dhukkuba busaa of-irraa ittisuuf tarkaanfiin fudhatan jiraa?		Eeyyee…….....01 Lakki……02	Laki 62

60.	Busaa of-irraa ittisuuf waan maatiin kun hojjate natti himuu dandeessuu?	Biffaa (motumaan)01 Golgaa sireetti…...02 Dibata bookee……03 Kan biraa (ibsaa)…04	_____	
61.	Maallaqa waggaa darbe busaa ittisuuf maatiin kun baase Qr.hammamii kafale? 61.1. Biffaa bookkee busaa,42.2 Golgaa sireef, 61.3.Dibata bookeeittisuuf 42.4Kan biraaf (ibsaa).61.5.kan waligalaa		61.1 61.2 61.3 61.4 61.5 _____ _____ _____ _____ _____	

Annex V: Afaan Oromo Version Informed Consent

Guca Waliigaltee

Qabiyeen qo`annoo kana natti himamee naaf galeetti jira. Caraan akkan barbadetti gaafii gaafadhuu fi deebii deebsuu danda`u naaf keenameti jira. Yeroon barbadee osoon sababii hindhiyessin akkaan addabii tokkoo malee hirmaana koo addan kutu hubadheera. Jechoonii koo hundinuu akka iciitiin qabamus hubadheera. Qoratoonis maxansaaf akka maqaa koo itti hin fayadamnee fi yadiin kamiyuu akkaa naan adda basee hin ibsineedha.

Qo`annoo kana irratti hirmachuuf fedhii koo ta`uu ni ibsa.

Mallatoo hirmaataa: _____Guyyaaa: _____

Kodii hirmaataa _____

Madda Odeffannoo qorataa: - Obboo Dhufeeraa Riqituu

Tel: +251922260706/+251923043878 E-mail: duferarikitu24@gmail.com

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: _____

Signature: _____

Name of the institution: _____

Date of submission: _____

This thesis has been submitted for final examination with my approval as University advisor

Name and Signature of internal Examiner

_____

_____

Name and Signature of the first advisor

_____

_____

Name and Signature of the second advisor

_____